

PROJECT TECHNICAL SPECIFICATION

CANADIAN COAST GUARD

**CONSTRUCTION OF ONE (1) EQUIPMENT SHELTER AND
ONE (1) GENERATOR BUILDING**

St. Lawrence, NL

PROJECT NO.: F6839-205539

ISSUED FOR TENDER

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DRAWING LIST

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APPENDIX 2 - GENERATOR BUILDING:

ARCHITECTURAL

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01L1402B02903	SECTIONS AND DETAILS
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NOTES

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Part 1 General**1.1 SECTION INCLUDES**

- .1 Work covered by contract documents.
- .2 Codes.
- .3 Required documents.
- .4 Work Schedule.
- .5 Contractor use of premises.
- .6 Partial Owner occupancy.
- .7 Setting out of work.
- .8 Location of equipment and fixtures.
- .9 Cutting and patching.
- .10 Existing services.
- .11 Oral agreement.
- .12 Taxes and permits.

1.2 PRECEDENCE

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- .1 The work covered under this Contract consists of construction of one (1) 3.7m x 9.75 m wood framed equipment shelter and one (1) 4.27m x 4.27m wood frame generator building as per these specifications and drawings.
- .2 The supply and installation of all mechanical and electrical equipment/systems, as indicated on the contract drawings and more particularly, specified herein.
- .3 The supply and installation of foundations as indicated on the contract drawings.
- .4 Construction of equipment unit at following Canadian Coast Guard site:

St. Lawrence VHF Site

St. Lawrence, Newfoundland and Labrador
Latitude: 48° 58' 06" North
Longitude: 58° 02' 49" West

SUMMARY OF WORK

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- .5 Site preparation, including site grading; services, etc. as indicated on the contract drawings.
 - .6 The contractor is responsible for the testing of all systems in presence of Coast Guard personnel at delivery and a report of the testing results to be delivered to owner no later than ten (10) working days after completion of all the testing. Testing shall include but not be limited to:
 - .1 Ventilation System
 - .2 Lighting
 - .3 Heating System
 - .4 All alarm points back to alarm cabinet
 - .5 Verification of electrical circuit designations
 - .6 Verification of documentation
 - .7 Physical inspection of equipment shelters
 - .7 Documentation on the system and subsystem is to be provided by the contractor. This shall include but not limited to:
 - .1 Complete set of as-built drawings.
 - .2 A complete maintenance manual indicating required maintenance for all installed components, schedule and parts list.
 - .3 A complete report on all system testing.
 - .8 The work included in this contract is specified in the format of general specification document with specific works identified on drawings. The contractor remains responsible for the appropriation of the work between the trade, contractors, his own forces and suppliers. The Engineer will not be responsible for determination of or for providing opinion on the scope of work split between sub-contractors and trade jurisdictions.

1.4 CODES

- .1 Perform work in accordance with the latest edition of the National Building Code of Canada (NBC) 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:
 - .1 Contract documents,
 - .2 Specified standards, codes and referenced documents.

1.5 REQUIRED DOCUMENTS

- .1 Maintain on job site, one copy of each of the following:
 - .1 Specifications.
 - .2 Contract drawings.
 - .3 Addenda.
 - .4 Reviewed shop drawings.
 - .5 Change orders.
 - .6 Other modifications to Contract.

SUMMARY OF WORK

- .7 Copy of approved work schedule.
- .8 Manufacturers' installation and application instructions.
- .9 Health and Safety Plan and other safety related documents.

1.6 WORK SCHEDULE

- .1 Provide in form acceptable to Engineer, within 10 working days after Contract award, schedule showing dates for:
 - .1 Submission of shop drawings, material lists and samples.
 - .2 Delivery of equipment and materials.
 - .3 Commencement and completion of major work.
 - .4 Final completion date within time period required by Contract documents.
- .2 Interim reviews of work progress based on work schedule will be conducted as decided by Engineer and schedule updated by Contractor in conjunction with and to approval of Engineer.
- .3 Schedule work to accommodate Owner's continued use of premises during construction.
- .4 When schedule has been approved by Engineer, take necessary measures to complete work within scheduled time. Do not change schedule without Engineers approval.

1.7 COST BREAKDOWN

- .1 Before submitting first progress claims submit breakdown of Contract price in detail as directed by Engineer. After approval by Engineer, cost breakdown will be used as basis for progress payments.

1.8 CONTRACTOR USE OF PREMISES

- .1 Contractor shall follow security procedures as established by Canadian Coast Guard, within existing procedures at the site, and any project – specific requirements as directed by Engineer.
- .2 Maintain parking, storage of materials, construction trailers, etc., within the confines directed by the Engineer.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

1.9 PARTIAL OWNER OCCUPANCY

- .1 Existing facilities to remain open and fully operational during the course of this project.
- .2 Coordinate use of premises under direction of Engineer.

1.10 PROJECT MEETINGS

- .1 Project meetings will be held at times and locations as determined by Engineer.
- .2 Engineer will arrange project meetings and record/distribute minutes.

SUMMARY OF WORK

1.11 SETTING OUT OF WORK

- .1 Assume full responsibility for and execute complete layout of work to locations indicated.
- .2 Provide devices needed to lay out and construct work.
- .3 Supply such devices as straight edges and templates required to facilitate Engineer's inspection of work.

1.12 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered to be 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 Engineer of impeding installation and obtain his approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Engineer.

1.13 CUTTING AND PATCHING

- .1 Obtain Engineer's approval before cutting, boring or sleeving load-bearing members.
- .2 Cut and patch as required to make work fit.
- .3 Make cuts with clean, true, smooth edges.
- .4 Where new work connects with existing and where existing work is altered, cut, patch and make good existing work.
- .5 Contractor shall be responsible for repair of any damage to existing work resulting from construction activities.

1.14 EXISTING SERVICES

- .1 Where works involves breaking into or connecting to existing services, carry out work at times directed by Engineer, by authorities having jurisdiction, with minimum of disturbance to operation.
- .2 Before commencing work, establish location and extent of service lines in area of Work and notify Engineer of findings.
- .3 Submit schedule to and obtain approval from Engineer for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.
- .4 Where unknown services are encountered, immediately advise Engineer and confirm findings in writing.

SUMMARY OF WORK

1.15 ORAL AGREEMENT

- .1 No oral order, objection, claim or notice by any party to the others shall affect or modify any of the terms or obligations contained in any of the Contract Documents and none of the provisions of the Contract Documents shall be held to be waived or modified by reason of any act whatsoever, other than by a definitely agreed waiver or modification thereof in writing, and no evidence shall be introduced in any proceeding of any other waiver or modification.

1.16 TAXES AND PERMITS

- .1 Obtain and pay for all other necessary permits and taxes required to complete the work specified herein and detailed on the drawing.

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 Inspecting and testing by inspecting firms or testing laboratories designated by Engineer.

1.2 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- .1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Engineer are specified under various sections.

1.3 APPOINTMENT AND PAYMENT

- .1 Engineer will appoint and pay for services of testing laboratory except follows:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .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 Engineer.
 - .6 Additional tests specified in the following paragraph.
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Engineer to verify acceptability of corrected work.

1.4 CONTRACTOR'S RESPONSIBILITIES

- .1 Provide labour, equipment 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.
 - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
- .2 Notify Engineer sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Engineer.

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 Shop drawings and product data.
- .2 Samples.
- .3 Certificates and transcripts.

1.2 RELATED SECTIONS

- .1 Section 01 45 00 - Quality Control.
- .2 Section 01 78 00 - Closeout Submittals.

1.3 ADMINISTRATIVE

- .1 Submit to Engineer submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Engineer. 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 shall be considered rejected.
- .6 Notify Engineer, 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 Engineers review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineers review of submittals.
- .10 Keep one reviewed copy of each submission on site.

1.4 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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3 Allow seven days for Engineer's review of each submission.
- .4 Adjustments made on shop drawings by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- .5 Make changes in shop drawings as Engineer may require, consistent with Contract Documents. When resubmitting, notify Engineer in writing of any revisions other than those requested.
- .6 Accompany submissions with transmittal letter, in duplicate, 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 shall 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 Contractors 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.

SUBMITTAL PROCEDURES

- .6 Standards.
- .7 Operating weight.
- .8 Wiring diagrams.
- .9 Single line and schematic diagrams.
- .10 Relationship to adjacent work.
- .8 After Engineer's review, distribute copies.
- .9 Submit 4 copies of shop drawings for each requirement requested in specification Sections and as consultant may reasonably request.
- .10 Submit 4 copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Engineer where shop drawings will not be prepared due to standardized manufacture of product.
- .11 Delete information not applicable to project.
- .12 Supplement standard information to provide details applicable to project.
- .13 If upon review by Engineer, 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.
- .14 The review of shop drawings by Canadian Coast Guard (CCG) is for sole purpose of ascertaining conformance with general concept. This review shall not mean that CCG approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.5 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Engineer's business address.
- .3 Notify Engineer in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.

SUBMITTAL PROCEDURES

- .6 Make changes in samples which Engineer may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.6 SCHEDULES, PERMITS AND CERTIFICATES

- .1 Upon award of contract, submit to Engineer a copy of the Work Schedule and various other schedules, permits, certification documents and project management plans as specified in other sections of the specifications.
- .2 Submit copy of permits, notices, compliance certificates received by Regulatory Agencies having jurisdiction and as applicable to work.

1.7 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 that CCG shows due diligence towards health and safety on construction sites.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.

1.3 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2 Province of Newfoundland and Labrador
 - .1 Occupational Health and Safety Act, R.S.N. 1990.

1.4 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within seven 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 two copies of Contractor's authorized representative's work site health and safety inspection reports to Engineer and authority having jurisdiction, weekly.
- .4 Submit copies of reports or directions issued by Federal, Provincial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit Material Safety Data Sheets (MSDS) to Engineer.
- .7 Engineer will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within seven days after receipt of plan. Revise plan as appropriate and resubmit plan to Engineer within two days after receipt of comments from Engineer.
- .8 Engineer'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.
- .9 Medical Surveillance: Where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications during emergency situations.

HEALTH AND SAFETY REQUIREMENTS

- .10 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations.

1.5 MEETINGS

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

1.6 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 Engineer may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.7 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.

1.8 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Act, Occupational Health and Safety Regulations, C. Nfld.
- .2 Comply with Occupational Health and Safety Regulations, 1996.
- .3 Comply with Canada Labour Code Part II, Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.
- .4 Observe and enforce construction safety measures required by:
- .1 Latest edition of the National Building Code of Canada.
 - .2 Provincial Worker's Compensation Board.
 - .3 Municipal statutes and ordinances.
- .5 In the event of conflict between any provisions of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Engineer will advise on the course of action to be followed.

1.9 UNFORESEEN 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 Engineer verbally and in writing.

1.10 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 minimum 2 years' site-related working experience as Health and Safety associated with building construction.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 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.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .5 Be on site during execution of Work and report directly to and under the direction of the supervisor.

1.11 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 Engineer.

1.12 CORRECTION OF NON-COMPLIANCE

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

1.13 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.

END OF SECTION

Part 1 General**1.1 REPORTING FIRES**

- .1 Know location of nearest fire alarm box and telephone, including emergency phone number.
- .2 Report immediately all fire incidents to Fire Department as follows:
 - .1 telephone.
- .3 When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify the location.

1.2 FIRE EXTINGUISHERS

- .1 Supply fire extinguishers necessary to protect work in progress and contractor's physical plant on site.

1.3 SMOKING PRECAUTIONS

- .1 Observe smoking regulations at all times.

1.4 RUBBISH AND WASTE MATERIALS

- .1 Rubbish and waste materials are to be kept to a minimum.
- .2 Burning of rubbish is prohibited.
- .3 Removal:
 - .1 Remove all rubbish from work site at end of work day or shift or as directed.
- .4 Storage:
 - .1 Store oily waste in approved receptacles to ensure maximum cleanliness and safety.
 - .2 Deposit greasy or oily rags and materials subject to spontaneous combustion in approved receptacles and remove as required in 1.8.3.1.

1.5 FLAMMABLE AND COMBUSTIBLE LIQUIDS

- .1 Handling, storage and use of flammable and combustible liquids are to be governed by the current National Fire Code of Canada.
- .2 Flammable and combustible liquids such as gasoline, kerosene and naphtha will be kept for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing Underwriters' Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires permission of Fire Chief.
- .3 Transfer of flammable and combustible liquids is prohibited within buildings or jetties.

FIRE SAFETY REQUIREMENTS

- .4 Transfer of flammable and combustible liquids will not be carried out in vicinity of open flames or any type of heat-producing devices.
- .5 Flammable liquids having a flash point below 38°C, such as naphtha or gasoline, will not be used as solvents or cleaning agents.
- .6 Flammable and combustible waste liquids, for disposal, will be stored in approved containers located in a safe ventilated area. Quantities are to be kept to a minimum and Fire Department is to be notified when disposal is required.

1.6 HAZARDOUS SUBSTANCES

- .1 Work entailing use of toxic or hazardous materials, chemicals and/or explosives, or otherwise creating hazard to life, safety or health, will be in accordance with the latest edition of the National Fire Code of Canada.
- .2 Obtain from Fire Chief a "Hot Work" permit for work involving welding, burning or use of blow torches and salamanders, in buildings or facilities.
- .3 When Work is carried out in dangerous or hazardous areas involving the use of heat, provide fire watchers equipped with sufficient fire extinguishers. Determination of dangerous or hazardous areas along with level of protection necessary for Fire Watch is at discretion of the Fire Chief. Contractors are responsible for providing fire watch service for work on a scale established and in conjunction with Fire Chief at pre-work conference.

1.7 FIRE INSPECTION

- .1 Site inspections by Fire Chief will be coordinated through Engineer.
- .2 Co-operate with Fire Chief during routine fire safety inspection of work site.
- .3 Immediately remedy all unsafe fire situations observed by Fire Chief.

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 DISPOSAL OF WASTES**

- .1 Do not bury rubbish and waste materials on site unless approved by Engineer.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.
- .3 All wastes materials must be disposed at an approved landfill site. The Contractor is responsible for obtaining permission from the operator of the landfill prior to disposing of wastes. The Contractor shall provide the Engineering with written permission from the operator of the landfill prior to final disposal of wastes.

1.2 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.3 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties where indicated.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.
- .3 Protect roots of designated trees to drip line during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to areas indicated or designated by Engineer.

1.4 WORK ADJACENT TO WATERWAYS

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 Design and construct temporary crossings to minimize erosion to waterways.

- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Do not blast under water or within 100 m of indicated spawning beds.

1.5 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.
- .3 Equipment and system adjust and balance.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 78 00 - Closeout Submittals.

1.3 INSPECTION

- .1 Allow Engineer 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.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Engineer or by inspection authority having jurisdiction.
- .3 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.
- .4 Engineer may order any 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 examination and correction.

1.4 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Engineer for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Engineer.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Engineer at no cost to Engineer. Pay costs for retesting and re-inspection.

1.5 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.6 PROCEDURES

- .1 Notify appropriate agency and Engineer 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 an orderly sequence so as not to cause delay 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 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 Engineer as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Engineer it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Engineer.

1.8 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as may be requested.
- .2 The cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work shall be appraised by Engineer and may be authorized as recoverable.

1.9 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical systems.

Part 2 Products**2.1 NOT USED**

- .1 Not Used.

QUALITY CONTROL

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

CONSTRUCTION FACILITIES

Part 1 General**1.1 SECTION INCLUDES**

- .1 Office and sheds.
- .2 Parking.

1.2 INSTALLATION AND REMOVAL

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

1.3 CONSTRUCTION PARKING

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.
- .3 Build and maintain temporary roads where indicated by Engineer and provide snow removal during period of Work.
- .4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.

1.4 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.5 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Engineer.

1.6 EXISTING SITE INFRASTRUCTURE

- .1 Existing communications site to be protected from construction activities (dust and debris). Site shall remain in continuous operation except that shut down may be considered for periods, up to fifteen minutes, based on prior approval coordinated with

CONSTRUCTION FACILITIES

Engineer. Exact times of shut down to be predetermined and necessitate Notice to Mariners.

- .2 Engineer shall be notified 72 hours in advance of any planned power outages that will effect communications equipment.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Barriers.

1.2 RELATED SECTIONS

- .1 Section 01 52 00 - Construction Facilities.

1.3 INSTALLATION AND REMOVAL

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

1.4 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations.
- .2 Provide as required by governing authorities.

1.5 DUST TIGHT SCREENS

- .1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.

1.6 ACCESS TO SITE

- .1 Provide and maintain access road as may be required for access to Work.

1.7 FIRE ROUTES

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.8 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.9 PROTECTION OF BUILDING FINISHES

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.

□

TEMPORARY BARRIERS AND ENCLOSURES

.3 Confirm with Engineer locations and installation schedule 7 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

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 Product quality, availability, storage, handling, protection, and transportation.
- .2 Manufacturer's instructions.
- .3 Quality of Work, coordination and fastenings.
- .4 Existing facilities.

1.2 PRECEDENCE

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 REFERENCE STANDARDS

- .1 Within text of each specifications section, reference may be made to reference standards. List of standards reference writing organizations is contained in Section 01 42 00 - References.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether any product or system is in conformance with applicable standards, Engineer reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be born by Engineer in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .5 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

1.4 QUALITY

- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) 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 any dispute arise as to quality or fitness of products, decision rests strictly with Engineer based upon requirements of Contract Documents.

COMMON PRODUCT REQUIREMENTS

- .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.

1.5 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Engineer 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 Engineer at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Engineer reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.6 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 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber and aluminium siding on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Engineer.
- .9 Touch-up damaged factory finished surfaces to Engineer's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.7 TRANSPORTATION

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

COMMON PRODUCT REQUIREMENTS

- .2 Transportation cost of products supplied by Owner will be paid for by Engineer. Unload, handle and store such products.

1.8 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 Engineer in writing, of conflicts between specifications and manufacturer's instructions, so that Engineer may establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Engineer to require removal and re-installation at no increase in Contract Price or Contract Time.

1.9 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 Engineer if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Engineer 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 Engineer, whose decision is final.

1.10 CO-ORDINATION

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

1.11 CONCEALMENT

- .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation, inform Engineer if there is interference. Install as directed by Engineer.

1.12 REMEDIAL WORK

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

1.13 LOCATION OF FIXTURES

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

1.14 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 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 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.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.15 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. 316 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. Use resilient washers with stainless steel.

1.16 PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Engineer.
- .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.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Progressive cleaning.
- .2 Final cleaning.

1.2 RELATED SECTION

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Section 01 77 00 - Closeout Procedures.

1.3 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Engineer. Do not burn waste materials on site, unless approved by Engineer.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use clearly marked separate bins for recycling. Refer to Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .7 Remove waste material and debris from site at end of each working day.
- .8 Dispose of waste materials and debris at designated dumping areas on Crown property.
- .9 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

CLEANING

1.4 FINAL CLEANING

- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review, remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Engineer. Do not burn waste materials on site, unless approved by Engineer.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Remove stains, spots, marks and dirt from electrical and mechanical fixtures, walls, ceilings and floors.
- .8 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .10 Remove dirt and other disfiguration from exterior surfaces.
- .11 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.

END OF SECTION

Part 1 General**1.1 STORAGE, HANDLING AND PROTECTION**

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Engineer.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect, stockpile and store salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed for demolition from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Engineer.
- .7 Protect surface drainage, mechanical and electrical from damage and blockage.
- .8 Separate and store materials produced during dismantling of structures in designated areas.
- .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.
 - .3 Provide waybills for separated materials.

1.2 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers.
- .3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

1.3 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by existing facility.

1.4 SCHEDULING

- .1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 APPLICATION

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

3.3 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

- .1 Schedule E - Government Chief Responsibility for the Environment

Province	Address	General Inquires	Fax
Newfoundland	Department of Environment, Confederation Building, Box 8700, St. John's, NF A1B 4J6	(709) 729-2664	(709) 729-1930

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Administrative procedures preceding preliminary and final inspections of Work.

1.2 RELATED SECTIONS

- .1 Section 01 78 00 - Closeout Submittals.

1.3 INSPECTION AND DECLARATION

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Engineer in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Consultant's Inspection.
- .2 Consultant's Inspection: Consultant and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted, balanced and are fully operational.
 - .4 Operation of systems have been demonstrated to Owner's personnel.
 - .5 Work is complete and ready for Final Inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by Owner, and Consultant. If Work is deemed incomplete by Owner and Consultant, complete outstanding items and request re-inspection.
- .5 Declaration of Substantial Performance: when Owner and Consultant consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance.
- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance shall be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment: When Owner and Consultant consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment.

CLOSEOUT PROCEDURES

- .8 Payment of Holdback: After issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback amount in accordance with general conditions.

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 As-built, samples, and specifications.
- .2 Equipment and systems.
- .3 Product data, materials and finishes, and related information.
- .4 Operation and maintenance data.
- .5 Spare parts, special tools and maintenance materials.
- .6 Warranties and bonds.

1.2 RELATED SECTIONS

- .1 Section 01 45 00 - Quality Control.
- .2 Section 01 77 00 - Closeout Procedures.
- .3 Section 01 79 00 - Demonstration and Training.

1.3 SUBMISSION

- .1 Submit (2) copies of 'As-Built' drawings for approval by the Engineer.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned after final inspection, with Engineer'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 Engineer, 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 If requested, furnish evidence as to 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.

1.4 FORMAT

- .1 Organize data in the form of an instructional manual.

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CLOSEOUT SUBMITTALS

- .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 Section numbers and 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.

1.5 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 date of submission; names,
 - .2 addresses, and telephone numbers of 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 clearly 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].

1.6 AS-BUILTS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site for Owner one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.

CLOSEOUT SUBMITTALS

- .4 Change Orders and other modifications to the 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 Engineer.

1.7 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Engineer.
- .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: legibly mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: legibly 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.

1.8 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 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .12 Additional requirements: As specified in individual specification sections.

1.9 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

1.10 SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Engineer. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.11 MAINTENANCE MATERIALS

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Engineer. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.12 SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Engineer. Include approved listings in Maintenance Manual.

1.13 STORAGE, HANDLING AND PROTECTION

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Engineer.

CLOSEOUT SUBMITTALS

1.14 WARRANTIES AND BONDS

- .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 the applicable item of work.
- .4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

Part 2 Products**2.1 NOT USED**

- .1 Not Used.

Part 3 Execution**3.1 NOT USED**

- .1 Not Used.

END OF SECTION



Fisheries and
Oceans Canada

Real Property

Pêches
et Océans

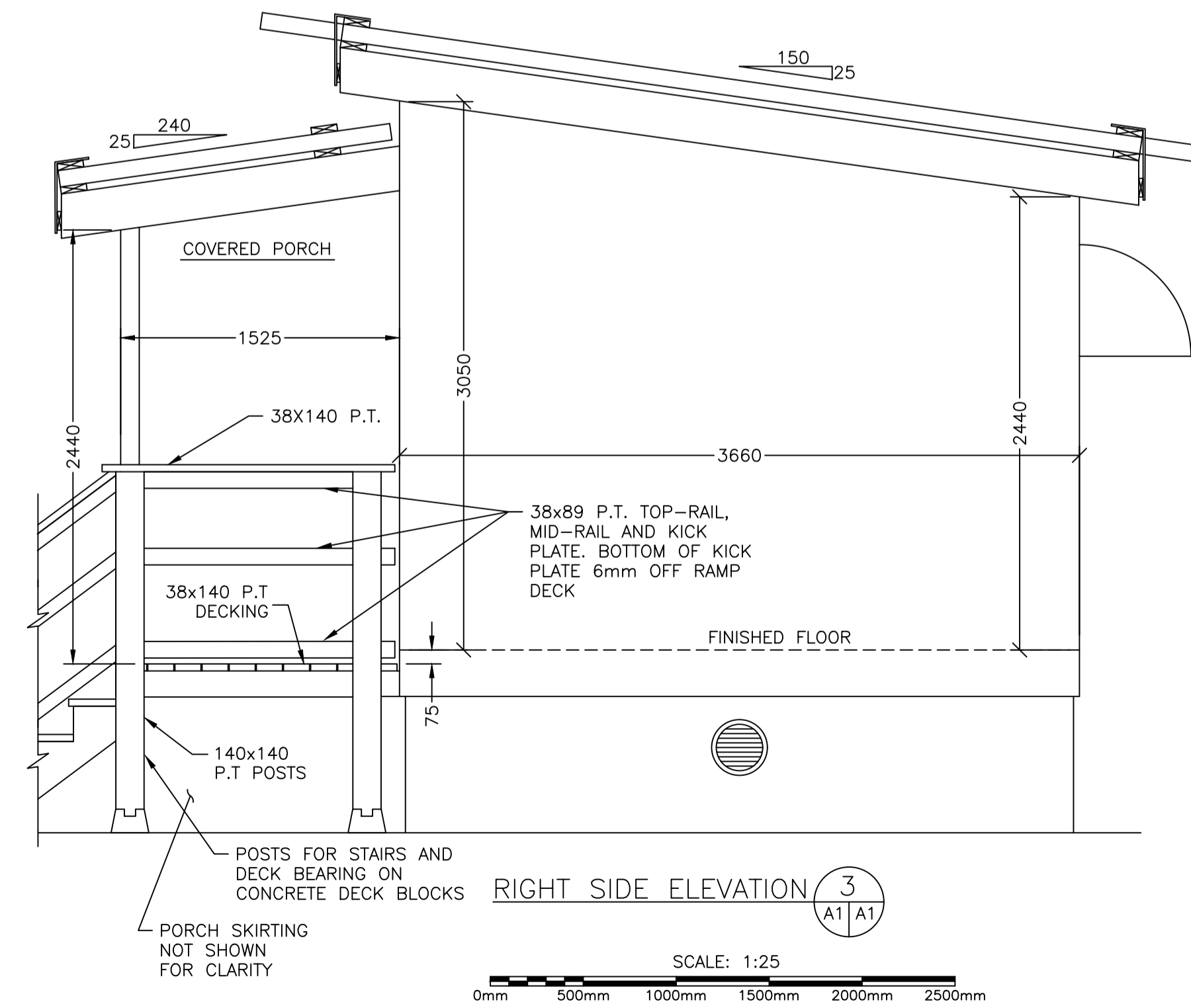
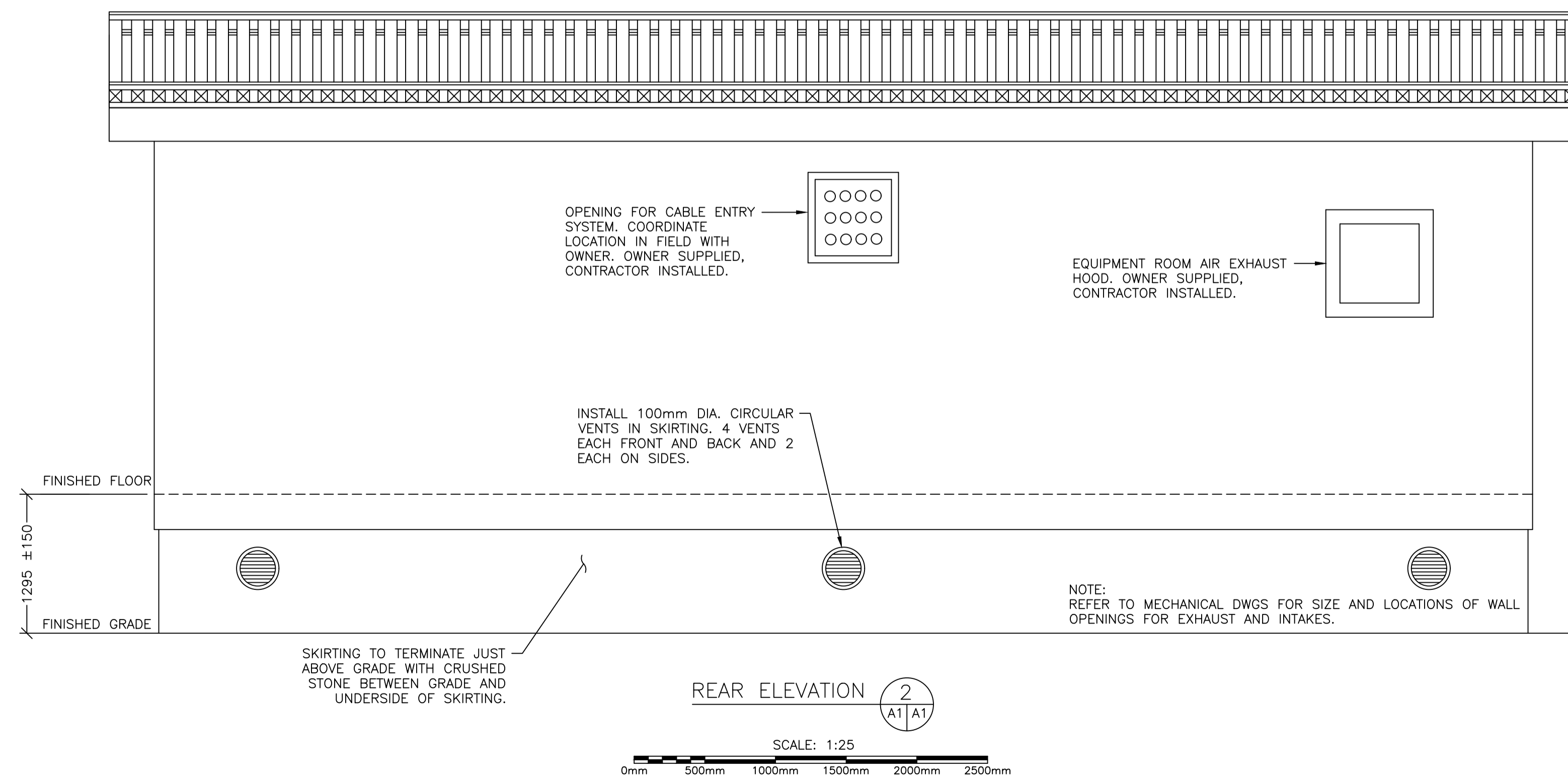
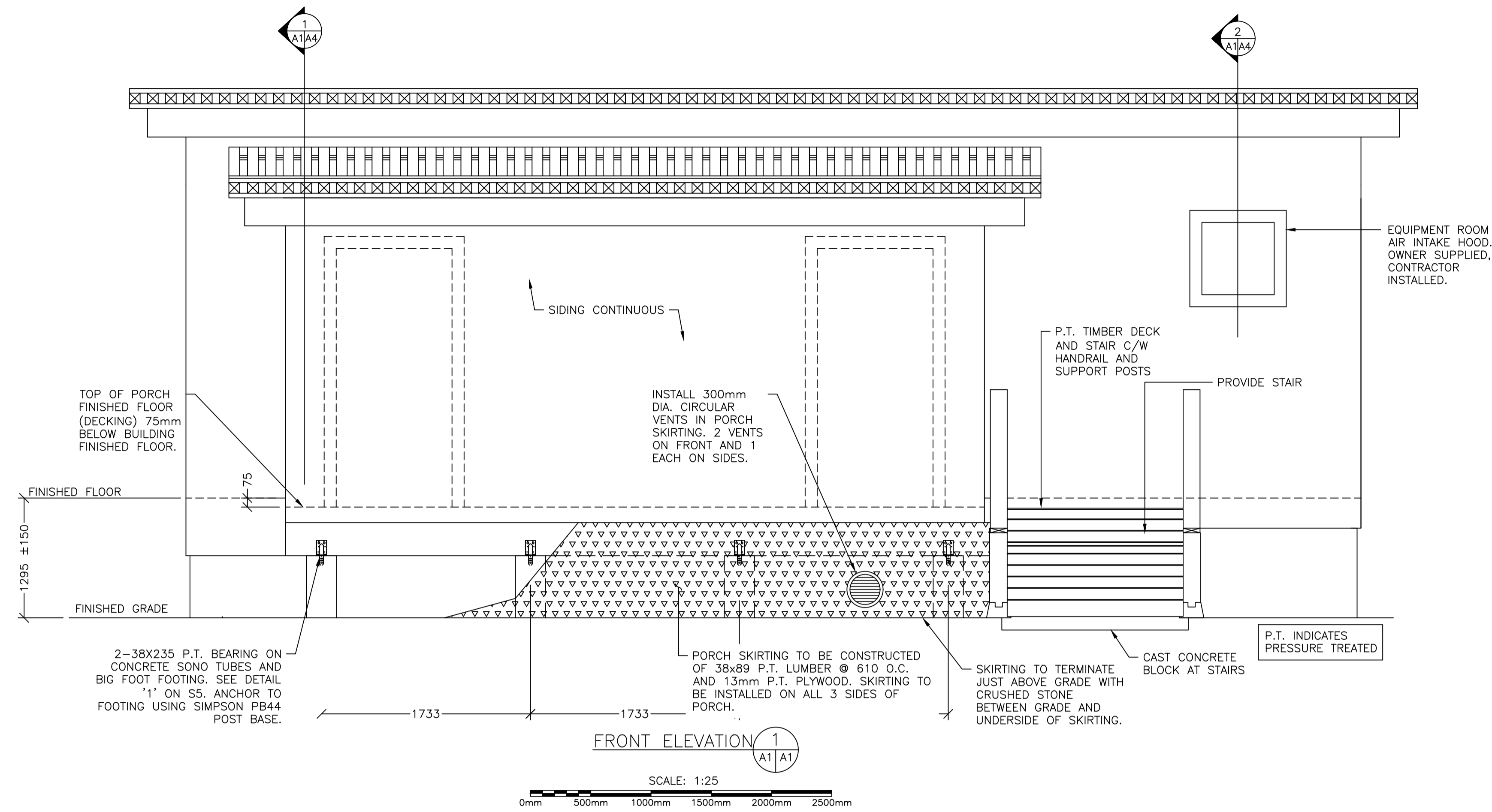
Garde cotiere

P.O. BOX 5667
ST. JOHN'S, NEWFOUNDLAND AND LABRADOR
A1C 5X1

MCTS EQUIPMENT BUILDING — ST. LAWRENCE

DRAWING LIST:

A1	ELEVATIONS
A2	FLOOR, ROOF AND ICE-SHIELD PLANS
A3	SECTIONS AND DETAILS
A4	TYPICAL DETAILS
A5	DOOR SCHEDULE AND DETAILS
S1	FRAMING PLAN, SECTIONS AND DETAILS
S2	FOUNDATION SECTIONS AND DETAILS
M1	VENTILATION SYSTEM PLANS AND DETAILS
M2	MECHANICAL PENETRATIONS
E1	ELECTRICAL LAYOUT AND LEGEND
E2	ELECTRICAL DETAILS
E3	ELECTRICAL DETAILS AND PANEL SCHEDULES
E4	GROUNDING PLAN
N1	ARCHITECTURAL AND STRUCTURAL NOTES
N2	MECHANICAL NOTES
N3	ELECTRICAL NOTES



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no.	revision	date	by	approved
2	REVISED	28/10/2020	MH	RB
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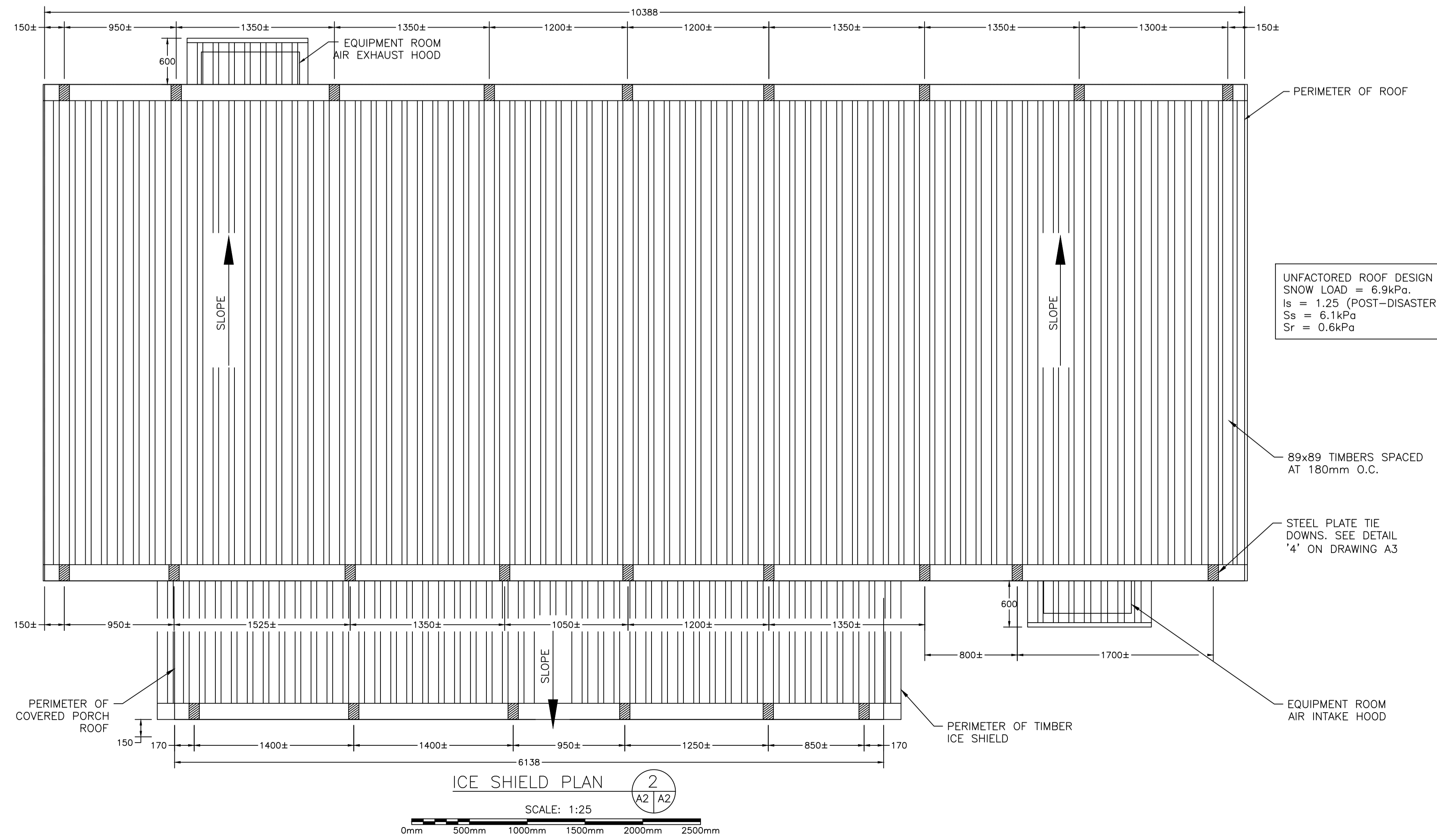
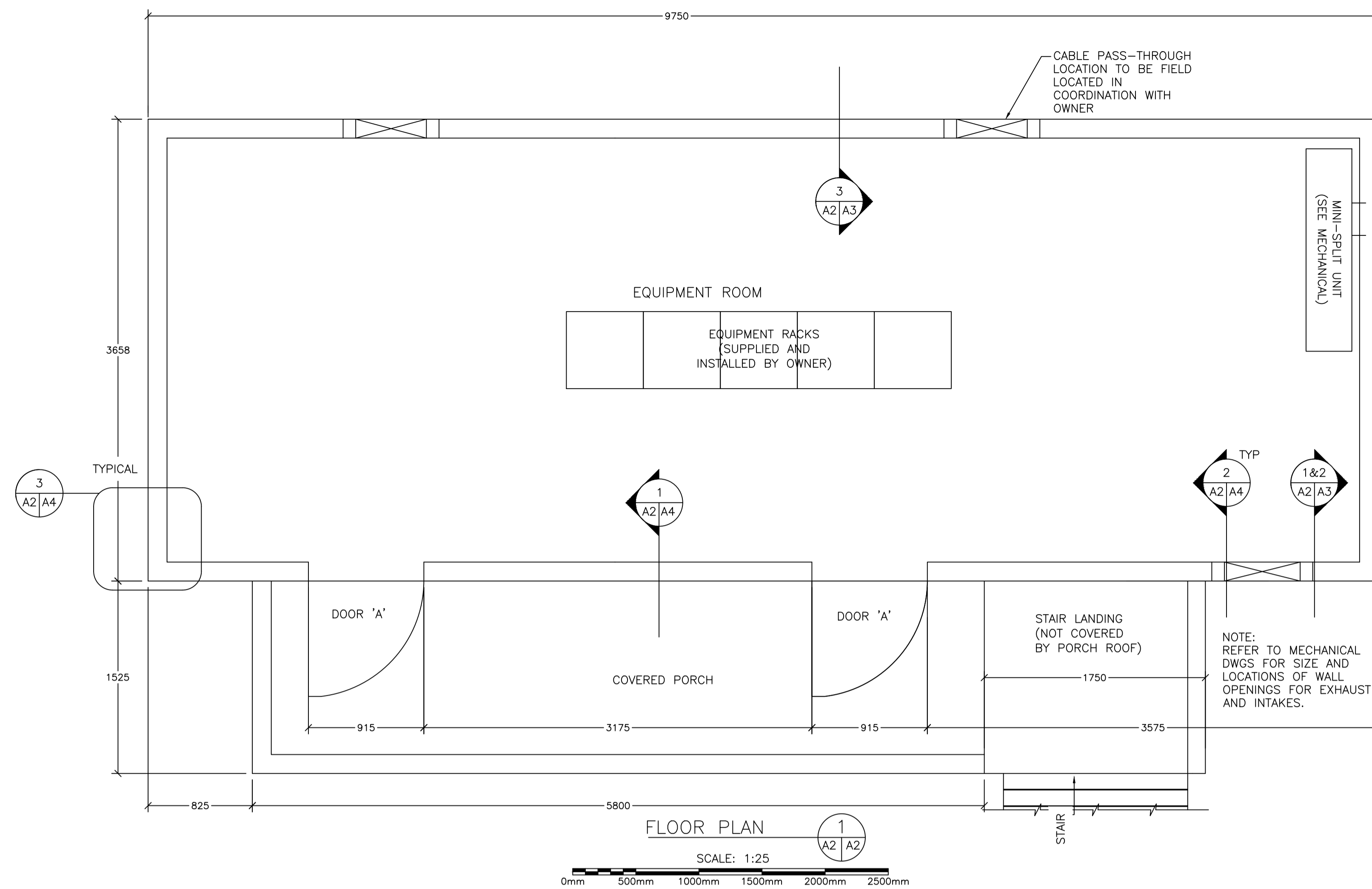
Project - projet


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Drawing - dessin

ELEVATIONS

drawn - dessiné	M.G.G.	designed - dessiné par	D.N.
date - date	AUGUST 2020	checked - vérifié	R.N.
scale - échelle	AS SHOWN	approved for tender - approuvé pour l'offre	R.N.
project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
	01L1402B03001-A01	1 OF 16	




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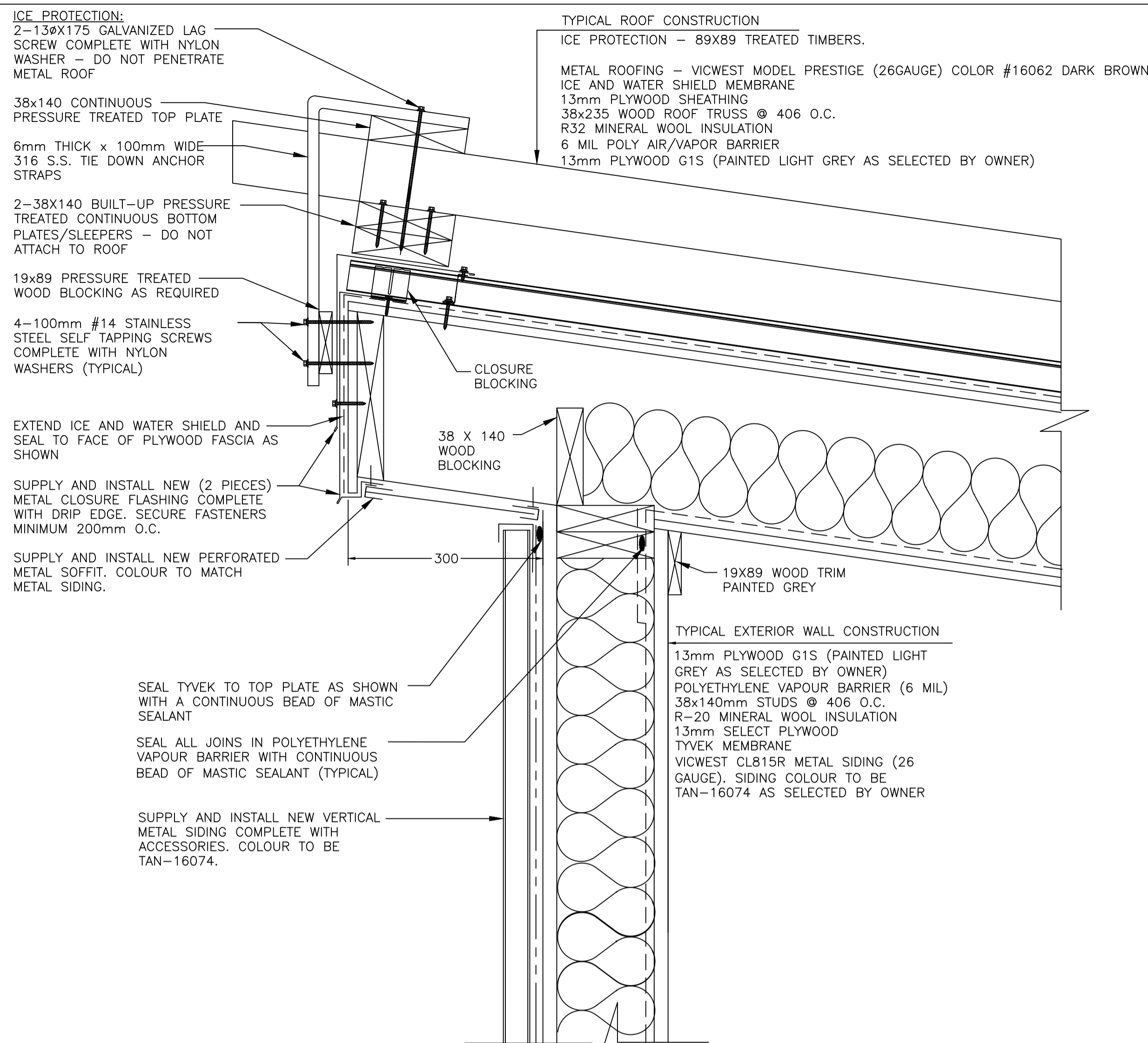
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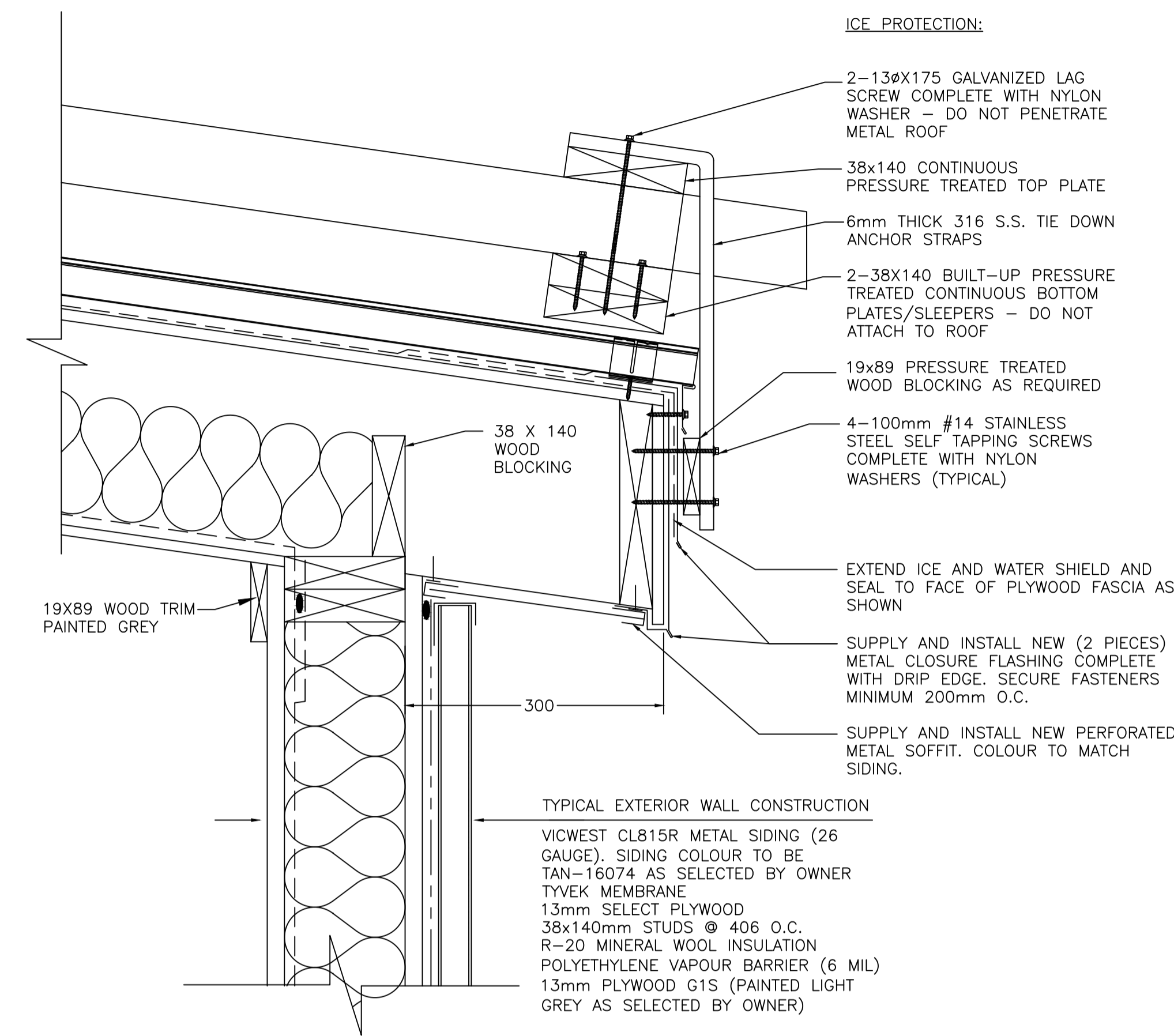
Drawing - dessin

**FLOOR, ROOF AND
ICE-SHIELD PLANS**

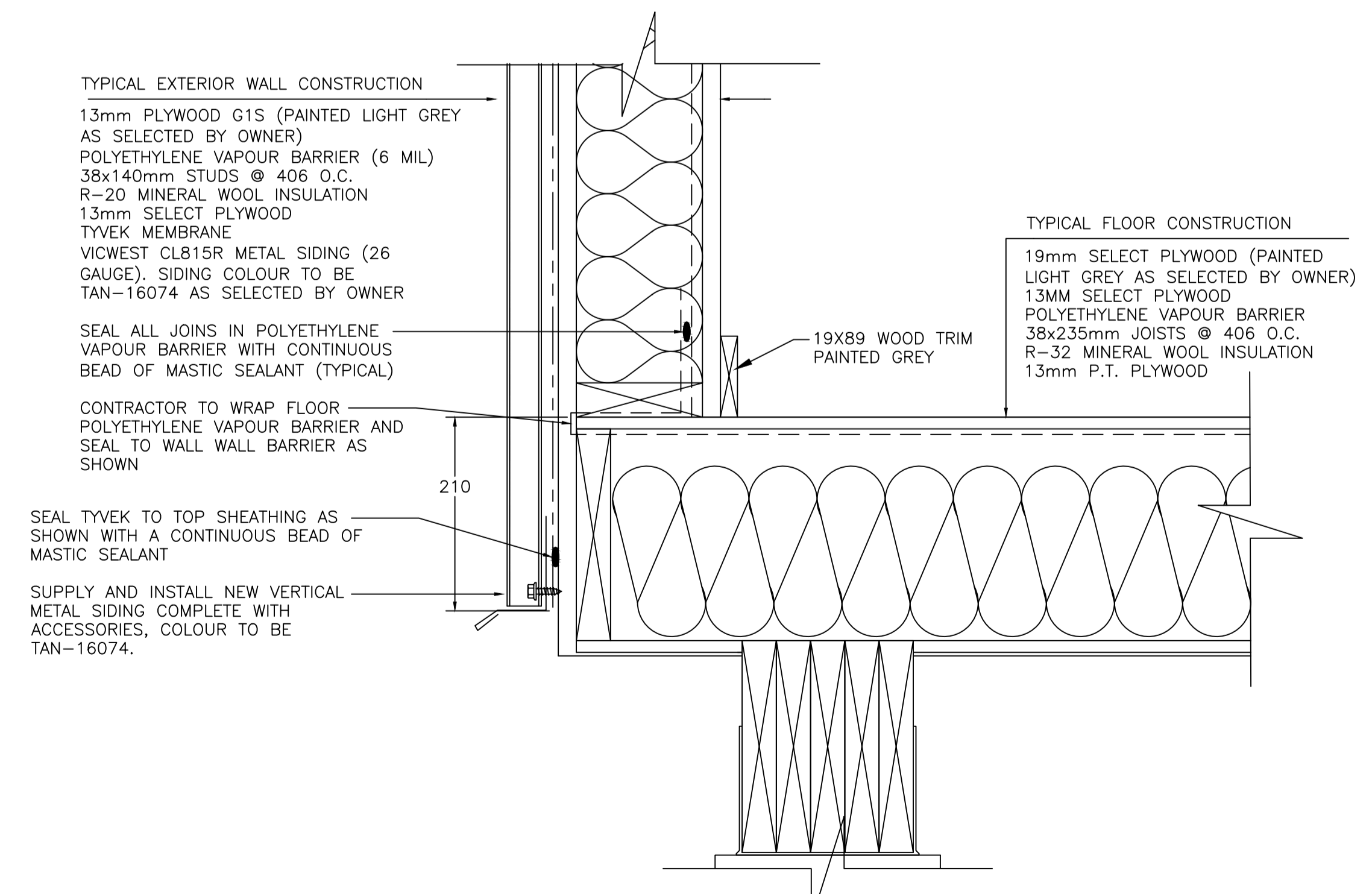
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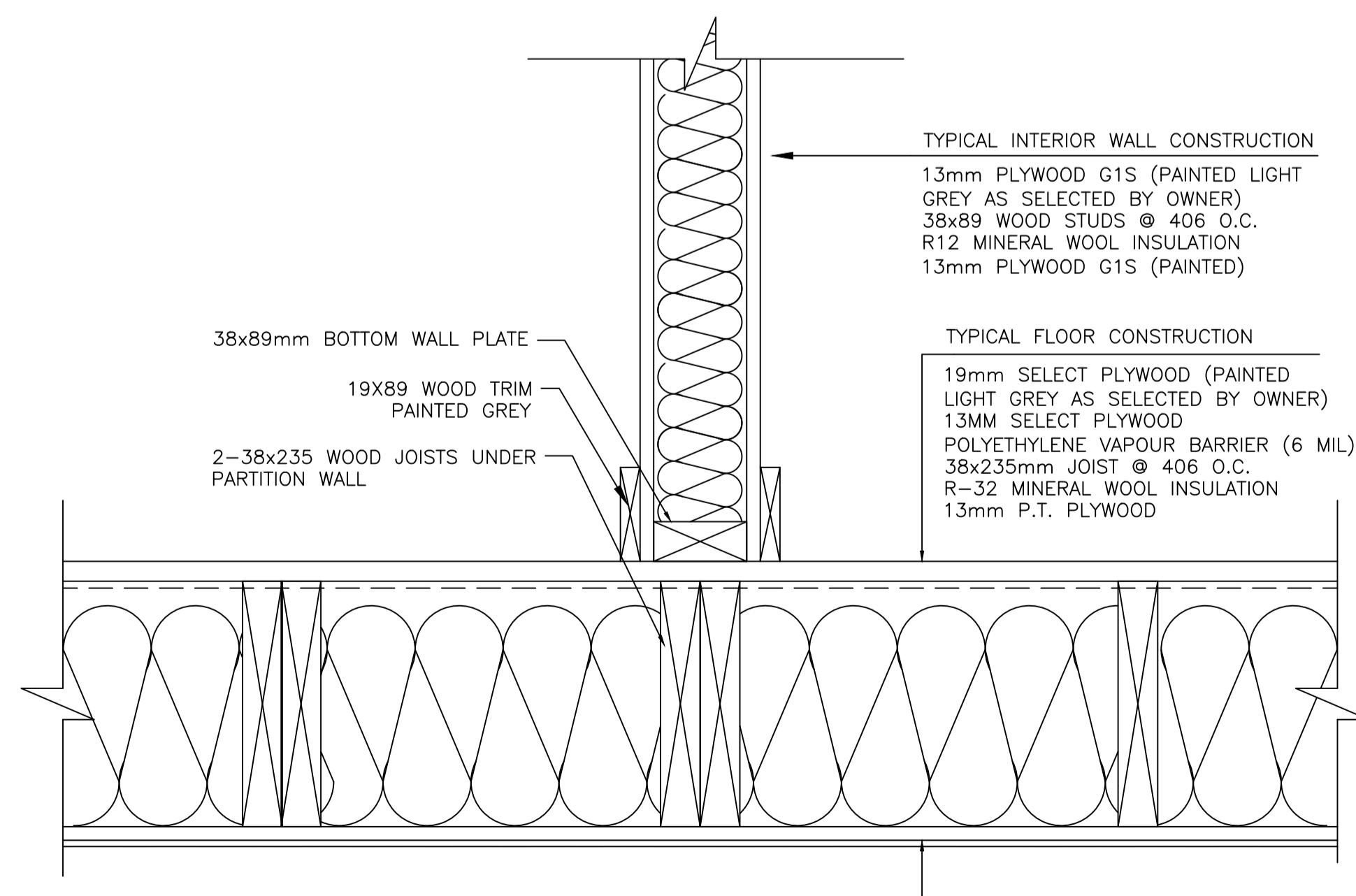
TYPICAL ROOF DETAIL WITH ICE PROTECTION 1
SCALE: 1:5
0mm 100mm 200mm 300mm 400mm 500mm



3 TYPICAL ROOF DETAIL WITH ICE PROTECTION
SCALE: 1:5
500mm 400mm 300mm 200mm 100mm 0mm



TYPICAL EXTERIOR WALL/FLOOR DETAIL 2
SCALE: 1:5
0mm 100mm 200mm 300mm 400mm 500mm



FLOOR/INTERIOR PARTITION WALL DETAIL 4
SCALE: 1:5
0mm 100mm 200mm 300mm 400mm 500mm

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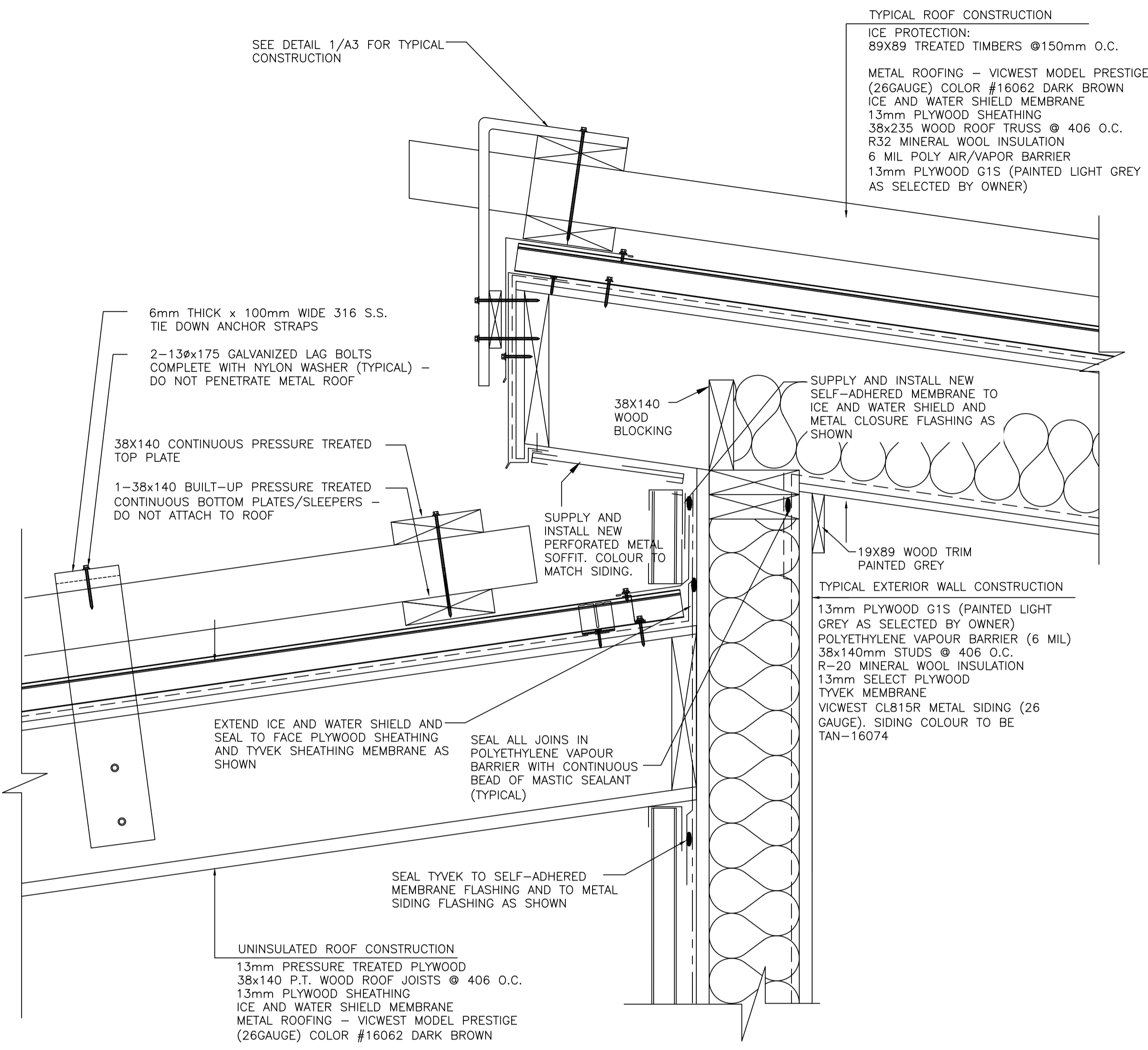
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MCTS EQUIPMENT BLDG
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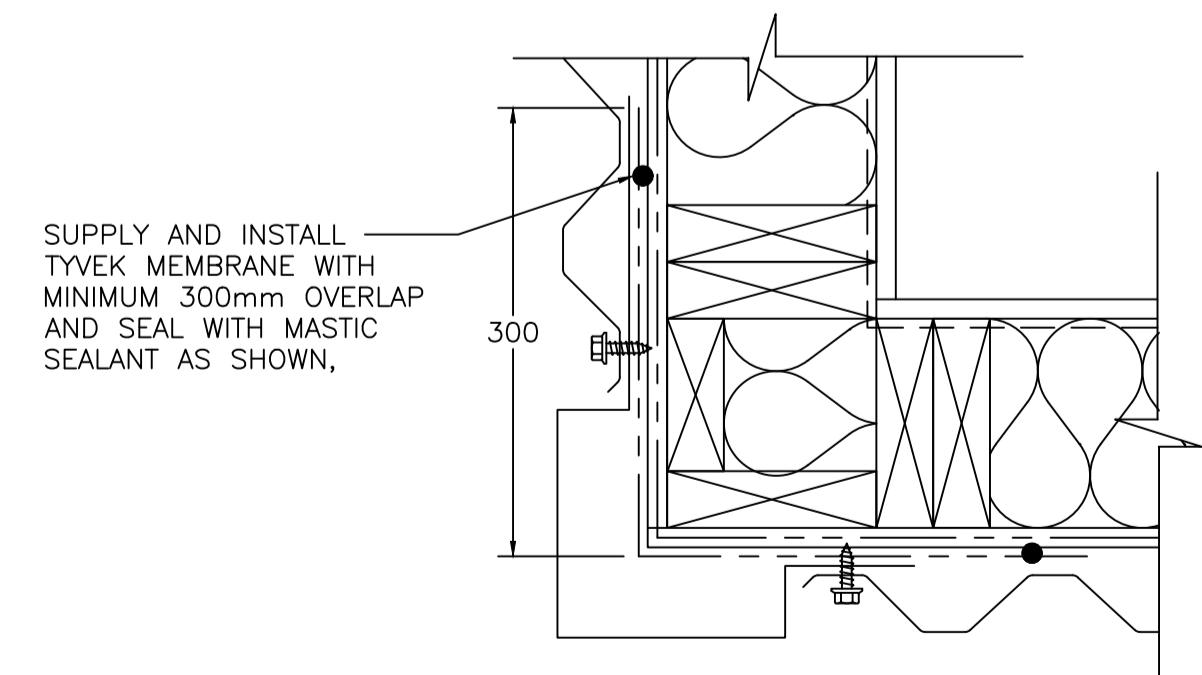
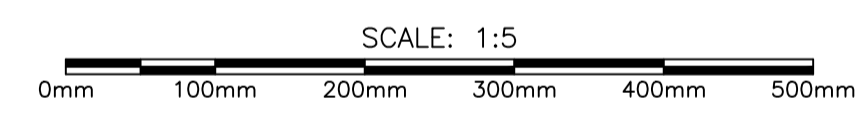
Drawing - dessin
SECTIONS AND DETAILS

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date - date	AUGUST 2020	checked - verifie	R.N.
scale - echelle	AS SHOWN	approved for tender - approuve pour l'offre	R.N.

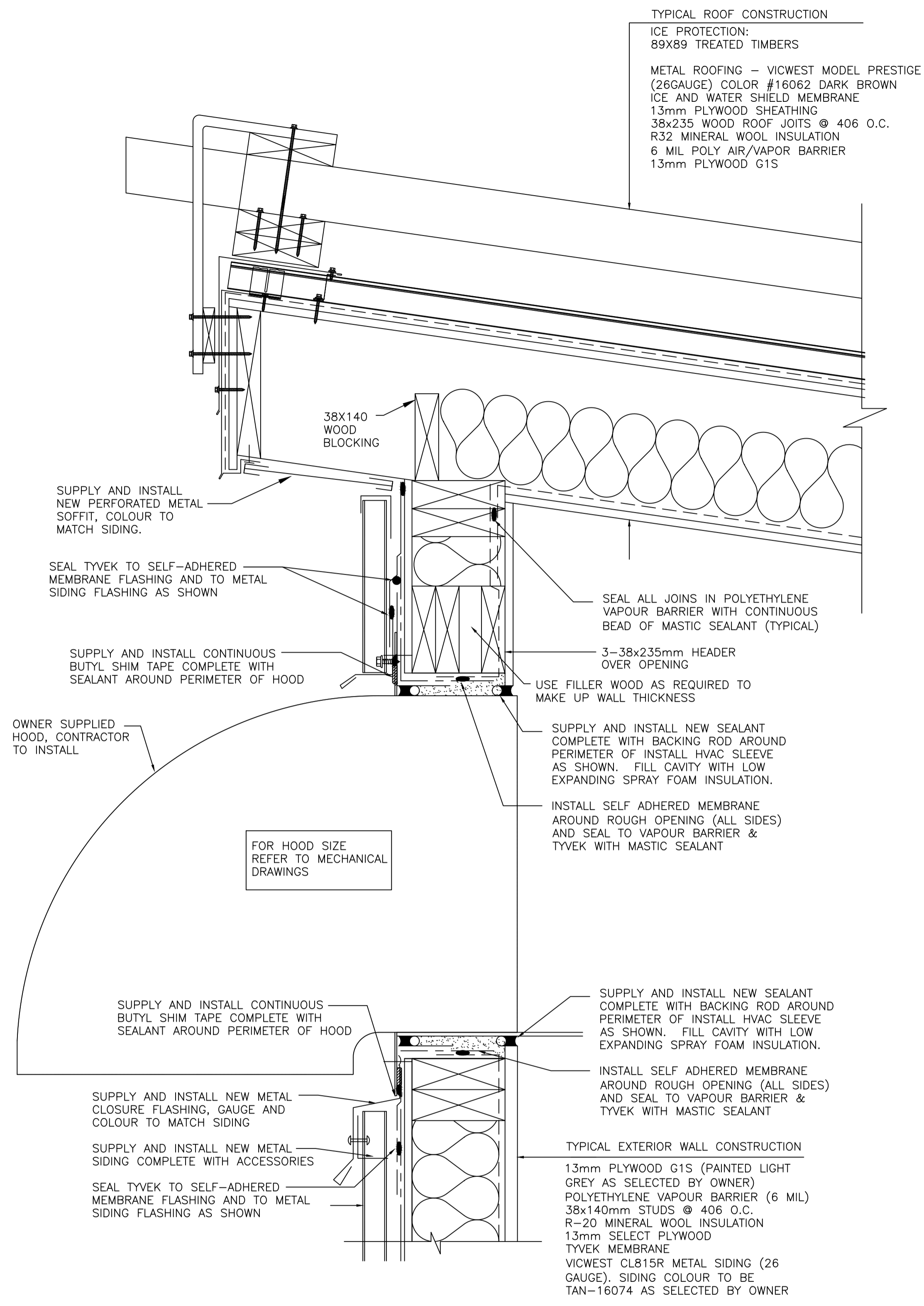
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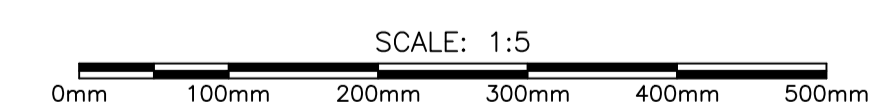
TYPICAL PORCH/TRAILER INTERFACE WITH ICE PROTECTION 1



TYPICAL OUTSIDE CORNER DETAIL 3



TYPICAL MECHANICAL OPENING DETAIL 2



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Project – projet
**MCTS EQUIPMENT BLDG
 ST. LAWRENCE**

Drawing – dessin
TYPICAL DETAILS

drawn – dessiné M.G.G.	designed – dessinée par D.N.
date – date AUGUST 2020	checked – vérifié R.N.
scale – échelle AS SHOWN	approved for tender – approuvé pour l'offre R.N.
project no. – projet no. 01L1402B03004-A04	sheet – feuille 4 OF 16

DOOR FINISH SCHEDULE

REF.	LOCATION AND DESCRIPTION						DOORS				FRAMES			GLAZING			NOTES	HARDWARE											
	DOOR NUMBER	TYPE	WIDTH	HEIGHT	THICKNESS	LABEL (HOURS)	FACE	CORE	FINISH	GRILLE	MATERIAL	PROFILE	ELEVATION	FINISH	DOOR	SIDELIGHT		TRANSOM	BUTTS	PASSAGE LATCH SET	LOCK SET	CLOSER	PUSH / PULL	KICK PLATES	HOLDER STOP	THRESHOLD	WEATHER STRIPPING	DOOR BOTTOM	MISC.
	A	HM	915	2050	45	0.75	A	PC	PT1	-	PGS	A	A	PT1	-	-	-	•	-	•	•	-	-	-	•	•	•	•	CRASH STOP, PANIC HARDWARE

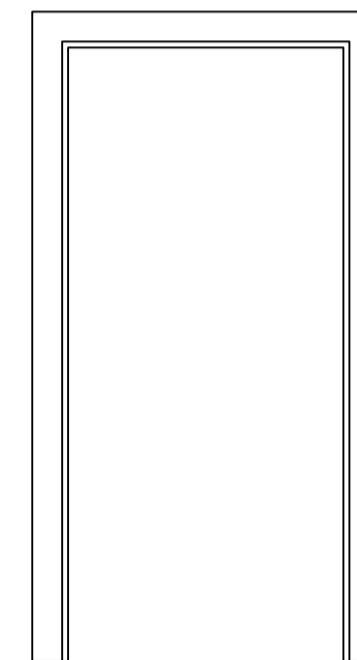
LEGEND

- HC - HONEYCOMB CORE
- PC - POLYSTYRENE CORE
- PGS - PAINTABLE GALVANNEAL STEEL
- HM - HOLLOW METAL
- WD - WOOD
- PT1 - PRIME AND PAINT TWO (2) COATS WITH ALKYD BASED PAINT IN SEMI-GLOSS SHEEN
- PT2 - PRIME AND PAINT TWO (2) COATS LATEX SEMI-GLOSS SHEEN



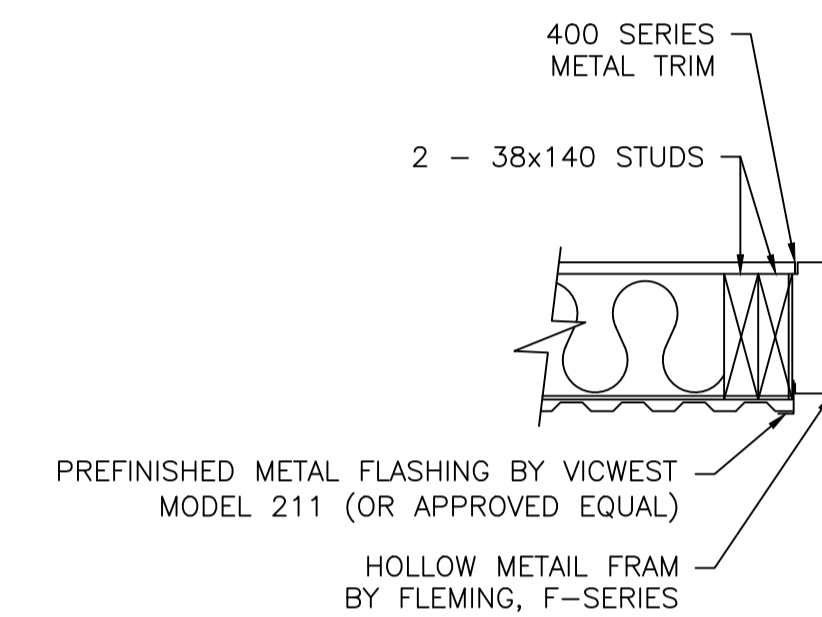
TYPE 'A'

DOOR TYPE DETAIL
NTS



TYPE 'A'

FRAME TYPE DETAIL
NTS



HOLLOW METAL FRAME
DOOR JAMB DETAIL TYPE 'A'
NTS

DOORS/FRAME/HARDWARE/NOTES:

1. ACCEPTABLE MATERIAL:
 - .1 DOOR FRAMES: FLEMING F16 SERIES WELDED FRAME.
 - .2 EXTERIOR DOORS: FLEMING D18 SERIES POLYSTYRENE CORE.
 - .3 HARDWARE (OR APPROVED EQUIVALENT):
LOCKSET: TO BE OWNER SUPPLIED FOLLOWING CONTRACT AWARD.
LATCH GUARD DR385A BY LOCKWOOD INDUSTRIES. LEVER HANDLE/DEADBOLT COMBO.

CLOSER: EN351-UO BY SARGENT
HINGES: MACPRO BY MCKINNEY - MPB91 NRP 114X101 (x6 PER LEAF)

WEATHER-STRIPPING: 303AV (2 X 2134) (1 X WIDTH) BY PEMKO
ADJUSTABLE WEATHER-STRIP ON THREE SIDES MITERED AT CORNERS.
EXTEND WEATHER-STRIPPING TO FLOOR. BUBBLE GASKET SEAL ON THREE SIDES.
DOOR BOTTOM: 345AV 914mm BY PEMKO
THRESHOLD: 185AT BY PEMKO
DOOR CHECK CHAINS: 3561 30-1/2" BY CANAROPA
2. INSTALL LABELED STEEL FIRE RATED DOORS AND FRAMES TO NFPA 80.
3. INSTALL DOORS AND FRAMES PER CSDFMA INSTALLATION GUIDE.
4. SET FRAMES PLUMB, SQUARE, LEVEL AND CORRECT ELEVATION.
5. SECURE ANCHORAGES AND CONNECTIONS TO ADJACENT CONSTRUCTION.
6. BRACE FRAMES RIGIDLY IN POSITION WHILE BUILDING-IN. INSTALL TEMPORARY HORIZONTAL WOOD SPREADER AT THIRD POINTS OF DOOR OPENING TO MAINTAIN FRAME WIDTH. PROVIDE VERTICAL SUPPORT AT CENTRE OF HEAD FOR OPENINGS OVER 1200mm WIDE. REMOVE TEMPORARY SPREADERS AFTER FRAMES ARE BUILT-IN.
7. MAKE ALLOWANCES FOR DEFLECTION OF STRUCTURE TO ENSURE STRUCTURAL LOADS ARE NOT TRANSMITTED TO FRAMES.
8. CAULK PERIMETER OF FRAMES. BETWEEN FRAME AND ADJACENT MATERIAL.
9. MAINTAIN CONTINUITY OF VAPOUR RETARDER.
10. PROVIDE EVEN MARGINS BETWEEN DOORS AND JAMBS AND DOOR FINISHED FLOOR AND THRESHOLDS AS FOLLOWS:
 - .1 HINGES SIDES: 1.0mm
 - .2 LATCHSIDE AND HEAD: 1.5mm
 - .3 FINISHED FLOOR AND THRESHOLDS: 13mm
11. ADJUST OPERABLE PARTS FOR CORRECT FUNCTION.
12. TOUCH UP WITH PRIMER FINISHES DAMAGED DURING INSTALLATION. FOLLOWING COMPLETION OF PRIMER APPLICATION, APPLY TWO (2) COATS OF EXTERIOR FINISH PAINT TO ALL DOOR SURFACES (COLOUR TO MATCH SIDING).
13. FILL EXPOSED FRAME ANCHORS SURFACES WITH IMPERFECTIONS WITH METALLIC PASTE FILLER AND SAND TO A UNIFORM SMOOTH FINISH.
14. INSTALL THREE (3) BUMPERS ON STRIKE JAMB FOR EACH DOOR.



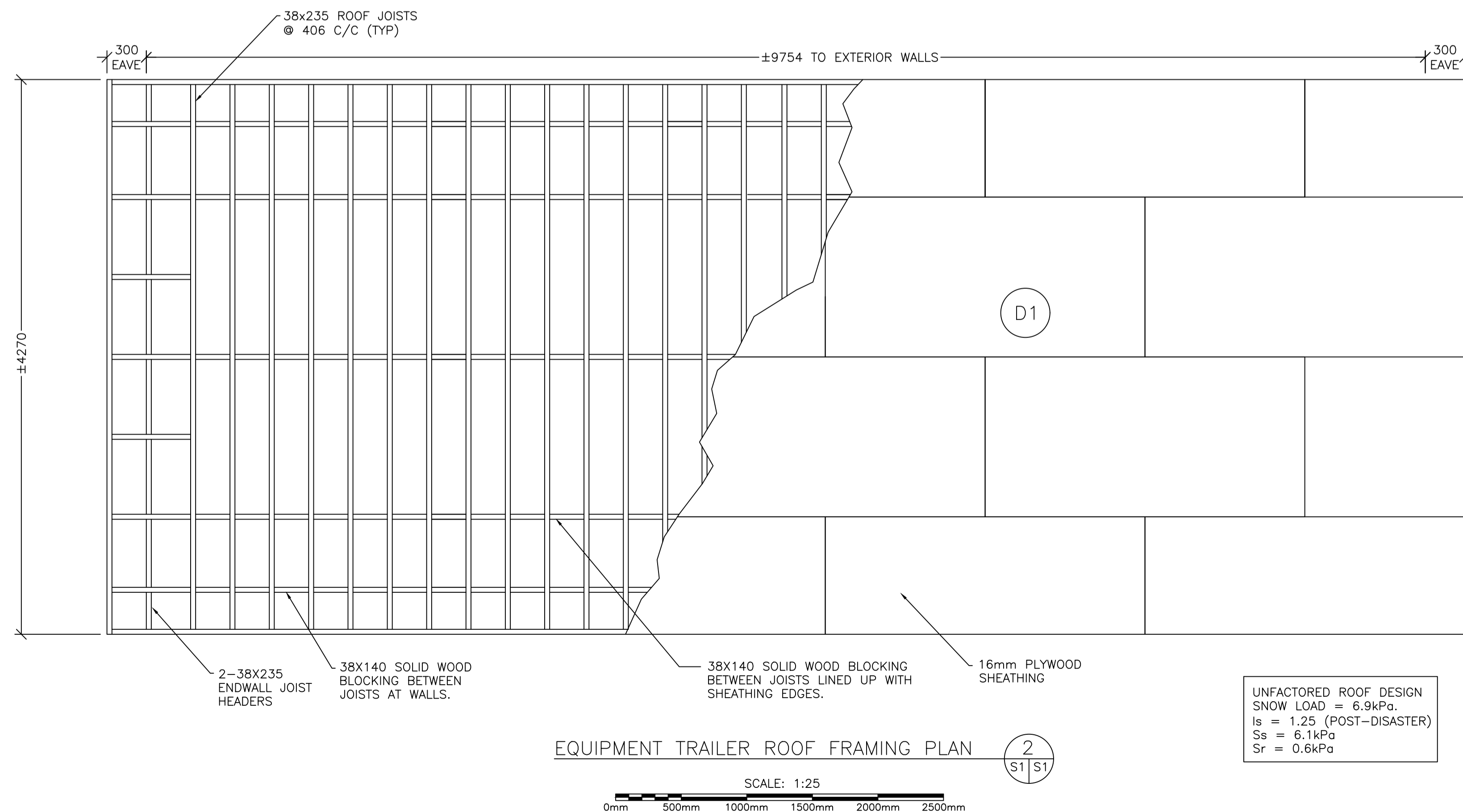
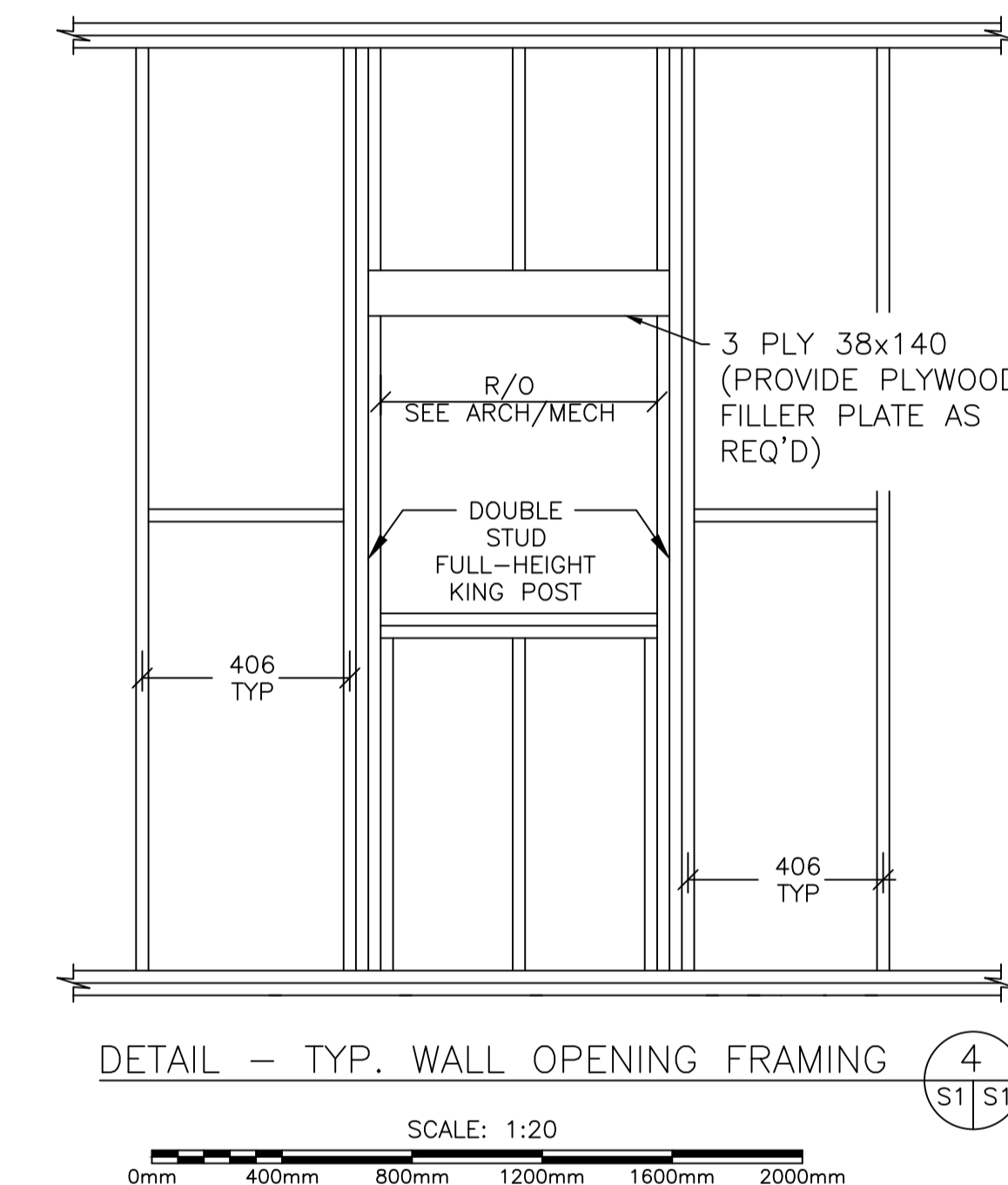
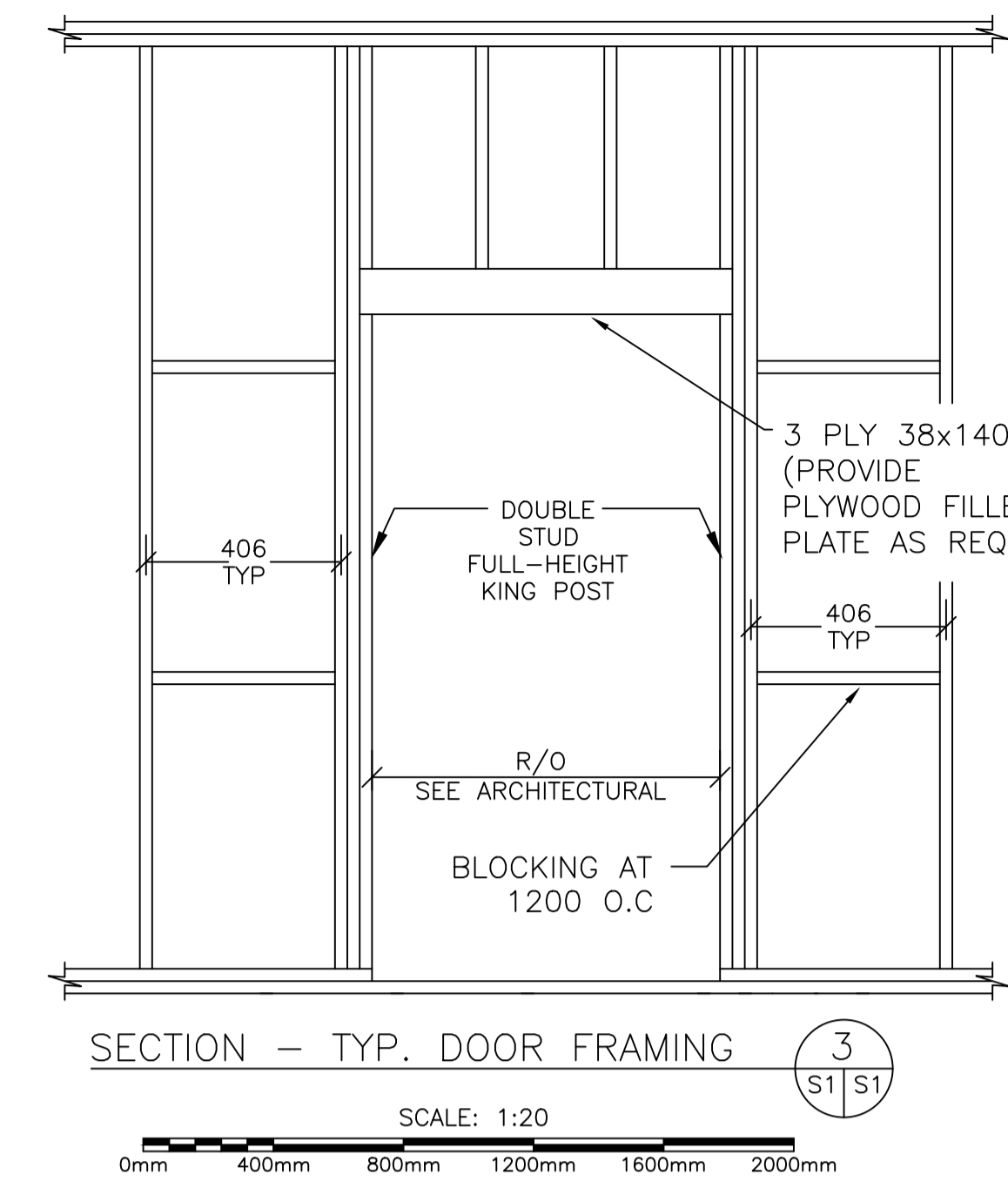
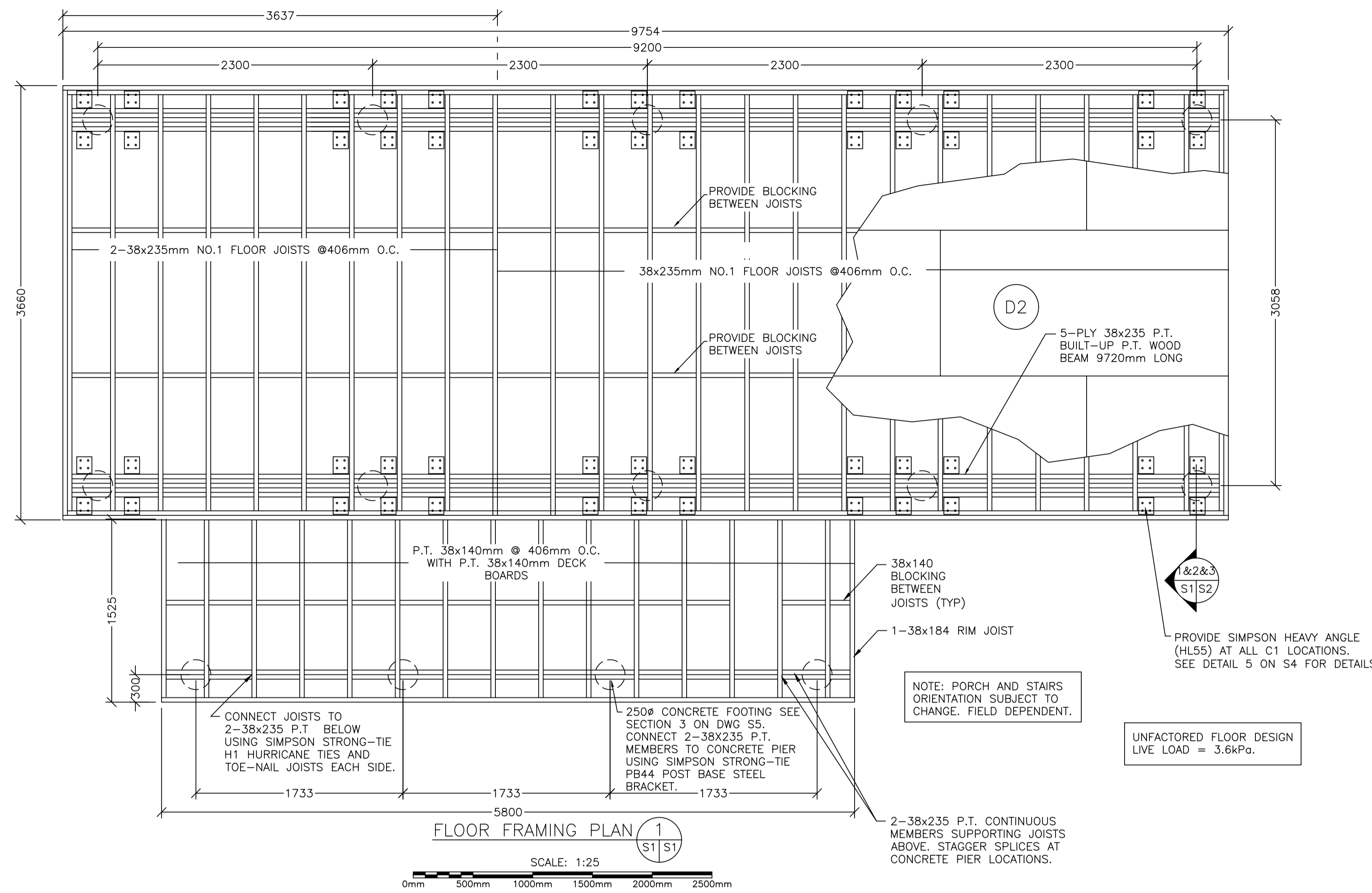
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Project - projet
MCTS EQUIPMENT BLDG
ST. LAWRENCE

Drawing - dessin
DOOR SCHEDULE AND DETAILS

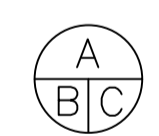
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scale - échelle	AS SHOWN	approved for tender - approuvé pour l'offre	R.N.
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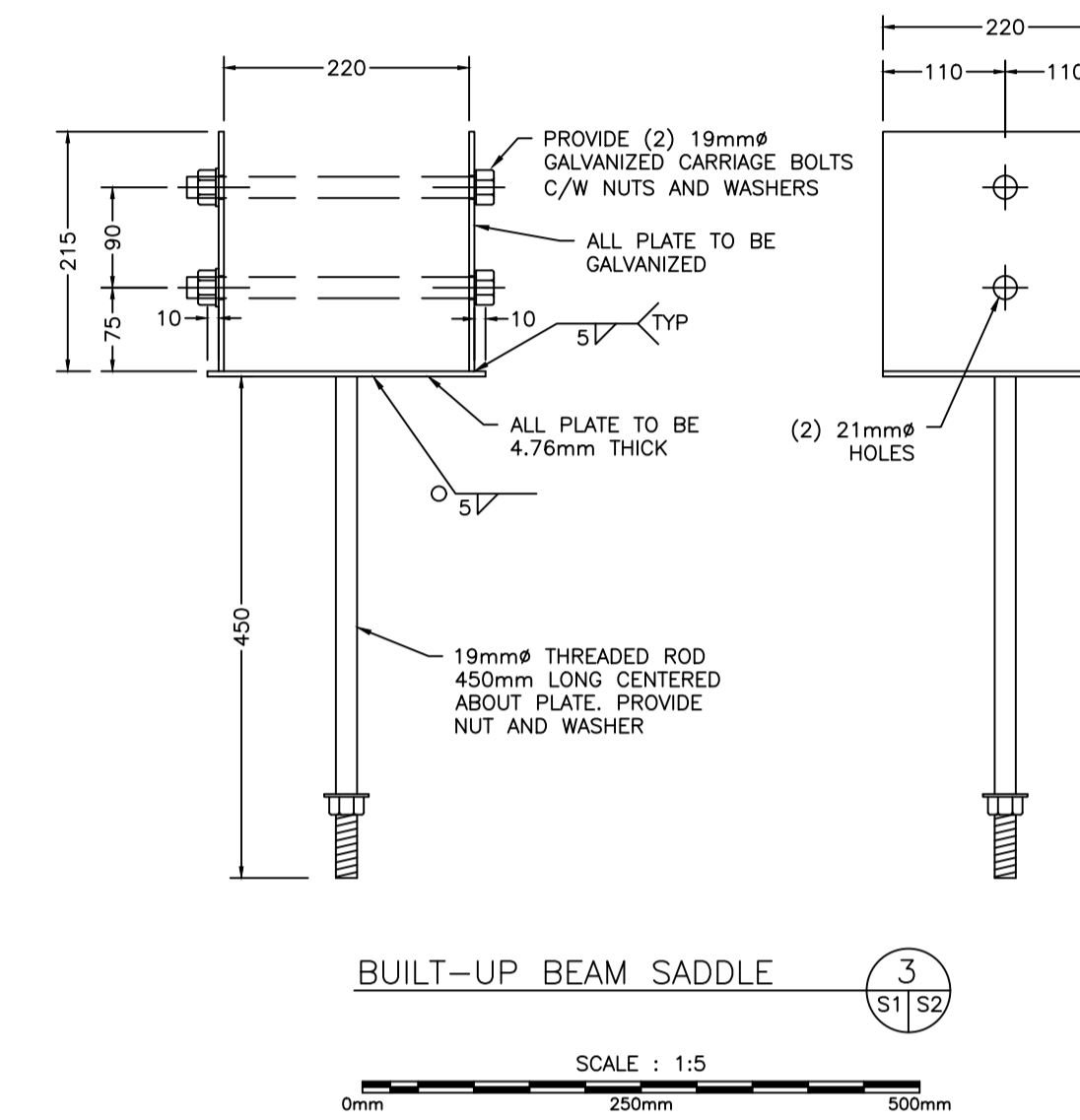
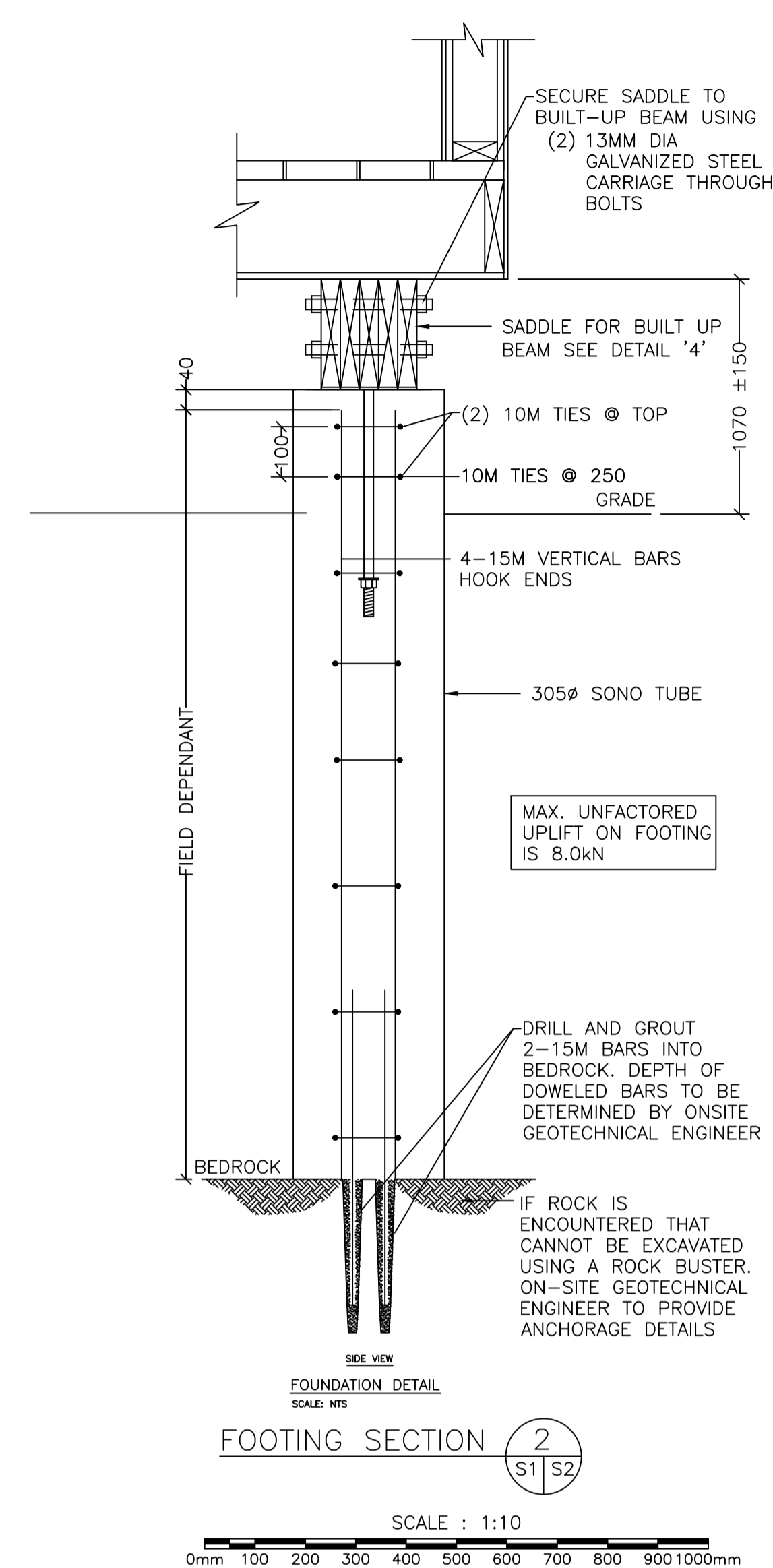
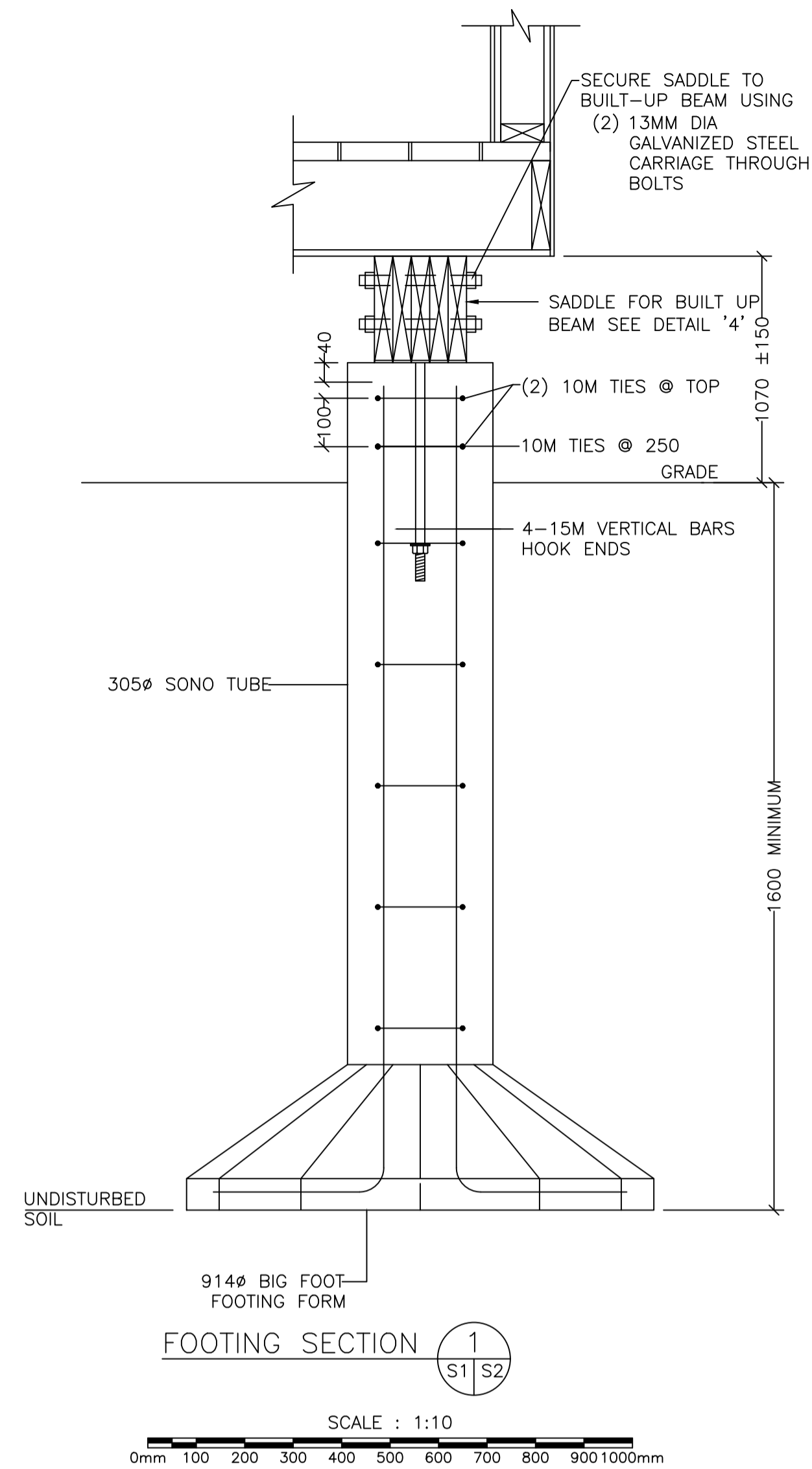


- STRUCTURAL TIMBER NOTES**
- ALL TIMBER MEMBERS (TRUSSES, JOISTS, GLUE LAMINATED, PLYWOOD, ETC.) TO BE DESIGNED IN ACCORDANCE WITH CSA 086 LATEST EDITION.
 - FABRICATOR SHALL SUBMIT SHOP DRAWINGS STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF NEWFOUNDLAND & LABRADOR PRIOR TO COMMENCEMENT OF FABRICATION.
 - WOOD JOISTS, BEAMS AND STUDS TO BE SPRUCE-PINE-FIR GRADE No.1/No.2
 - ALL SURFACES OF PRESSURE TREATED LUMBER THAT ARE EXPOSED THROUGH FIELD CUTTING, TRIMMING OR BORING MUST BE RE-TREATED WITH A LIBERAL APPLICATION OF PRESERVATIVE BEFORE INSTALLATION. INCISED LUMBER IS NOT PERMITTED.

PLYWOOD DIAPHRAGM SCHEDULE

MARK	DESCRIPTION
D1	16mm PLYWOOD SHEATHING (BLOCKED AT EDGES) NAILED TO FRAMING MEMBERS WITH 64mm NAILS AT 100 O.C. @ PANEL EDGES AND 300 O.C. OVER INTERMEDIATE FRAMING MEMBERS.
D2	19mm/13mm PLYWOOD SHEATHING (BLOCKED AT EDGES) NAILED TO FRAMING MEMBERS WITH 76mm NAILS AT 100 O.C. @ PANEL EDGES AND 300 O.C. OVER INTERMEDIATE FRAMING MEMBERS.

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no.	revision	date	by approved
no.	revision	date	par approve
Project - projet			
MCTS EQUIPMENT BLDG ST. LAWRENCE			
Drawing - dessin			
FRAMING PLAN, SECTIONS AND DETAILS			
drawn - dessine	M.G.G.	designed - dessine par	R.N.
date - date	AUGUST 2020	checked - verifie	V.P.
scale - echelle	AS SHOWN	approved for tender - approuve pour l'offre	R.N.
project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
	01L1402B03006-S01	6 OF 16	



FOUNDATION NOTES

- ALL BEARING CAPACITIES AND SOIL CONDITIONS TO BE CONFIRMED BY A GEOTECHNICAL ENGINEER LICENSED TO PRACTICE IN THE PROVINCE OF NEWFOUNDLAND AND LABRADOR.
 - ALL FOOTINGS ARE TO REST ON UNDISTURBED TILL HAVING A MINIMUM BEARING CAPACITY OF 150 KPa U.N.O.
 - IF FOOTINGS REST ON COMPACTED BACK FILL, THEN ALL FOOTING ELEVATIONS ARE TO BE CONFIRMED BY A GEOTECHNICAL ENGINEER BEFORE POURING.
 - ANY SOFT SPOT ENCOUNTERED UNDER FOOTINGS SHALL BE REMOVED AND FILLED WITH MASS CONCRETE OF MIN 20 MPa TO U/S OF FOOTINGS.
 - THE UNDERSIDE OF COLUMN FOOTINGS SHALL BE AT LEAST 1600mm BELOW THE FINISHED GRADE U.N.O.
 - DO NOT PLACE FOOTINGS ON FROZEN GROUND.
- THE LINE OF SLOPE BETWEEN ADJACENT EXCAVATIONS FOR FOOTINGS OR TRENCHES OR ALONG STEPPED FOOTINGS SHALL NOT EXCEED 1 VERTICAL TO 1 HORIZONTAL. MAXIMUM STEP IS 750mm.
- BACKFILL MATERIALS
 - BACKFILL PROPERTIES TO THE FOLLOWING REQUIREMENTS:
 - CRUSHED, PIT RUN OR SCREENED STONE, GRAVEL OR SAND.
 - GRADATIONS TO BE WITHIN LIMITS SPECIFIED WHEN TESTED TO ASTM C136 AND ASTM C117. SIEVE SIZES TO CAN/CGSB.8.1.
 - BACKFILL AND FILL MATERIAL TO BE PLACED IN 300mm LIFTS.
- | SIEVE DESIGNATION | % PASSING |
|-------------------|-----------|
| 50.8 mm | 100 |
| 25.4 mm | 50-100 |
| 19 mm | - |
| 15.9 mm | - |
| 9.5 mm | - |
| 4.75 mm | 20-55 |
| 1.20 mm | 10-35 |
| .30 mm | 5-20 |
| 0.075 mm | 2-8 |
- DO NOT BACKFILL AROUND OR OVER CAST-IN-PLACE CONCRETE WITHIN 48 h AFTER PLACING CONCRETE.
 - PLACE BACKFILL LAYERS SIMULTANEOUSLY ON BOTH SIDES OF INSTALLED WORK TO EQUALIZE LOADING. DIFFERENCE NOT TO EXCEED 300mm.
 - COMPACTION UNDER FOOTINGS TO 98% STANDARD PROCTOR DENSITY.
 - DEWATER EXCAVATIONS TO ENSURE CONCRETE AND SERVICES ARE PLACED IN THE DRY.
 - PROTECT EXISTING BUILDING AND SURFACE FEATURES FROM DAMAGE WHILE WORK IS IN PROGRESS. IN THE EVENT OF DAMAGE, IMMEDIATELY MAKE REPAIR TO APPROVAL OF ENGINEER.

CAST IN PLACE CONCRETE NOTES

- ALL CONCRETE PRODUCTION AND PLACEMENT INCLUDING WEATHER PROTECTION TO CONFORM TO CSA A23.1 LATEST EDITION. ALL TESTING TO CONFORM TO CSA 23.2 LATEST EDITION.
- ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 32 MPa U.N.O. FOOTINGS/PIERS: 32 MPa, MAXIMUM SLUMP 75mm, EXPOSURE CLASS F-2
- CLEAR CONCRETE COVER TO REINFORCING PER CSA A23.1:

FOOTINGS:	75mm
PIERS:	50mm
- ALL REINFORCING TO CONFORM TO CSA G30.18 LATEST EDITION. ALL REINFORCING TO HAVE A MINIMUM YIELD OF 400 MPa.
- ALL REINFORCING STEEL SHALL BE DETAILED, FABRICATED AND SUPPORTED IN ACCORDANCE WITH CSA A23.1 LATEST EDITION.
- ALL DOWELS ARE TO BE TIED TO VERTICAL REBAR AND IN PROPER POSITION BEFORE POURING CONCRETE. PLACING DOWELS AFTER CONCRETE IS POURED IS UNACCEPTABLE.
- FORM WORK MUST NOT BE REMOVED UNTIL CONCRETE HAS ATTAINED SUFFICIENT STRENGTH TO SUSTAIN ALL LOADINGS.
- LAP SPLICE ALL FOOTING DOWELS CLASS "B" TENSION SPLICE TO VERTICALS IN PIERS AND WALLS. ALL OTHER OTHER REINFORCING STEEL SHALL BE LAPPED A MINIMUM OF 24 BAR DIAMETERS, 300mm MIN U.N.O.
- SUBMIT SHOP DRAWINGS ON ALL CONCRETE ANCHORS. CONCRETE ANCHORS TO BE INSTALLED TO AVOID EXISTING REBAR.
- SUBMIT REINFORCING STEEL SHOP DRAWINGS FOR REVIEW BY ENGINEER PRIOR TO FABRICATION OF REINFORCING.



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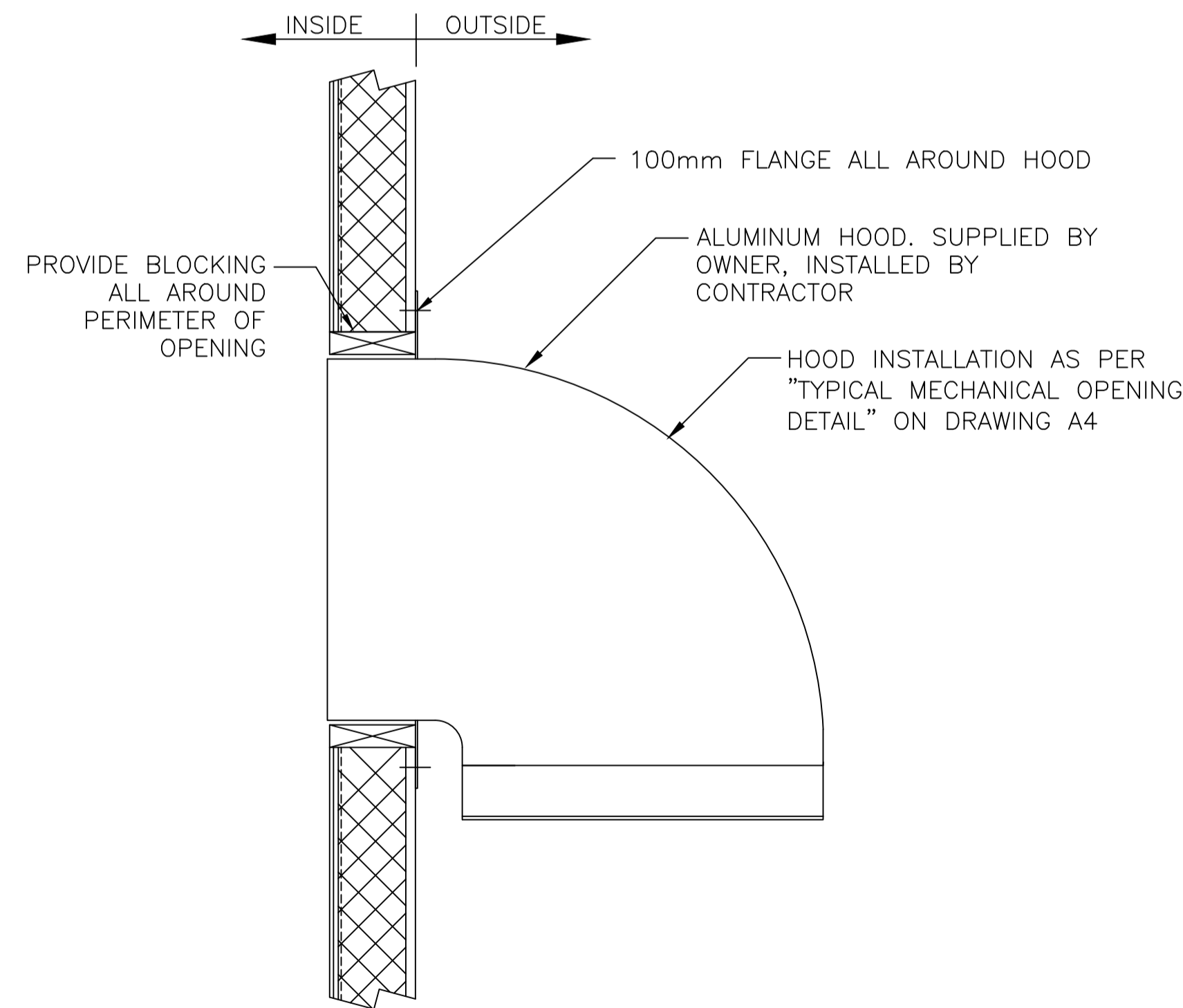
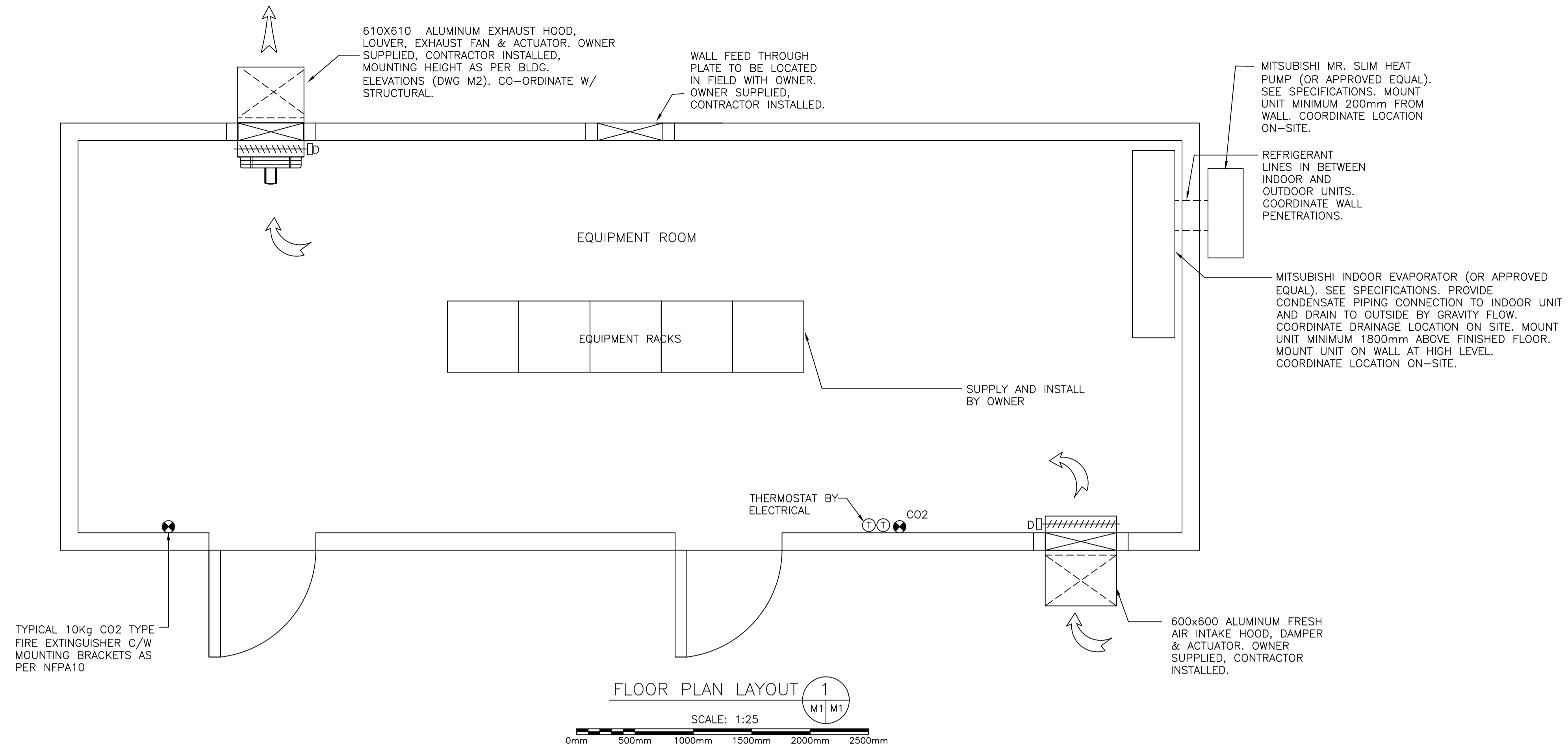
Project - projet

**MCTS EQUIPMENT BLDG
ST. LAWRENCE**

Drawing - dessin

**FOUNDATIONS
SECTIONS AND DETAILS**

drawn - dessine	M.G.G.	designed - dessine par	R.N.
date - date	AUGUST 2020	checked - verifie	V.P.
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project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
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DETAIL - TYPICAL HOOD 3
 N.T.S. M1 M1

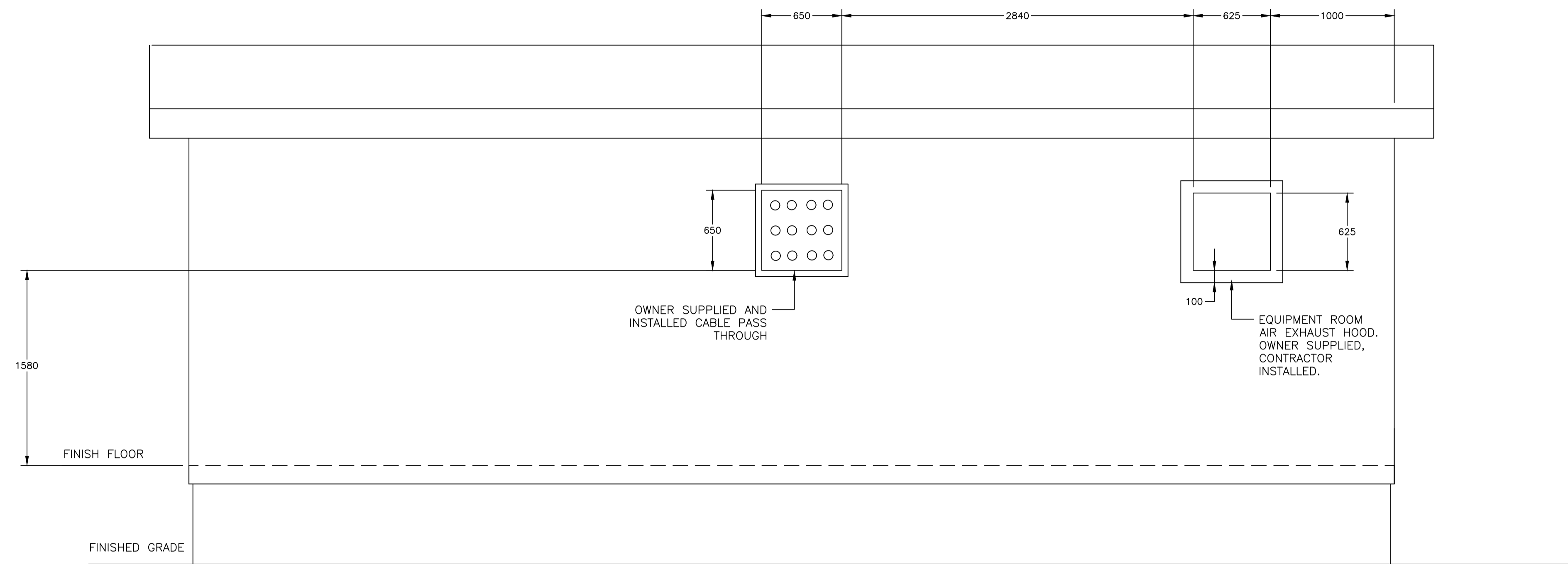
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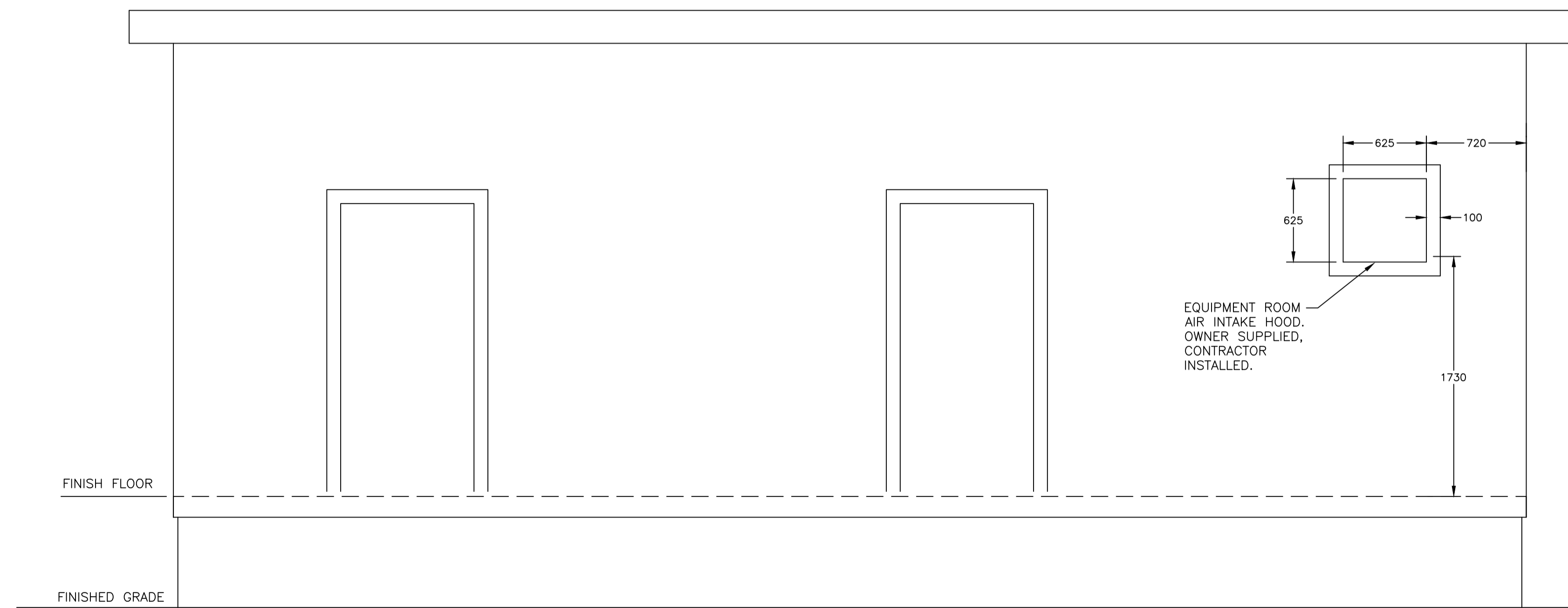
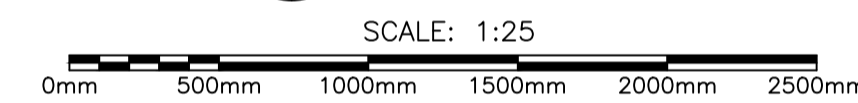
Project - projet
MCTS EQUIPMENT BLDG
ST. LAWRENCE

Drawing - dessin
PLANS AND DETAILS

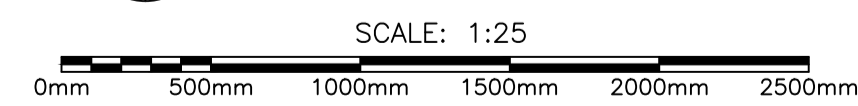
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scale - echelle	AS SHOWN	approved for tender - approuve pour l'offre	R.N.
project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
	01L1402B03008-M01	8 OF 16	



REAR ELEVATION 1
M2 | M2



FRONT ELEVATION 2
M2 | M2



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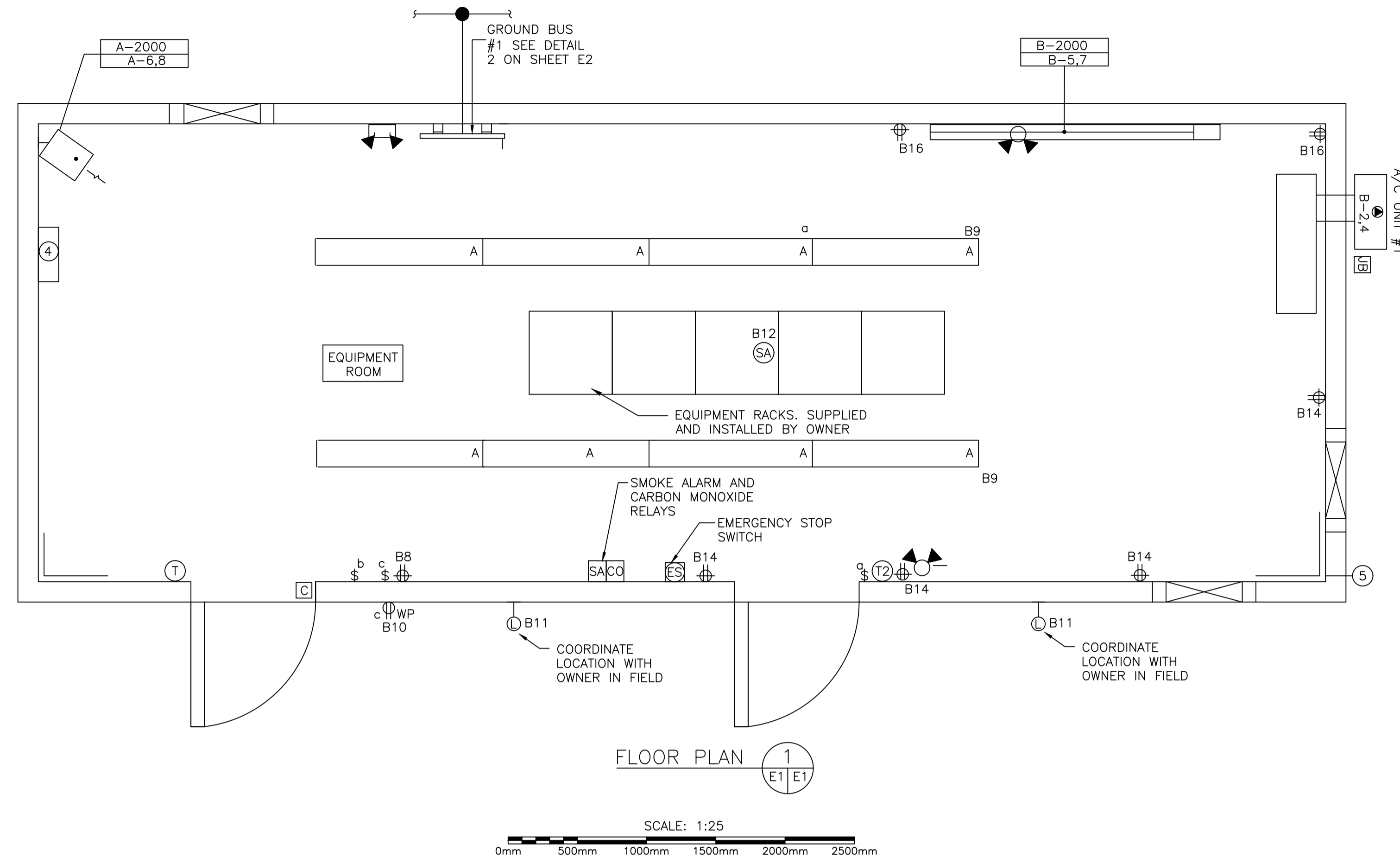
Project - projet

MCTS EQUIPMENT BLDG
ST. LAWRENCE

Drawing - dessin

MECHANICAL PENETRATIONS

drawn - dessine	M.G.G.	designed - dessinée par	T.T.
date - date	AUGUST 2020	checked - vérifié	J.H.
scale - échelle	AS SHOWN	approved for tender - approuvé pour l'offre	R.N.
project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
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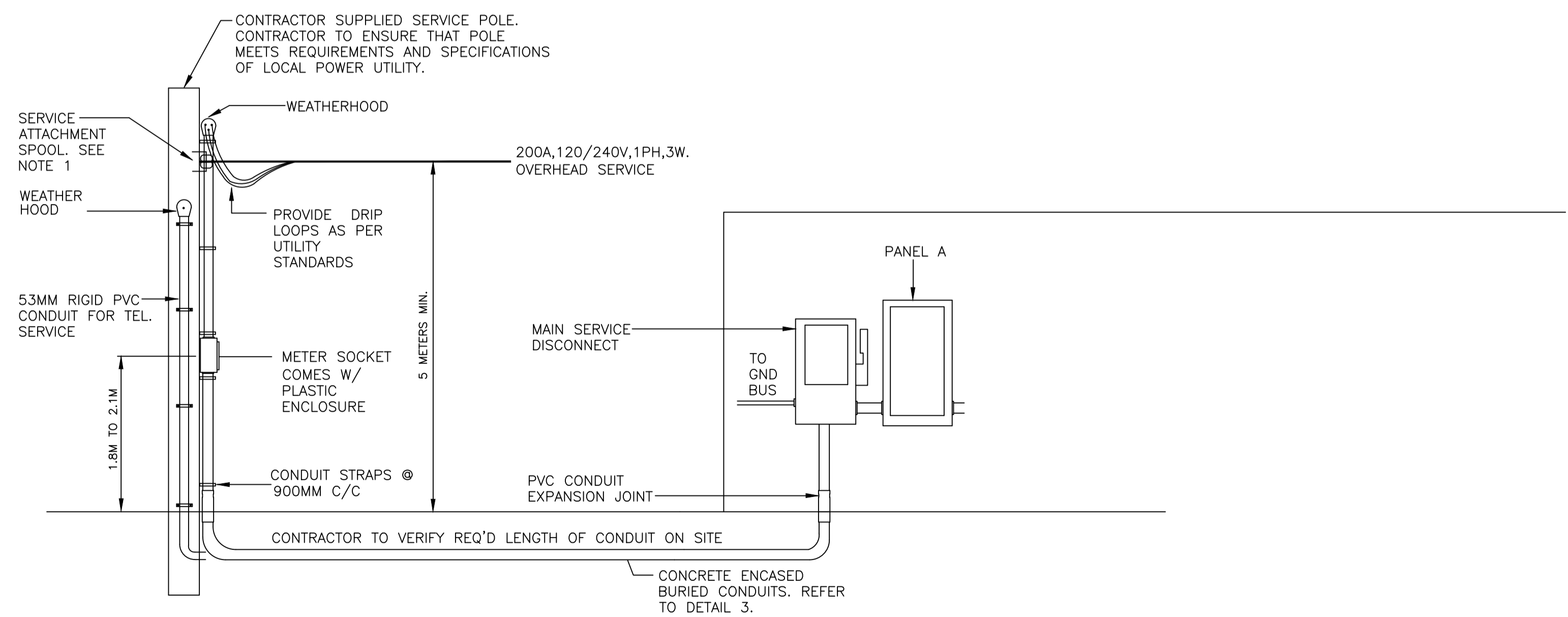


EQUIPMENT DESCRIPTION

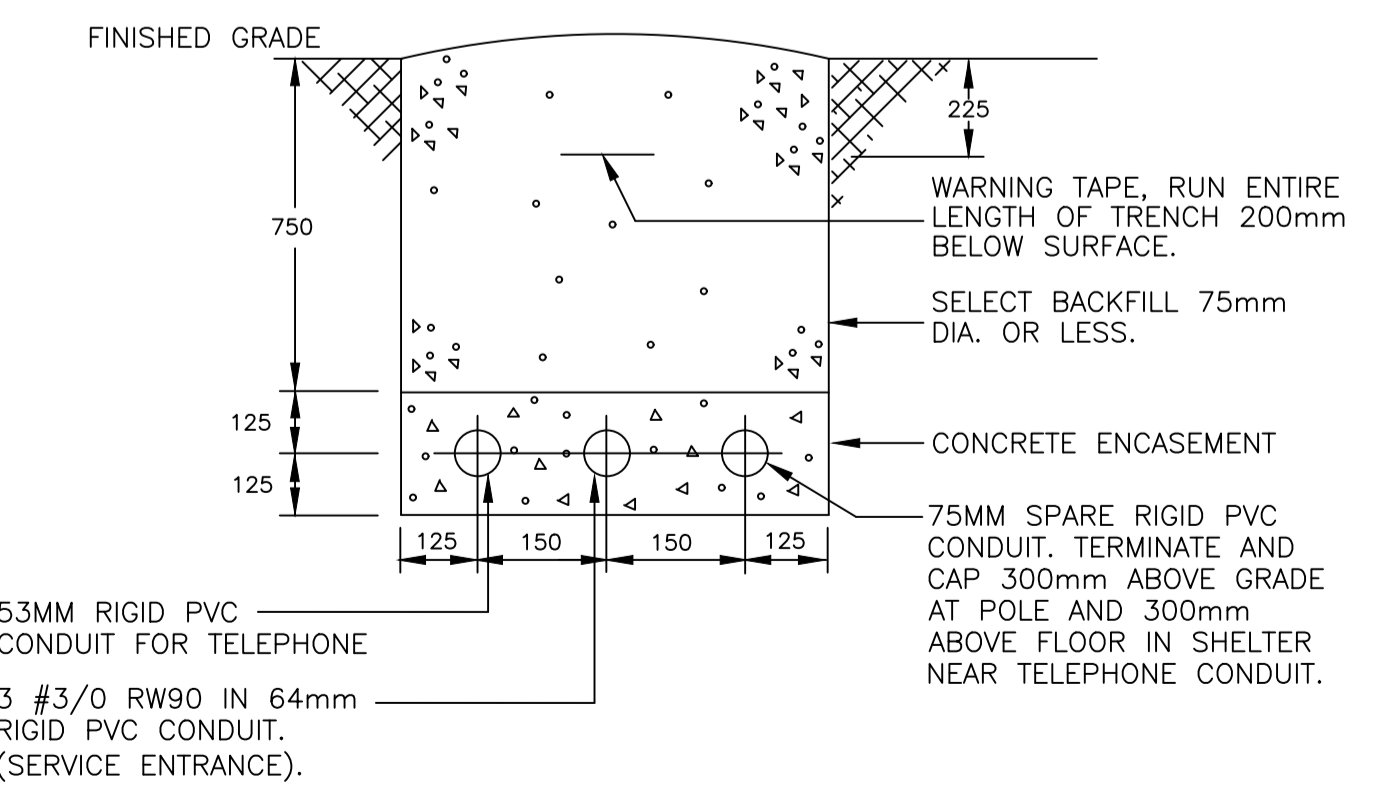
- ① MAIN SERVICE ENTRANCE DISCONNECT SWITCH 200A/200AF, 120/240V. 1Ø, 2P, SOLID NEUTRAL, BY SQUARE-D / SCHNEIDER ELECTRIC.
- ② MAIN DISTRIBUTION PANEL BOARD DP-A 200A. 120/240V. 1Ø, 3W. SEE PANEL DETAIL.
- ③ AUTOMATIC TRANSFER SWITCH. OWNER SUPPLIED, CONTRACTOR INSTALLED.
- ④ EMERGENCY DISTRIBUTION PANEL BOARD EP-B 100A. 120/240V. 1Ø, 3W. SEE PANEL DETAIL.
- ⑤ TWO COMPARTMENT WIREWAY AROUND FULL PERIMETER OF EQUIPMENT ROOM. LOCATE IN UPPER CORNER OF WALL AS PER DETAIL 3, SHEET E2. WIREWAY TO BE USED FOR WIRING OF DEVICES SHOWN IN EQUIPMENT ROOM. WIREWAY TO BE HOOKED UP TO PANEL EP-B.

LEGEND

- ⌚ SINGLE POLE SWITCH 120V. 15A. #PS15AC1-1 BY PASS & SEYMOUR, INSTALLED IN SURFACE MOUNTED BOX #CIFS-1G-1/2 WITH #CIFS-9 COVER BY THOMAS & BETTS. INDICATES LIGHTS CONTROLLED
- ⌚ GANGED TOGGLE SWITCHES
- ⌚ DUPLEX OUTLET 15A. 120V. #5262-1 BY PASS & SEYMOUR, INSTALLED IN SURFACE MOUNTED BOX #CIFS-1G-1/2 WITH #CDR COVER BY THOMAS & BETTS.
- ⌚ SAME AS ABOVE EXCEPT MOUNTED 1050MM ABOVE FINISHED FLOOR.
- ⌚ TELEPHONE OUTLET.
RUN TELEPHONE WIRING IN 21MM EMT CONDUIT TO TELEPHONE EQUIPMENT
- ⌚ EMERGENCY LIGHTING UNIT. 120V AC. C/W 2 - 12VOLT 6W LED MR16 LAMP HEADS. MOUNT 2100MM AFF. PROVIDE L5-15R ADJACENT RECEPTACLE TEST SWITCH. SERIES #12ESL144-2-LJ BY EMERGI-LITE.
- ⌚ DOUBLE ADJUSTABLE REMOTE HEAD FOR EMERGENCY LIGHTING. 12 VOLT 5W LED MR16. MOUNT 2100MM AFF. RUN 2 #12 RW90 IN 21mm CONDUIT TO EMERGENCY LIGHTING UNIT. SERIES #EF150-D-LIC BY EMERGI-LITE.
- ⌚ ELECTRIC UNIT HEATER. SUSPENDED UNIT HEATER 2000W. 240V. 1Ø #OAS2038 BY QUELLET.
- ⌚ GAS DETECTOR. SEE MECHANICAL DRAWINGS FOR DETAIL.
- ⌚ LOW VOLTAGE VICONICS VT7200 THERMOSTAT. SUPPLIED & INSTALLED BY DIV. 26.
- ⌚ LOW VOLTAGE HONEYWELL FOCUS PRO 5000 THERMOSTAT. SUPPLIED & INSTALLED BY DIV. 26.
- ⌚ SMOKE ALARM AMERICAN SENSORS ESA5011 C/W RM3A RELAY MODULE. TIE INTO SECURITY SYSTEM. REFER TO DETAILS 3 & 5 ON DWG E2. (INTERCONNECT SMOKE ALARMS SUCH THAT WHEN ONE SOUNDS THEY ALL SOUND.)
- ⌚ CARBON MONOXIDE RELAY.
- ⌚ CONNECTION TO MECHANICAL OR ELECTRICAL EQUIPMENT
- ⌚ CARBON MONOXIDE ALARM. KIDDE#900-0L20 C/W RM3A RELAY MODULE. TIE INTO SECURITY SYSTEM. REFER TO DETAILS 3 & 5 ON DRAWING E2.
- ⌚ SURFACE MOUNTED 1.22m LONG 42W LED LUMINAIRE C/W ENERGY EFFICIENT 120V ELECTRIC DRIVER, FROST ACRYLIC LENS AND END CAP. 5000 LUMEN OUTPUT, 4000K CCT, MIN. CRI 80. LITHONIA CAT. #Z1DL485000LMFST12040KPLRWH OR APPROVED EQUAL.
- ⌚ EXTERIOR WALL MOUNTED LED LUMINAIRE WITH PHOTOCELL CONTROL, IMPACT RESISTANT POLYCARBONATE LENS, 120V, 19W, 1070 LUMENS, 5000K CCT. LITHONIA CATALOG #TWSLED-1-50K-120-PE OR APPROVED EQUAL.
- ⌚ PROVIDE CSA TYPE 3 (NEMA 3) RATED OUTDOOR JUNCTION BOX FOR CONNECTION TO A/C UNITS. PROVIDE 2#10 + 1#10 GND FOR EACH OUTDOOR A/C UNIT IN 21mmC FROM PANEL B TO THE JUNCTION BOX AND LEAVE 300mm OF COILED WIRE IN THE JUNCTION FOR CONNECTION TO A/C UNITS BY A/C CONTRACTOR. EXACT LOCATION OF JUNCTION BOX TO BE DETERMINED IN THE FIELD. SIZE JUNCTION BOX PER CEC.
- ⌚ ELECTRIC BASEBOARD HEATER. 7 FOOT LONG, 3750W, 240V. DOUBLE 20A BREAKER FOR 3750W OF HEAT.
- ⌚ EMERGENCY STOP SWITCH TIED BACK TO AUTOMATIC TRANSFER SWITCH IN GENERATOR ROOM.



- NOTES**
1. SERVICE ATTACHMENT SPOOL SHALL BE LOCATED NOT LESS THAN 4.5M ABOVE GRADE AS PER CEC.
 2. SERVICE INSTALLATION SHALL BE AS PER CEC AND UTILITY STANDARDS.



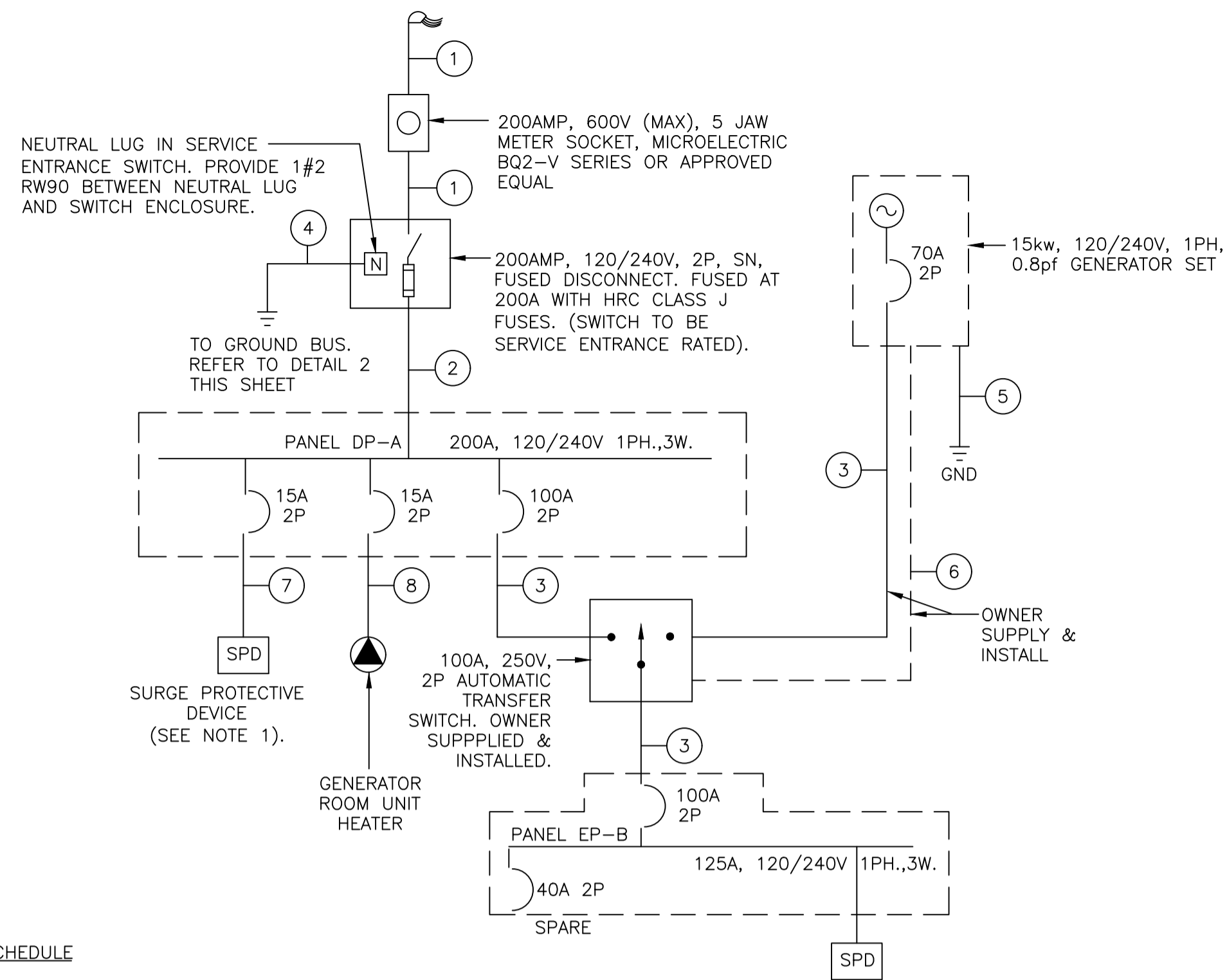
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Project - projet
MCTS EQUIPMENT BLDG ST. LAWRENCE

Drawing - dessin
ELECTRICAL LAYOUT AND LEGEND

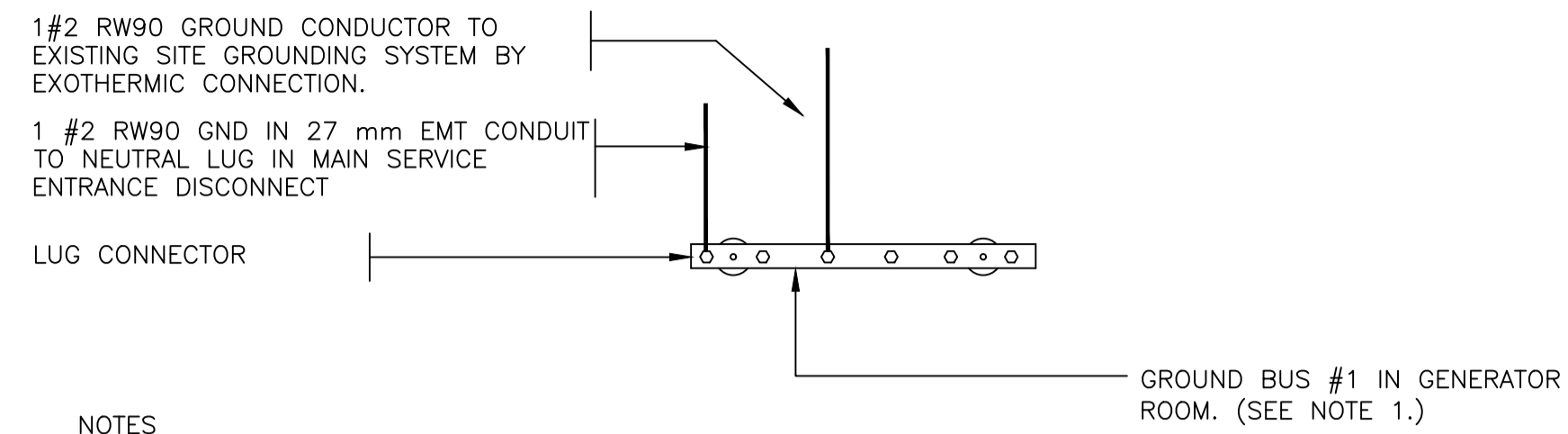
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date - date	AUGUST 2020	checked - vérifié	D.C.
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FEEDER SCHEDULE

- ① - UTILITY TO BE COMPLETED AS PART OF THIS CONTRACT. 3 #3/0 XLPE.
 - ② - 3 #3/0 RW90 +GND IN 53mm CONDUIT.
 - ③ - 3 #3 RW90 + GND IN 35mm CONDUIT.
 - ④ - 1 #2 RW90 GND IN 27mm CONDUIT.
 - ⑤ - 1 #6 RW90 GND IN 21mm CONDUIT.
 - ⑥ - 6 #12 RW90 + GND STRANDED IN 21mm CONDUIT.
 - ⑦ - WIRE SUPPLIED WITH SPD. MOUNT SPD ON THE PANEL ENCLOSURE AND RUN WIRE AS STRAIGHT AS POSSIBLE TO THE DOUBLE 30A SPD BREAKER. WIRE LENGTH FROM SPD TO BREAKER SHALL NOT EXCEED 150mm
 - ⑧ - 150mm
1. SURGE PROTECTIVE DEVICE TO BE OWNER SUPPLIED AND INSTALLED.
2. TRANSFER SWITCH (OWNER SUPPLIED, CONTRACTOR INSTALLED) HAS A SWITCHED NEUTRAL. BOND NEUTRAL TO GROUND AT THE GENERATOR.

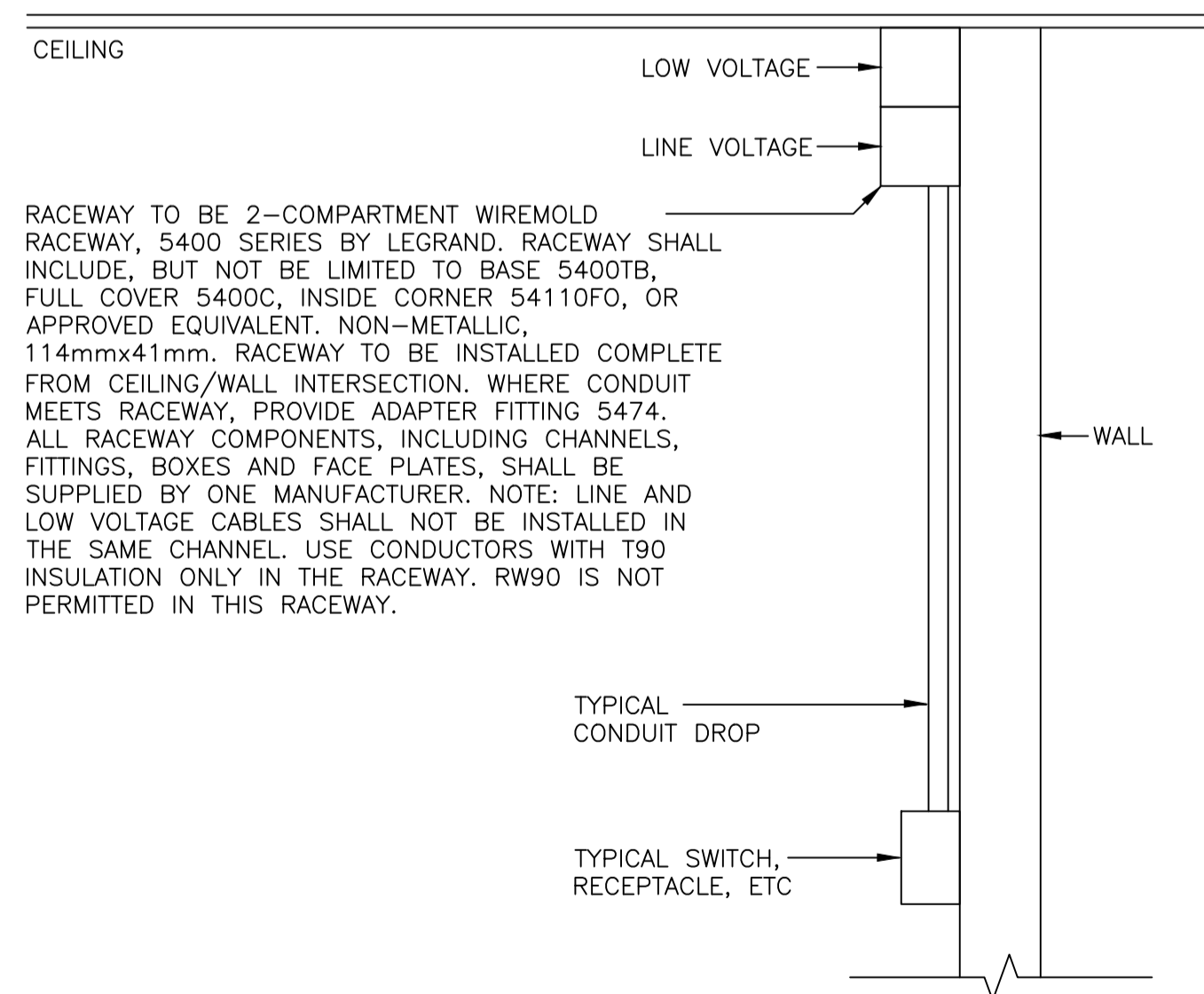
SINGLE LINE DIAGRAM
N.T.S.



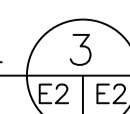
NOTES

1. GROUND BUSES SHALL BE ANDREW COMMSCOPE CAT.# UGBKIT-0424. INSTALL AS PER MANUFACTURER'S INSTRUCTIONS.

GROUND BUS DETAIL
N.T.S.



PERIMETER WIREWAY DETAIL
N.T.S.



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Project - projet

MCTS EQUIPMENT BLDG
ST. LAWRENCE

Drawing - dessin

ELECTRICAL DETAILS

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date - date	AUGUST 2020	checked - verifie	D.C.
scale - echelle	AS SHOWN	approved for tender - approuve pour l'offre	R.N.

project no. - projet no. drawing no. - no du dessin sheet - feuille
01L1402B03011-E02 11 OF 16

PANEL: DP-A LOCATION: GENERATOR ROOM MOUNTING: SURFACE
PANEL MODEL: SEE NOTE 1 **SERVICE:** 120/240, 1Ph., 3W BRANCH_BKR I.C.:10,000 A. RMS Sym.
DATE: **PANEL SIZE:** 200 Amp MAINS, **BREAKER TYPE:** SEE NOTE 2
NON-COMBINATION

LOAD DESCRIPTION	LOAD WATTS	WIRE SIZE	BKR. SIZE	CIRCUIT NO.	BKR. SIZE	WIRE SIZE	LOAD WATTS	LOAD DESCRIPTION
SPARE (LOSS OF POWER RELAY)		#12	15A 2P	1 2 3 4	100A 2P	#3	8830 8830	EP-B
SURGE PROTECTION DEVICE		#12	30A 2P	5 6 7 8	20A 2P	#12	1000 1000	GENERATOR ROOM HEATER
(GEN. LOSS RELAY)		#12	15A 2P	9 10 11 12	15A #12	1000 600		SPARE (COOLANT HEATER) SPARE (GEN. BATT CHARGER)
SPARE		#12	15A	13 14	15A #12			SPARE
SPARE		#12	15A	15 16	15A #12			SPARE
SPARE		#12	15A	17 18	15A #12			SPARE
SPARE		#12	15A	19 20	15A #12			SPARE
SPARE		#12	15A	21 22	15A #12			SPARE
SPARE		#12	15A	23 24	15A #12			SPARE

COMMENTS: + LOCK ON DEVICE CONNECTED TO BREAKER.

NOTES: 1. SIEMENS TUB B38, INSERT P1A30MC250AT, TRIM S38B.
2. BRANCH BREAKERS TYPE B.

PANEL DETAIL DP-A 1
N.T.S. E3 E3

PANEL: EP-B LOCATION: EQUIPMENT ROOM MOUNTING: SURFACE
PANEL MODEL: SEE NOTE 1 **SERVICE:** 120/240, 1Ph., 3W BRANCH_BKR I.C.:10,000 A. RMS Sym.
DATE: **PANEL SIZE:** 125 Amp MAINS, **BREAKER TYPE:** SEE NOTE 2
NON-COMBINATION

LOAD DESCRIPTION	LOAD WATTS	WIRE SIZE	BKR. SIZE	CIRCUIT NO.	BKR. SIZE	WIRE SIZE	LOAD WATTS	LOAD DESCRIPTION
SPARE		#12	15A	1 2	20A 2P	#12	1800 1800	A/C UNIT #1
SPARE (HEATER EQUIPMENT ROOM)	1000 1000	#12	15A 2P	5 6 7 8	15A #12	10 180		EMERG LTS + REC - GENERATOR ROOM
LIGHTING - INTERIOR	420	#12	15A	9 10	15A #12	180		REC - EXTERIOR
LIGHTING - EXTERIOR	20	#12	15A	11 12	15A #12	10		SMOKE/CO ALARM & GAS DET.
REC - BATTERY CHARGER	100	#12	15A	13 14	15A #12	180		REC - EQUIPMENT ROOM
SPARE (EQUIP. RM VENT)	100	#12	15A	15 16	15A #12	180		REC - EQUIPMENT ROOM
SPARE (EXHAUST FAN)	864	#12	15A	17 18	15A #12	100		TOWER LIGHTING
SPARE (VENT CONTROL)	50	#12	15A	19 20	15A #12	50		SPARE
SPARE (VENT CONTROL)	50	#12	15A	21 22	15A #12	180		REC - TELEPHONE EQUIP.
SPARE (REC - RACK 1)	900	#12	15A	23 24	15A #12	750		SPARE (REC - RACK 2)
SPARE (REC - RACK 3)	750	#12	15A	25 26	15A #12	750		SPARE (REC - RACK 4)
SPARE (REC-RACK5(FUTURE))	750	#12	15A	27 28	15A #12	750		SPARE (REC-RACK6(FUTURE))
SPARE	120	#12	15A	29 30	15A #12			SPARE
SPARE	120	#12	15A	31 32	15A #12			SPARE
SPARE		#12	15A	33 34	15A #12			SPARE
SPARE		#12	15A	35 36	15A #12			SPARE
SPARE		#12	15A	37 38	15A #12			SPARE
SPARE (PANEL UPS-C)	2600 2600	#8	60A 2P	39 40 41 42	100A 2P	#12		SPD

COMMENTS: + LOCK ON DEVICE CONNECTED TO BREAKER.

NOTES: 1. SIEMENS TUB B44, INSERT P1A42MC250AT, TRIM S44B.
2. BREAKERS TYPE B.

PANEL DETAIL EP-B 2
N.T.S. E3 E3

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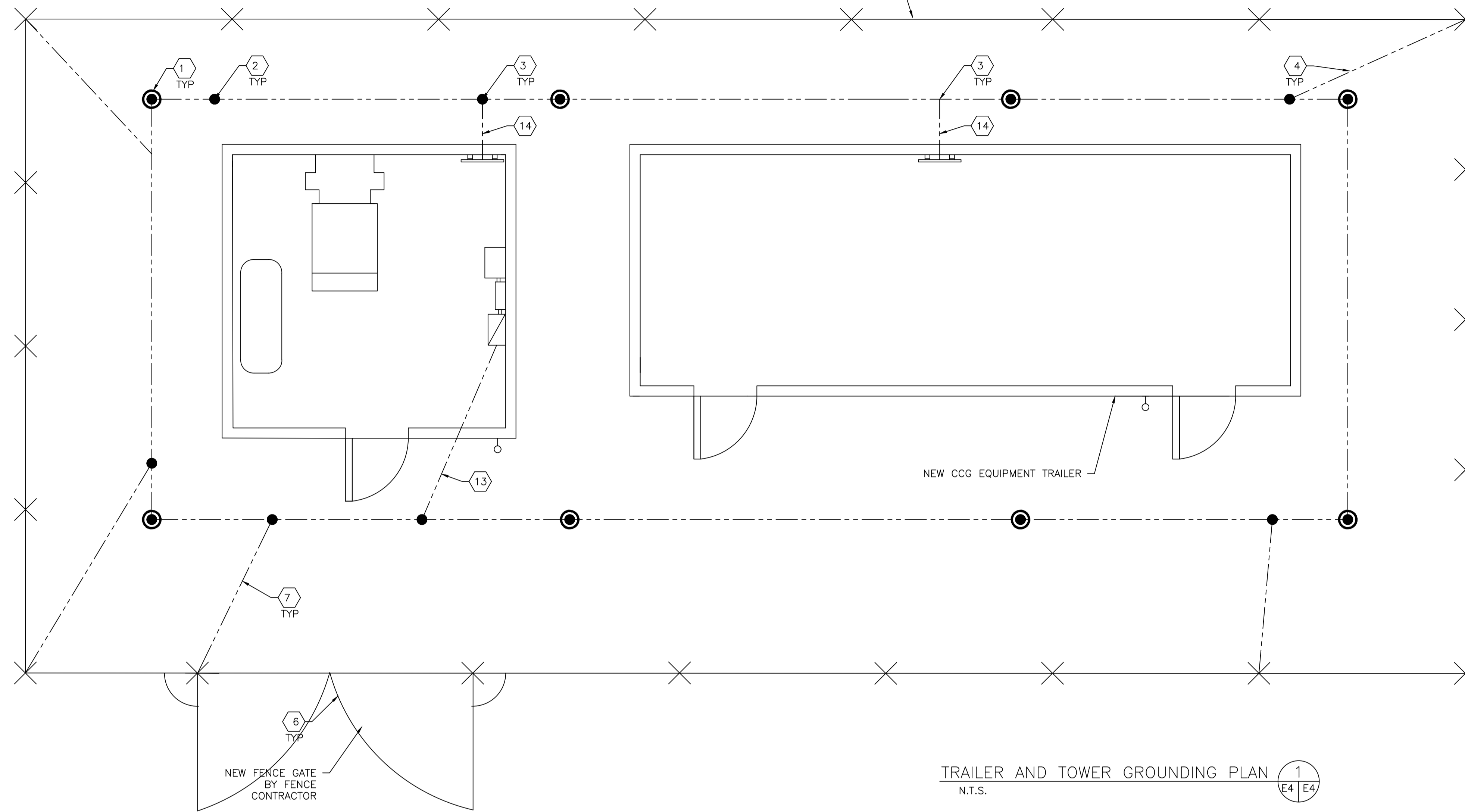
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Project - projet
MCTS EQUIPMENT BLDG
ST. LAWRENCE


Drawing - dessin
ELECTRICAL DETAILS AND
PANEL SCHEDULES

drawn - dessine	M.G.G.	designed - dessine par	K.W.
date - date	AUGUST 2020	checked - verifie	D.C.
scale - echelle	AS SHOWN	approved for tender - approuve pour l'offre	R.N.

NEW FENCE BY FENCE CONTRACTOR. FENCE PLAN SHOWN IS DIAGRAMMATIC FOR THE PURPOSE OF GROUNDING SCHEME. CONFIRM EXACT LOCATION AND SHAPE OF FENCE ON SITE



- 1 19mmØ x 3m LONG COPPER CLAD STEEL GROUND ROD. 6 REQUIRED.
- 2 NEW TRAILER GROUND GRID. # 2/0 BARE STRANDED COPPER CONDUCTOR BURIED AT 700mm BELOW FINISHED GRADE.
- 3 EXOTHERMIC CONNECTION BELOW GRADE.
- 4 BOND FENCE TO GROUNDING SYSTEM AT 10m INTERVALS USING #2/0 BARE STRANDED COPPER CONDUCTOR.
- 5 BOND EXISTING TOWER GROUND RING TO NEW FENCE USING #2/0 BARE STRANDED COPPER CONDUCTOR.
- 6 PROVIDE FLEXIBLE BONDING STRAP BETWEEN STATIONARY GATE POST AND GATE FRAME.
- 7 BOND EACH STATIONARY GATE POST TO TRAILER GROUND GRID.
- 8 BOND NEW TRAILER GROUND GRID TO EXISTING TOWER GRID RING USING #2/0 BARE STRANDED COPPER CONDUCTOR AT 2 LOCATIONS MINIMUM 2m APART.
- 9 BOND EACH WAVE GUIDE POST TO TRAILER GROUND GRID USING #2 INSULATED COPPER CONDUCTOR.
- 10 BOND EXTERIOR GROUND BAR OF THE TRAILER TO TRAILER GROUND GRID USING #2/0 INSULATED COPPER CONDUCTOR.
- 11 MAINTAIN A 200mm GAP BETWEEN THE WAVEGUIDE BRIDGE AND THE TRAILER AND BOND WAVEGUIDE BRIDGE TO EXTERIOR GROUND BAR USING #2 INSULATED COPPER CONDUCTOR.
- 12 BOND INTERIOR GROUND BAR OF THE TRAILER TO TRAILER GROUND GRID USING #2/0 INSULATED COPPER WIRE.
- 13 BOND SERVICE ENTRANCE NEUTRAL TO TRAILER GROUND GRID USING #6 INSULATED COPPER CONDUCTOR.
- 14 BOND GENERATOR COMPARTMENT GROUND BAR TO TRAILER GROUND GRID USING #2/0 INSULATED STRANDED COPPER CONDUCTOR.


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**MCTS EQUIPMENT BUILDING
ST. LAWRENCE**

Drawing - dessin

GROUNDING PLAN

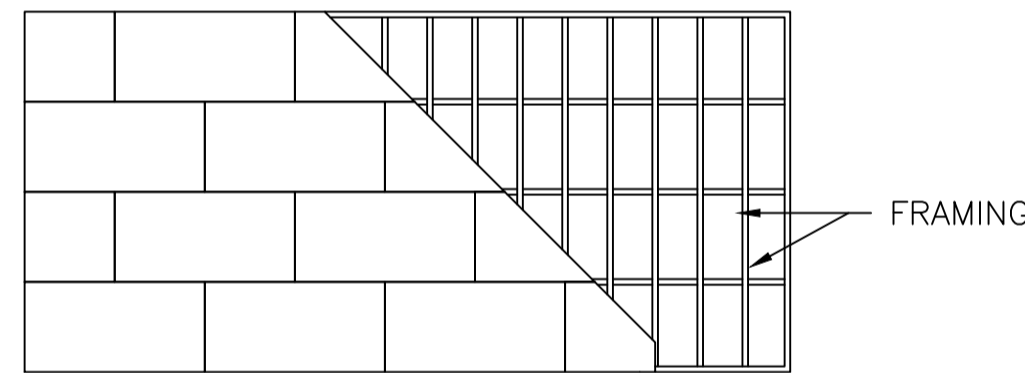
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GENERAL NOTES

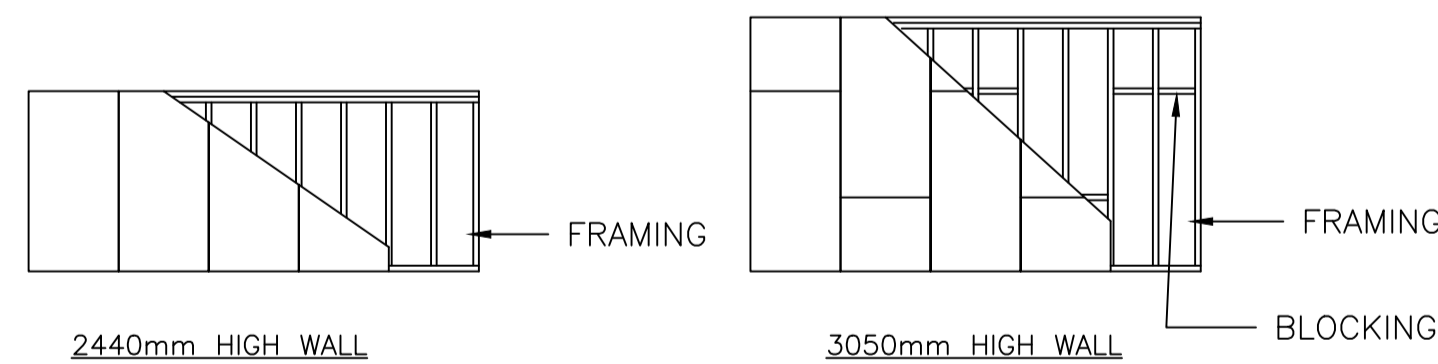
1. ALL WORKMANSHIP, EXCEPT WHERE NOTED OTHERWISE SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL BUILDING CODE OF CANADA (LATEST EDITION).
2. VERIFY ALL DIMENSIONS AND REPORT DISCREPANCIES BEFORE PROCEEDING WITH THE WORK. DO NOT SCALE THESE DRAWINGS.
3. FOR DIMENSIONS NOT GIVEN ON STRUCTURAL DRAWINGS SEE ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS.
4. FOR SIZE AND LOCATION OF MECHANICAL AND ELECTRICAL EQUIPMENT AND OPENINGS SEE MECHANICAL AND ELECTRICAL DRAWINGS. VERIFY ALL DIMENSIONS WITH THE MECHANICAL AND ELECTRICAL CONTRACTORS.
5. MAKE ADEQUATE PROVISIONS FOR CONSTRUCTION STRESSES, WEATHER PROTECTION AND FOR SUFFICIENT TEMPORARY BRACING AND SHORING TO KEEP THE STRUCTURE PLUMB AND LEVEL DURING ALL PHASES OF WORK. CONTRACTOR TO SUBMIT RESHORING DIAGRAMS FOR REVIEW STAMPED BY PROFESSIONAL ENGINEER AND LICENSED TO PRACTICE IN THE PROVINCE OF NEWFOUNDLAND & LABRADOR.
6. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO SAFEGUARD ALL EXISTING STRUCTURES AFFECTED BY THIS CONSTRUCTION.
7. ALL REQUIREMENTS FOR MECHANICAL AND ELECTRICAL EQUIPMENT AND ANY OTHER TRADES OR SERVICES AFFECTING THE STRUCTURE SHALL BE ESTABLISHED BY THE GENERAL CONTRACTOR IN CONSULTATION WITH CORRESPONDING MANUFACTURERS OR SUPPLIERS AND THE ARCHITECT AND THE ENGINEER.
8. DESIGN LOADS AS SHOWN ON DRAWINGS.
9. ALL LOADS AND FORCES SHOWN ON DRAWINGS ARE UNFACTORED U.N.O. IF LOADING TYPE IS NOT INDICATED, CONSIDER IT TO BE A LIVE LOAD. ALL LOADINGS ARE IN SYSTEM INTERNATIONAL UNITS U.N.O.

STRUCTURAL TIMBER NOTES

1. ALL TIMBER MEMBERS (TRUSSES, JOISTS, GLUE LAMINATED, PLYWOOD, ETC.) TO BE DESIGNED IN ACCORDANCE WITH CSA 086 LATEST EDITION.
2. FABRICATOR SHALL SUBMIT SHOP DRAWINGS STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF NEWFOUNDLAND & LABRADOR PRIOR TO COMMENCEMENT OF FABRICATION.
3. PROVIDE TRUSS PLATES WHERE BEARING WIDTH OF WOOD PLATES IS LESS THAN DESIGN WIDTH.
4. PROVIDE METAL TRUSS CONNECTORS FOR CONNECTION OR ROOF TRUSSES TO WOOD PLATES. GROSS UPLIFT LOAD FOR ROOF TRUSSES ARE 1.5 KPa U.N.O.
5. PLYWOOD NAILING SCHEDULE:
ROOF AND CEILING SHEATHING
 64mm NAILS @ 100 O.C. AT PLYWOOD EDGES
 64mm NAILS @ 300 O.C. AT INTERIOR OF SHEET
WALL SHEATHING
 64mm NAILS @ 150 O.C. AT PLYWOOD EDGES
 64mm NAILS @ 300 O.C. AT INTERIOR OF SHEET
6. WOOD JOISTS, BEAMS AND STUDS TO BE SPRUCE-PINE-FIR GRADE No.1/No.2
7. ROOF AND CEILING SHEATHING TO BE FULLY BLOCKED ATTACHED TO FRAMING IN FOLLOWING CONFIGURATION.



8. WALL SHEATHING TO BE FULLY BLOCKED AND ATTACHED TO FRAMING IN FOLLOWING CONFIGURATION.



9. SHEAR WALL HOLD-DOWN ANCHORS REQUIRED AT BOTH ENDS FOR EACH SEGMENT OF UNINTERRUPTED WALL.
10. ALL SURFACES OF PRESSURE TREATED LUMBER THAT ARE EXPOSED THROUGH FIELD CUTTING, TRIMMING OR BORING MUST BE RE-TREATED WITH A LIBERAL APPLICATION OF PRESERVATIVE BEFORE INSTALLATION.

INSULATION NOTES

1. ALL BATT INSULATION TO CAN/ULC S702.
2. INSULATION SHALL BE INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS.
3. INSTALL INSULATION WITH FACTORY APPLIED VAPOUR BARRIER FACING WARM SIDE OF BUILDING SPACES. LAP ENDS AND SIDE FLANGES OF MEMBRANE OVER FRAMING MEMBERS. RETAIN IN POSITION WITH STAPLES. INSTALLED AS RECOMMENDED BY MANUFACTURER. TAPE SEAL BUTT ENDS AND LAPPED SIDE FLANGES. DO NOT CUT OR TEAR VAPOUR BARRIER.

PAINTING NOTES

1. ALL WORK TO CONFORM TO LATEST MPI REQUIREMENTS FOR INTERIOR PAINTING WORK INCLUDING PREPARATION AND PRIMING.
2. STANDARD OF ACCEPTANCE AS FOLLOWS:
 WALLS: NO DEFECTS VISIBLE FROM A DISTANCE OF 1000mm AT 90 DEGREES TO SURFACE
 CEILINGS:NO DEFECTS VISIBLE FROM FLOOR AT 45 DEGREES TO SURFACE WHEN VIEWED USING FINAL LIGHTING SOURCE.
 FINAL COAT TO EXHIBIT UNIFORMITY OF COLOUR AND UNIFORMITY OF SHEEN ACROSS FULL SURFACE AREA.
3. SUBMIT PRODUCT DATA AND MANUFACTURER'S INSTALLATION/SPPICATION FOR EACH PAINT AND COATING PRODUCT TO BE USED.
4. PAINT MATERIALS FOR PAINT SYSTEMS SHALL BE PRODUCTS OF A SINGLE MANUFACTURER.
5. ONLY QUALIFIED PRODUCTS WITH E2 "ENVIRONMENTALLY FRIENDLY" RATING ARE ACCEPTABLE FOR USE ON THIS PROJECT.
6. UPON COMPLETION, SUBMIT RECORDS OF PRODUCTS USED. LIST PRODUCTS IN RELATION TO FINISH SYSTEM AND INCLUDE THE FOLLOWING:
 - 6.1. PRODUCT NAME, TYPE AND USE
 - 6.2. MANUFACTURER'S PRODUCT NUMBER
 - 6.3. COLOUR NUMBER
 - 6.4. MPI ENVIRONMENTALLY FRIENDLY CLASSIFICATION SYSTEM RATING
 - 6.5. MANUFACTURER'S MATERIAL SAFETY DATA SHEETS (MSDS)
7. SITE REQUIREMENTS
 - 8.1 HEATING, VENTILATION AND LIGHTING:
 - a) PERFORM NO PAINTING WORK UNLESS ADEQUATE AND CONTINUOUS VENTILATION AND SUFFICIENT HEATING FACILITIES ARE IN PLACE TO MAINTAIN AMBIENT AIR AND SUBSTRATE TEMPERATURES ABOVE 10 OC FOR 24 HOURS BEFORE, DURING AND AFTER PAINT APPLICATION UNTIL PAINT HAS CURED SUFFICIENTLY.
 - b) WHERE REQUIRED, PROVIDE CONTINUOUS VENTILATION FOR SEVEN DAYS AFTER COMPLETION OF APPLICATION OF PAINT.
 - c) PERFORM NO PAINTING WORK UNLESS A MINIMUM LIGHTING LEVEL OF 323 LUX IS PROVIDED ON SURFACES TO BE PAINTED. ADEQUATE LIGHTING FACILITIES SHALL BE PROVIDED BY GENERAL CONTRACTOR.
 - 8.2 TEMPERATURE, HUMIDITY AND SUBSTRATE MOISTURE CONTENT LEVELS:
 - a) UNLESS SPECIFICALLY PRE-APPROVED BY THE SPECIFYING BODY, PAINT INSPECTION AGENCY AND THE APPLIED PRODUCT MANUFACTURER, PERFORM NO PAINTING WORK WHEN:
 - AMBIENT AIR AND SUBSTRATE TEMPERATURES ARE BELOW 10 OC.
 - SUBSTRATE TEMPERATURE IS OVER 32 OC UNLESS PAINT IS SPECIFICALLY FORMULATED FOR APPLICATION AT HIGH TEMPERATURES.
 - SUBSTRATE AND AMBIENT AIR TEMPERATURES ARE EXPECTED TO FALL OUTSIDE MPI OR PAINT MANUFACTURERS PRESCRIBED LIMITS.
 - THE RELATIVE HUMIDITY IS ABOVE 85% OR WHEN THE DEW POINT IS LESS THAN 3 OC VARIANCE BETWEEN THE AIR/SURFACE TEMPERATURE.
 - RAIN OR SNOW ARE FORECAST TO OCCUR BEFORE PAINT HAS THOROUGHLY CURED OR WHEN IT IS FOGGY, MISTY, RAINING OR SNOWING AT SITE.
 - b) PERFORM NO PAINTING WORK WHEN THE MAXIMUM MOISTURE CONTENT OF THE SUBSTRATE EXCEEDS:
 - 15% FOR WOOD.
 - c) CONDUCT MOISTURE TESTS USING A PROPERLY CALIBRATED ELECTRONIC MOISTURE METER, EXCEPT TEST CONCRETE FLOORS FOR MOISTURE USING A SIMPLE "COVER PATCH TEST".
 - d) TEST CONCRETE, MASONRY AND PLASTER SURFACES FOR ALKALINITY AS REQUIRED.
 - 8.3 SURFACE AND ENVIRONMENTAL CONDITIONS:
 - a) APPLY PAINT FINISH ONLY IN AREAS WHERE DUST IS NO LONGER BEING GENERATED BY RELATED CONSTRUCTION OPERATIONS OR WHEN WIND OR VENTILATION CONDITIONS ARE SUCH THAT AIRBORNE PARTICLES WILL NOT AFFECT QUALITY OF FINISHED SURFACE.
 - b) APPLY PAINT ONLY TO ADEQUATELY PREPARED SURFACES AND TO SURFACES WITHIN MOISTURE LIMITS NOTED HEREIN.
 - c) APPLY PAINT ONLY WHEN PREVIOUS COAT OF PAINT IS DRY OR ADEQUATELY CURED.
 - 8.4 ADDITIONAL INTERIOR APPLICATION REQUIREMENTS:
 - a) APPLY PAINT FINISHES ONLY WHEN TEMPERATURE AT LOCATION OF INSTALLATION CAN BE SATISFACTORILY MAINTAINED WITHIN MANUFACTURER'S RECOMMENDATIONS.



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PART 1: GENERAL

1.13 COMMISSIONING

- .1 PROVIDE ALL NECESSARY LABOUR, MATERIALS, TOOLS, AND EQUIPMENT FOR IMPLEMENTING ALL REQUIRED COMMISSIONING ACTIVITIES INCLUDING: ALL CHECKING, TESTING, ADJUSTING, AND FINE TUNING OF SYSTEM SET POINTS AND TO PUT SYSTEMS INTO OPERATION.
- .2 COMPLETE A SYSTEMATIC VERIFICATION PROCEDURE TO ENSURE THAT:
 - .1 EQUIPMENT AND MATERIAL DELIVERED AND INSTALLED ARE AS PER APPROVED SHOP DRAWINGS, IN ACCORDANCE WITH ALL APPLICABLE CODES, NORMAL GOOD PRACTICE, MANUFACTURER'S INSTALLATION GUIDELINES, AND REQUIREMENTS OF THESE SPECIFICATIONS,
 - .2 PIPING AND DUCTWORK IS PRESSURE TESTED AS REQUIRED,
 - .3 EQUIPMENT IS SAFE TO BE STARTED.
- .3 COMPLETE A SYSTEMATIC VERIFICATION PROCEDURE TO ENSURE THAT EQUIPMENT AND SYSTEMS OPERATE SAFELY, EFFICIENTLY, AND IN GENERAL CONFORMITY WITH THE DESIGN INTENT INCLUDING:
 - .1 VERIFYING OPERATING CONDITIONS,
 - .2 VERIFYING PROPER OPERATION OF ALL SAFETY DEVICES,
 - .3 VERIFYING HYDRONIC SYSTEM FLUIDS ARE CLEAN AND TREATED AS PER SPECIFICATIONS,
 - .4 VERIFYING CONTROL SYSTEM OPERATION,
 - .5 VERIFYING SATISFACTORY EQUIPMENT OPERATING POINTS (PUMPS AND FANS) AND MOTOR LOADING,
 - .6 VERIFYING LINKAGE BETWEEN INTERACTING SYSTEMS,

1.4 CARE, OPERATION AND START-UP

- .1 MANUFACTURERS OR THEIR AGENTS TO UNDERTAKE EQUIPMENT START-UP WHERE REQUIRED BY THE SPECIFICATIONS OR WHERE REQUIRED BY THE EQUIPMENT MANUFACTURER AS A CONDITION OF WARRANTY. WHERE MANUFACTURER IS NOT REQUIRED TO DO START-UP, CARRY OUT IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.
- .2 INSTRUCT OPERATING PERSONNEL IN THE OPERATION, CARE, MAINTENANCE OF EQUIPMENT.

1.15 TESTING

- .1 TEST ALL PIPING TO 150% OF OPERATING PRESSURE FOR 8 HOURS, OR AS REQUIRED BY CODES.

1.17 IDENTIFICATION

- .1 IDENTIFY ALL EQUIPMENT WITH ENGRAVED LAMACOID PLATES.
- .2 IDENTIFY ALL VALVES WITH NUMBERED BRASS TAGS. RECORD VALVE NUMBERS, SERVICE AND NORMAL POSITION ON VALVES SCHEDULE. INCLUDE VALVE SCHEDULE IN MAINTENANCE MANUALS.

PART 2 INSULATION

2.1 GENERAL

- .1 INSULATION TO NFPA-90-A MAXIMUM FLAME-SPREAD AND SMOKE-DEVELOPED RATINGS OF 25 AND 50 RESPECTIVELY. INSTALL ALL INSULATION AS PER MANUFACTURER'S RECOMMENDATIONS.
- .2 THERMAL CONDUCTIVITY ("K" FACTOR) NOT TO EXCEED SPECIFIED VALUES AT 24 DEGREES C MEAN TEMPERATURE WHEN TESTED IN ACCORDANCE WITH ASTM C 335.

2.2 PRODUCT

- .1 TIAC CODE A-2: RIGID MOULDED CALCIUM SILICATE IN SECTIONS AND BLOCKS, AND WITH SPECIAL SHAPES TO SUIT PROJECT REQUIREMENTS.
 - .1 INSULATION: ASTM C533.
 - .2 MAXIMUM "K" FACTOR: ASTM C533.
 - .3 DESIGN TO PERMIT PERIODIC REMOVAL AND RE-INSTALLATION.
- .2 SECUREMENT
 - .1 TAPE: SELF-ADHESIVE, ALUMINUM, PLAIN, 50 MM WIDE MINIMUM.
 - .2 TIE WIRE: 1.5 MM DIAMETER STAINLESS STEEL.
 - .3 BANDS: STAINLESS STEEL, 19 MM WIDE, 0.5 MM THICK.
 - .4 FACING: 25 MM GALVANIZED STEEL HEXAGONAL WIRE MESH ON ONE FACE OF INSULATION.
 - .5 FASTENERS: 4 MM DIAMETER PINS WITH 35 MM DIAMETER OR SQUARE CLIPS.
- .3 JACKETS
 - .1 ALUMINUM: TO 0.5 MM THICK WITH LONGITUDINAL SLIP JOINTS AND 50 MM END LAPS, 0.4 MM THICK DIE SHAPED FITTING COVERS WITH FACTORY ATTACHED PROTECTIVE LINER ON INTERIOR SURFACE.

2.3 EXECUTION

- .1 INSTALL IN ACCORDANCE WITH TIAC NATIONAL STANDARDS AND AS PER MANUFACTURER'S RECOMMENDATIONS.
- .2 RE-COVER ALL GENERATOR EXHAUST PIPING AND MUFFLER WITH INSULATED JACKET.
- .3 PROVIDE INSULATION SHIELDS AT ALL PIPE HANGERS.
- .4 PIPE AND DUCT INSULATION SCHEDULE.

SERVICE	TIAC CODE	THICKNESS
ENGINE EXHAUST	A-2	50 MM

PART 3: FIRE PROTECTION

3.1 GENERAL

- .1 REFERENCES
 - .1 PROVINCIAL AND LOCAL BUILDING CODES, AND FIRE REGULATIONS AS APPROVED BY THE AUTHORITY HAVING JURISDICTION.
 - .2 NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS:
 - .1 NFPA 10 - PORTABLE FIRE EXTINGUISHERS

PART 4: PIPING, VALVES AND FITTINGS

4.1 GENERAL

- .1 PROVIDE COMPLETE, FULLY OPERATIONAL PIPING SYSTEMS COMPLETE WITH ALL ISOLATION, CHECK, PRESSURE REDUCING AND BACKFLOW PREVENTION VALVES AS INDICATED AND FURTHER AS REQUIRED FOR PROPER SYSTEM OPERATION AND TO SATISFY LOCAL CODES.

4.2 PRODUCTS

- .1 PIPE AND FITTINGS
 - .1 STEEL: ASTM A53 GRADE B, SEAMLESS UP TO NPS 2, ERW FOR LARGER
 - .2 SERVICE:

SERVICE	PIPE SIZE	MATERIAL	FITTINGS
FUEL OIL	ALL	SCHEDULE 40 STAINLESS STEEL	SCREWED
GENERATOR EXHAUST	NPS 3 AND OVER	SCHEDULE 40 STEEL	WELDED

.2 VALVES

- .1 GATE VALVES:
 - .1 NPS2 AND UNDER: BRONZE BODY, RISING STEM: TO MSS-SP-80, CLASS 125, 860 KPA SOLID WEDGE DISC, HANDWHEEL OPERATOR
- .2 GLOBE VALVES:
 - .1 NPS 2 AND UNDER: TO MSS-SP-80, CLASS 125, 860 KPA, BRONZE BODY, SCREWED OVER BONNET, RENEWABLE BRONZE DISC (COMPOSITION DISC SUITABLE FOR OIL SERVICE)
- .3 CHECK VALVES:
 - .1 NPS 2 AND UNDER: SWING TYPE, TO MSS-SP-80, CLASS 125, 860 KPA, BRONZE BODY, BRONZE SWING DISC (RENEWABLE COMPOSITION DISC SUITABLE FOR OIL SERVICE), SCREW IN CAP, REGRINDABLE SEAT
- .4 BALL VALVES:
 - .1 NPS 2 AND UNDER: BRONZE BODY, TFE SEAL, HARD CHROME BALL, 4 MPA, WOG, HANDLE OPERATOR

4.3 EXECUTION

- .1 NPS2 AND UNDER: SCREWED FITTINGS WITH PTFE TAPE OR LEAD-FREE PIPE DOPE.
- .2 CONNECT TO EQUIPMENT WITH UNIONS OR FLANGES. INSTALL PIPING OR MINIMIZE PIPE DISMANTLING FOR EQUIPMENT REMOVAL.
- .3 EACH PIECE OF EQUIPMENT TO BE ISOLATED BY GATE, OR BALL VALVES.
- .4 INSTALL VALVES WITH STEMS IN UPRIGHT OR HORIZONTAL POSITION. DO NOT INSTALL STEMS IN INVERTED POSITION.
- .5 PROVIDE SPRING HANGERS AND FLEXIBLE CONNECTIONS WHEN MAKING CONNECTION TO VIBRATION ISOLATED EQUIPMENT. OIL LINES TO DIESEL GENERATORS SHALL HAVE A MINIMUM 12" (300MM) LONG FLEXIBLE STAINLESS STEEL BRAID REINFORCED CONNECTIONS.
- .6 PROVIDE ALL PIPING TO FUEL TANK AND BETWEEN TANK AND ENGINE INCLUDE FILL, VENTS, SUPPLY AND RETURN, AND ALL CONNECTIONS TO FUEL TANK, AND ENGINE. GRADE PIPING AT 1% BACK TO TANK.
- .7 SUPPORT ALL PIPING FROM STRUCTURAL MEMBERS AS APPROVED BY ENGINEER. WHEN STRUCTURAL MEMBERS ARE NOT SUITABLE LOCATION, PROVIDE SUPPLEMENTARY MEMBERS SUCH AS STEEL CHANNELS OR ANGLES (OBTAIN APPROVAL PRIOR TO FABRICATION). HANGER SYSTEMS TO BE STEEL ROD AND CLEVIS, ANGLE IRON OR CHANNEL. STRAP HANGER NOT TO BE USED.
- .8 PIPE SUPPORTS SHALL MEET REQUIREMENTS OF ANSI B31.1. USE ROD DIAMETERS AND SUPPORT SPACING AS SHOWN BELOW WITH THE FOLLOWING EXCEPTIONS:
 - .1 SUPPORT APPROVED MECHANICAL JOINT PIPING WITH AT LEAST TWO HANGERS BETWEEN EACH JOINT OR FITTING.
 - .2 SUPPORT PLASTIC PIPE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

PIPE SIZE NPS	ROD DIAMETER	MAXIMUM SPACING STEEL	COPPER
½	10 MM	1.8 M	1.5 M
¾ TO 1 ¼	10 MM	2.1M	1.8 M
1 ½	10 MM	2.7 M	2.4 M
2	10 MM	3.0 M	2.7 M
2 ½ TO 3	10 MM	3.6 M	3.0 M
4	10 MM	3.6 M	3.6 M
6	10 MM	4.8 M	

PART 5: HEATING, VENTILATION AND AIR CONDITIONING

5.1 GENERAL

- .1 PROVIDE ALL LABOUR, MATERIALS AND EQUIPMENT REQUIRED FOR COMPLETE HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS GENERALLY INCLUDE THE FOLLOWING:

5.2 PRODUCTS

- .1 WALL MOUNTED EXHAUSTER:
 - .1 FULLY ASSEMBLED, STURDILY CONSTRUCTED DIRECT DRIVE, WALL MOUNTED HORIZONTAL EXHAUST FAN, DURABLE POWER COATED FINISH, HEAVY DUTY OSHA MOTOR/GUARD, ENCLOSED AIR OVER MOTOR WITH OVERLOAD PROTECTION, DISCONNECT SWITCH. FAN SPECIFICATIONS: "LFI" MODEL P24-1V, 124 BLADE DIAMETER, DIMENSION 29.25"x29.25", AIR FLOW 3,520CFM @ 0.25" STATIC PRESSURE. ELECTRICAL POWER SUPPLY: 115/1/60, 1/3HP.
 - .2 STANDARD OF ACCEPTANCE: LFI OR EQUAL.
- .2 INTERIOR DUCTWORK SHALL BE FABRICATED FROM GALVANIZED STEEL TO ASTM A525 G90 DESIGNATION. METAL GAUGE SHALL BE IN ACCORDANCE WITH SMACNA STANDARDS.
- .3 EXTERIOR HOODS DUCTWORK SHALL BE FABRICATED FROM ALUMINUM TYPE 3003-H-14 SHEET MATERIAL. METAL GAUGE SHALL BE IN ACCORDANCE WITH SMACNA STANDARDS.
- .4 INTAKE/RELIEF DAMPERS: ALUMINUM FRAME WITH POLYURETHANE POCKETS, ALUMINUM BLADES WITH POLYURETHANE INTERNALLY INSULATION (R-2.25 MINIMUM), SILICONE BLADE AND SIDE SEALS, AMCA CERTIFIED, SALT WATER RESISTANCE INCLUDING STAINLESS STEEL HARDWARE.
 - .1 STANDARD OF ACCEPTANCE: TAMCO 9000 SW.

5.3 EXECUTION

- .1 INSTALL ALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.
- .2 ALL EQUIPMENT TO BE VIBRATION ISOLATED. USE RUBBER ISOLATORS FOR EQUIPMENT LESS THAN 30 KG SPRING ISOLATORS FOR LARGER EQUIPMENT.
- .3 PROVIDE TYPE "L" COPPER WITH COPPER FITTINGS CONDENSATE PIPING FROM WALL MOUNTED INDOOR UNIT.
- .4 MANUFACTURE AND INSTALL ALL DUCTWORK IN ACCORDANCE WITH THE RECOMMENDATION OF SMACNA.
- .5 ALL DUCTWORK CONNECTION TO ISOLATED EQUIPMENT TO BE MADE USING 100 MM FLEXIBLE CONNECTORS.
- .6 SEAL ALL JOINTS IN DUCTWORK.
- .7 MAKE TRANSITIONS, OFFSETS OR EASEMENTS IN DUCT SYSTEMS WHERE REQUIRED TO AVOID CONFLICT WITH STRUCTURE OR OTHER TRADES. COORDINATE LOCATION OF DUCTWORK WITH OTHER TRADES TO MINIMIZE ALTERATIONS.

PART 6: DIESEL GENERATOR INSTALLATION

6.1 GENERAL

- .1 DIESEL ELECTRIC GENERATOR IS SPECIFIED UNDER THE ELECTRICAL SECTION, INCLUDING MUFFLER AND EXHAUST FLEXIBLE CONNECTIONS.

6.2 PRODUCTS

- .1 MUFFLER AND EXHAUST FLEXIBLE CONNECTIONS PROVIDED WITH GENERATOR.
- .2 ABOVE GROUND OIL STORAGE TANK SHALL BE FIBERGLASS REINFORCED PLASTIC, VILCO OR OTHER APPROVED MANUFACTURER. SUITABLE FOR ABOVE GROUND INSTALLATION, UNDERWRITER'S APPROVED AND LABELLED.
- .3 TANK SHALL BE 200 IMPERIAL GALLONS (909 LITERS) COMPLETE WITH TOP INLET, VENTS, LEVEL GAUGE CONNECTION, DRAIN VALVE, AND OUTLET AND RETURN CONNECTIONS.
- .4 PROVIDE TANK WITH GAUGE GLASS FOR FULL HEIGHT OF TANK COMPLETE WITH GAUGE COCKS.
- .5 FUEL LEVEL GAUGE C/W ALARM WIRING. OWNER TO SUPPLY PRODUCT INFORMATION.
- .6 AFTER ALL TESTS AND PLANT ACCEPTANCE, TANK SHALL BE COMPLETELY FILLED WITH OIL, GRADE AS APPLICABLE. PROVIDE CERTIFICATE THAT THE TANK HAS BEEN FILLED. INCLUDE FOR COST OF OIL FOR TESTING AND TO FILL SYSTEM AFTER TESTS.
- .7 PROVIDE WIRING SCHEMATIC FOR REVIEW.

6.3 EXECUTION

- .1 INSTALL EXHAUST PIPE, MUFFLER, FLEXIBLE PIPE CONNECTION AND FLAPPER VALVE OR RAIN CAP IN EXHAUST PIPE. PROVIDE A COMPLETE INSTALLATION FROM THE GENERATOR ENGINE FLANGE.
- .2 INSTALL A FLEXIBLE CONNECTION ON THE GENERATOR RADIATOR AND PROVIDE ALL DUCTWORK, MOTORIZED DAMPERS, AND WEATHER-PROOF HOODS FOR EXHAUST, OUTSIDE AIR INTAKE AND RECIRCULATING AIR.
- .4 PROVIDE A CONDENSATE DRAIN PIPE FROM THE MUFFLER.

PART 7: CONTROLS SYSTEM

7.1 GENERAL

- .1 PROVIDE ALL THERMOSTATS, SENSORS, ACTUATORS, CONTROLLER, OPERATORS AND ACCESSORIES AS REQUIRED FOR FULL OPERATIONAL SEQUENCE AS DESCRIBED HEREIN.

7.2 PRODUCTS


- .1 WIRING: ALL WIRING TO BE IN ACCORDANCE WITH ELECTRICAL SPECIFICATION.

7.3 EXECUTION

- .1 GENERAL
 - .1 INSTALL SYSTEMS AND RELATED CONTROLS USING FACTORY TRAINED JOURNEYMAN CERTIFIED BY THE PROVINCE OF NEWFOUNDLAND LABRADOR.

7.4 SEQUENCE OF OPERATION

- .1 MOTORIZED DAMPERS FOR CONTROL OPERATION (GENERATOR ROOM)
 - .1 REFER TO DRAWING M1.
- .2 WALL MOUNTED EXHAUST FAN (ELECTRICAL/EQUIPMENT ROOM)
 - .1 IN FAILURE OF HEAT PUMP UNITS AND SPACE THERMOSTAT CALLS FOR COOLING, MOTORIZED DAMPER ASSOACITED TO EXHAUST FAN 100% OPEN, EXHAUST FAN "ON", INTAKE AIR DAMPER 100% OPEN. BOTH DAMPERS ARE CLOSED AND EXHAUST FAN "OFF" WHEN THERMOSTAT REACH TEMPERATURE SET-POINT.
 - .2 EXHAUST FAN "OFF AND BOTH DAMPERS IN CLOSE POSITION WHEN HEAT PUMP UNITS ARE IN OPERATION.


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ST. LAWRENCE**

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260000 GENERAL

- PERFORM DETAILED VERIFICATION OF WORK PRIOR TO ORDERING THE ELECTRICAL EQUIPMENT AND COMMENCING CONSTRUCTION. VERIFY EQUIPMENT DIMENSIONS WITH THE VENDOR AND ENSURE THE EQUIPMENT WILL FIT IN THE AVAILABLE SPACE. ISSUE A WRITTEN NOTICE TO THE ENGINEER OF ANY DISCREPANCIES.
- SUBMIT SHOP DRAWINGS, PRODUCT DATA AND SAMPLES IN ACCORDANCE WITH SPECIFICATIONS. INDICATE DETAILS OF CONSTRUCTION, DIMENSIONS, CAPACITIES, WEIGHTS AND ELECTRICAL PERFORMANCE CHARACTERISTICS OF EQUIPMENT OR MATERIAL. WHERE APPLICABLE INCLUDE WIRING AND SINGLE LINE DIAGRAMS. ADVERTISING OR SALES LITERATURE WILL NOT BE ACCEPTABLE AS SHOP DRAWINGS.
- PROVIDE ALL LABOR, MATERIAL, EQUIPMENT, INSURANCE AND SERVICES TO COMPLETE ELECTRICAL INSTALLATION IN THE TELECOM EQUIPMENT BUILDING IN ACCORDANCE WITH THE DESIGN AND SPECIFICATIONS AND PRESENT IT AS FULLY OPERATIONAL TO THE SATISFACTION OF THE OWNER.
- CARRY OUT WORK IN ACCORDANCE WITH ALL APPLICABLE CODES STANDARDS, ORDINANCES AND HEALTH & SAFETY RULES.
- COORDINATE THE WORK PERTAINING TO POWER, GROUNDING AND COMMUNICATIONS FOR EQUIPMENT WITH SUPPLIER PRIOR TO ROUGH-IN. FINAL TERMINATIONS TO BE AT THE DIRECTION OF THE EQUIPMENT SUPPLIER.
- PROVIDE ALL CUTTING AND PATCHING NECESSARY FOR THE INSTALLATION OF THE ELECTRICAL WORK. ANY DAMAGE DONE TO THE WORK ALREADY IN PLACE BY REASON OF THIS WORK SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE BY A QUALIFIED TRADESPERSON EXPERIENCED IN SUCH WORK. PATCHING SHALL BE UNIFORM IN APPEARANCE AND SHALL MATCH THE SURROUNDING SURFACE. DO NOT CUT STRUCTURAL MEMBERS WITHOUT APPROVAL OF THE STRUCTURAL ENGINEER.
- FABRICATION AND INSTALLATION OF THE COMPLETE ELECTRICAL SYSTEM SHALL BE DONE IN A FIRST CLASS WORKMANSHIP BY QUALIFIED PERSONNEL EXPERIENCED IN SUCH WORK AND SHALL SCHEDULE THE WORK IN AN ORDERLY MANNER SO AS NOT TO IMPEDE PROGRESS OF THE PROJECT.
- AT THE COMPLETION OF THE ELECTRICAL INSTALLATION PROVIDE THREE SETS OF OPERATION AND MAINTENANCE MANUALS, BOUND IN 3-RING HARD COVER BINDERS, DULY LABELED, AND CONTAINING COMPLETE LIST OF REPLACEMENT PARTS, SHOP DRAWINGS AND CATALOG INFORMATION OF ALL MAJOR EQUIPMENT, SUCH AS, DISTRIBUTION BOARD, GENERATOR, ATS, LUMINARIES, PANEL BOARD, PANEL SCHEDULE, MOTOR STARTERS, SECURITY SYSTEM, CABLE RACKS, ETC.
- COMPLETE INSTALLATION SHALL BE GUARANTEED FOR A PERIOD OF ONE (1) YEAR AFTER THE DATE OF WRITTEN ACCEPTANCE OF THE EQUIPMENT BUILDING BY OWNER. ANY WORK, MATERIAL OR EQUIPMENT FOUND TO BE FAULTY DURING THAT PERIOD SHALL BE CORRECTED AT ONCE, UPON WRITTEN NOTIFICATION, AT THE EXPENSE OF THE CONTRACTOR.

260500 BASIC MATERIALS AND METHODS

- INSTALLATION, MATERIALS, EQUIPMENT AND WORKMANSHIP SHALL CONFORM TO THE APPLICABLE PROVISIONS OF THE LOCAL ELECTRICAL CODE AND THE TERMS, CONDITIONS AND REGULATIONS OF THE AUTHORITY HAVING LAWFUL JURISDICTION PERTAINING TO THE WORK REQUIRED. ALL MATERIAL, EQUIPMENT AND DEVICES SHALL CONFORM TO THE APPLICABLE CSA AND ULC STANDARDS.
- ALL MATERIALS AND EQUIPMENT SHALL BE NEW. MATERIALS AND EQUIPMENT SHALL BE THE STANDARD PRODUCTS OF MANUFACTURER'S CURRENT DESIGN. ANY FIRST-CLASS PRODUCT MADE BY A REPUTABLE MANUFACTURER MAY BE USED PROVIDING IT CONFORMS TO THE DESIGN REQUIREMENTS AND MEETS THE APPROVAL OF THE ENGINEER AND THE OWNER. APPROVALS SHALL BE OBTAINED PRIOR TO PURCHASE.
- ARRANGE CONDUIT, WIRING, EQUIPMENT, AND OTHER WORK GENERALLY AS SHOWN, PROVIDING PROPER CLEARANCES AND ACCESS. CAREFULLY EXAMINE ALL CONTRACT DRAWINGS AND FIT THE WORK IN EACH LOCATION WITHOUT SUBSTANTIAL ALTERATION. WHERE DEPARTURES ARE PROPOSED BECAUSE OF FIELD CONDITIONS OR OTHER CAUSES, PREPARE AND SUBMIT DETAILED DRAWINGS FOR ACCEPTANCE. THE RIGHT IS RESERVED TO MAKE REASONABLE CHANGES IN LOCATION OF EQUIPMENT, CONDUIT, AND WIRING UP TO THE TIME OF ROUGH-IN OR FABRICATION.
- THE CONTRACT DRAWINGS ARE GENERALLY DIAGRAMMATIC AND ALL OFFSETS, BENDS, FITTINGS AND ACCESSORIES ARE NOT NECESSARILY SHOWN. PROVIDE ALL SUCH ITEMS AS MAY BE REQUIRED TO FIT THE WORK TO THE CONDITIONS.
- MOUNTING HEIGHTS OF ALL WIRING DEVICES SHALL BE VERIFIED WITH THE OWNER PRIOR TO INSTALLATION.

260510 IDENTIFICATION

- ALL EQUIPMENT SHALL BE IDENTIFIED USING NAMEPLATES AND LABELS.
- NAMEPLATES SHALL BE 1/8" (3mm) THICK PLASTIC ENGRAVING SHEET, WHITE FACE, BLACK CORE, ENGRAVED WITH EQUIPMENT IDENTIFICATION AND ATTACHED TO EQUIPMENT WITH SELF-TAPPING SCREWS. CHEMICAL ADHESION PLATES ARE NOT ACCEPTABLE. LETTERS SHALL BE MINIMUM 1/4" (6mm) HIGH.
- LABELS SHALL BE EMBOSSED PLASTIC WITH MINIMUM 1/4" (6mm) HIGH LETTERS. LABELS SHALL BE USED FOR IDENTIFYING CONDUIT, CABLES, JUNCTION BOXES, RECEPTACLES, ETC.
- WORDING ON NAMEPLATES AND LABELS MUST BE APPROVED BY THE ENGINEER PRIOR TO MANUFACTURING.

260520 CONDUCTORS AND CONNECTORS

- UNLESS NOTED OTHERWISE, ALL CONDUCTORS SHALL BE COPPER, MINIMUM SIZE #12 AWG, WITH THERMOPLASTIC OR CROSS-LINKED POLYETHYLENE INSULATION CONFORMING TO THE APPLICABLE LOCAL ELECTRICAL CODE. INSULATION SHALL BE RATED FOR 90°C. CONDUCTORS SHALL BE COLOR CODED IN ACCORDANCE WITH THE LOCAL ELECTRICAL CODE.
- UNLESS NOTED OTHERWISE, ALL CONDUCTORS USED FOR GROUNDING SHALL BE COPPER AND SHALL HAVE GREEN INSULATION.
- FOR COPPER CONDUCTORS #6 AWG AND SMALLER USE 3M SCOTCH-LOK OR T&B STA-KON COMPRESSION TYPE CONNECTORS WITH INTEGRAL OR SEPARATE INSULATION CAPS. FOR COPPER CONDUCTORS LARGER THAN #6 AWG USE SOLDERLESS, IDENT HEX SCREW OR BOLT TYPE PRESSURE CONNECTORS OR DOUBLE COMPRESSION C-CLAMP CONNECTORS, UNLESS SPECIFIED OTHERWISE ON DRAWINGS.
- UNLESS NOTED OTHERWISE, ALL LUGS SHALL BE TIN PLATED COPPER, TWO-HOLE, LONG BARREL, COMPRESSION TYPE.
- CONDUCTOR LENGTHS SHALL BE CONTINUOUS FROM TERMINATION TO TERMINATION WITHOUT SPLICES. SPLICES ARE NOT ACCEPTABLE. IF SPLICES ARE UNAVOIDABLE PRIOR APPROVAL FROM THE ENGINEER MUST BE OBTAINED.

262823 SAFETY SWITCHES AND PROTECTIVE DEVICES

- ENCLOSED, NON-FUSIBLE AND FUSIBLE SAFETY (DISCONNECT) SWITCHES SHALL BE CSA APPROVED, SIZED AS INDICATED ON DRAWINGS.
- UNLESS NOTED OTHERWISE, PROVIDE CLASS J TIME DELAY FUSES FOR MAIN FEEDERS; CLASS RK1 TIME DELAY FUSES FOR MOTOR CIRCUITS AND CLASS RK5 NON-TIME-DELAY FOR OTHER BRANCH CIRCUITS.
- PROVIDE TWO (2) SETS OF SPARE FUSES AND A FUSE CABINET FOR EACH LOCATION WHERE FUSES ARE INSTALLED.
- PROVIDE MOLDED CASE, BOLT-ON TYPE, AND THERMAL MAGNETIC TRIP CIRCUIT BREAKERS AS SHOWN AND AS REQUIRED FOR THIS PROJECT. MULTIPLE POLE BREAKERS SHALL BE SINGLE HANDLE, COMMON TRIP. PROVIDE HANDLE LOCKING DEVICES WHERE INDICATED. INTERRUPTING RATING TO MATCH REQUIRED AVAILABLE FAULT CURRENTS.

260534 RACEWAYS, CABLE RACKS AND BOXES

- ALL CONDUIT SHALL BE CSA APPROVED AND ULC LABELED.
- UNLESS NOTED OTHERWISE, CONDUIT INSTALLED ON THE EXTERIOR OF THE EQUIPMENT BUILDING IS PERMITTED TO BE RIGID PVC. CONDUIT INSIDE THE BUILDING IN AREAS WHERE SAFE FROM MECHANICAL DAMAGE SHALL BE EMT. CONDUIT IN AREAS OF RISK OF PHYSICAL DAMAGE SHALL BE RIGID STEEL.
- ALL EMPTY CONDUIT INSTALLED FOR FUTURE INSTALLATION OF WIRES AND CABLES SHALL HAVE A PULL CORD. PULL CORD SHALL BE LABELED AT BOTH ENDS FOR EASY IDENTIFICATION.
- ENCLOSURES AND CABINETS SHALL BE MADE OF STEEL BOX WITH REMOVABLE INTERIOR PANEL AND HINGED FRONT COVER, FINISHED INSIDE AND OUT WITH MANUFACTURER'S STANDARD ENAMEL. DOOR SHALL BE EQUIPPED WITH FLUSH LATCH AND CONCEALED HINGE. MANUFACTURERS: HOFFMANN, O-2/GEDNEY, T&B OR APPROVED EQUAL.

262400 SERVICE AND DISTRIBUTION

- VERIFY ALL DIMENSIONS AND CLEARANCES BY FIELD MEASUREMENTS BEFORE INSTALLATION.
- BRANCH CIRCUIT PANELBOARDS SHALL BE OF THE TYPE AND RATINGS AS SHOWN ON DRAWINGS.

263214 EMERGENCY POWER SYSTEM

- OWNER SUPPLIED WITH CONNECTIONS (HVAC/ELEC) AS PART OF THIS CONTRACT.

260528 GROUNDING

- ALL SAFETY GROUNDING OF THE ELECTRICAL EQUIPMENT SHALL BE CARRIED OUT IN ACCORDANCE WITH THE LATEST EDITION OF THE LOCAL ELECTRICAL CODE.
- ALL LIGHTNING PROTECTION SYSTEM GROUNDING SHALL BE CARRIED OUT IN ACCORDANCE WITH THE LATEST ISSUE OF CAN/CSA – B72.
- DC OR REFERENCE GROUNDING SHALL BE DONE IN ACCORDANCE WITH DC PLANT MANUFACTURER'S GROUNDING STANDARDS AND AS REQUIRED BY THE OWNER.
- MAINTAIN OWNER'S INSTRUCTIONS FOR ALL GROUNDING RELATED REQUIREMENTS.
- ALL INTERIOR GROUNDING AND BONDING CONDUCTORS SHALL BE CONNECTED USING HEAVY-DUTY COMPRESSION FITTINGS. MECHANICAL OR SOLDER TYPE CONNECTIONS ARE NOT PERMITTED.
- ALL GROUND BARS SHALL BE AS SHOWN ON THE DRAWINGS.
- IN ORDER TO MITIGATE HIGH FREQUENCY NOISE EFFECTIVELY THE GROUNDING CONDUCTORS SHALL BE RUN AS STRAIGHT AS POSSIBLE WITH MINIMUM NUMBER OF DIRECTION CHANGES. SHARP 90° BENDS OR KINKS ARE NOT PERMITTED. WHEN THE DIRECTION OF THE CONDUCTOR MUST CHANGE, IT SHALL BE DONE GRADUALLY. MINIMUM BENDING RADIUS OF GROUNDING CONDUCTORS OTHER THAN THE ELECTRICAL SAFETY GROUND CONDUCTORS SHALL BE AS FOLLOWS:

CONDUCTOR SIZE	MINIMUM BENDING RADIUS TO INSIDE EDGE
#12 AWG TO #8 AWG	3" (75mm)
#6 AWG TO #1/0 AWG	6" (150mm)
#2/0 AWG TO 750 KCMIL	12" (300mm)

- ALL GROUND LUG AND COMPRESSION CONNECTIONS SHALL BE COATED WITH ANTI-OXIDANT AGENT, SUCH AS NO-OX, NOALOX, PENETROX OR KOPRSIELD.


266000 TESTING AND COMMISSIONING

- CARRY OUT TESTING AND COMMISSIONING OF ALL MAJOR ELECTRICAL EQUIPMENT SUCH AS DISTRIBUTION BOARDS, GENERATOR, AUTOMATIC TRANSFER SWITCH, MOTOR STARTERS ETC. ENGAGE THE SERVICES OF SUPPLIERS OF EQUIPMENT IN FACILITATING TESTING AND COMMISSIONING.
- COORDINATE ALL TESTING PROCEDURES AND TIMES WITH THE EQUIPMENT SUPPLIER.
- INCLUDE TESTING AND COMMISSIONING REPORTS IN THE OPERATIONS AND MAINTENANCE MANUALS.

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

281300 SECURITY SYSTEM

- SECURITY SYSTEM MANUFACTURER/SUPPLIER IS TO BE SELECTED BY THE OWNER DURING THE COURSE OF THE PROJECT.
- PROVIDE PULL CORD IN ALL EMPTY CONDUIT RUNS. LABEL PULL CORD AT BOTH ENDS FOR EASY IDENTIFICATION.
- OWNER'S SECURITY SYSTEM CONTRACTOR SHALL BE RESPONSIBLE FOR SUPPLY, INSTALLATION, TERMINATION, TESTING AND COMMISSIONING OF THE SECURITY SYSTEM.

 A – INDICATES DETAIL NO.
B – INDICATED SHEET DETAIL IS REQUIRED
C – INDICATES SHEET DETAIL IS DRAWN

2	REVISED	28/10/2020	MH	RB
1	ISSUED FOR CONSTRUCTION	17/06/19	JS	RN
0	ISSUED FOR TENDER	16/08/17	JS	RN
no.	revision	date	by	approved
	revision	date	par	approuve

Project – projet
MCTS EQUIPMENT BLDG
ST. LAWRENCE

Drawing – dessin
ELECTRICAL NOTES

drawn – dessine	J.S.	designed – dessinée par	M.M.
date – date	MAY 2017	checked – vérifié	R.N.
scale – échelle	AS SHOWN	approved for tender – approuvé pour l'offre	R.N.
project no. – projet no.	drawing no. – no du dessin	sheet – feuille	
	01L1402B03016–N3	16 OF 16	



Fisheries and
Oceans Canada

Real Property

Pêches
et Océans

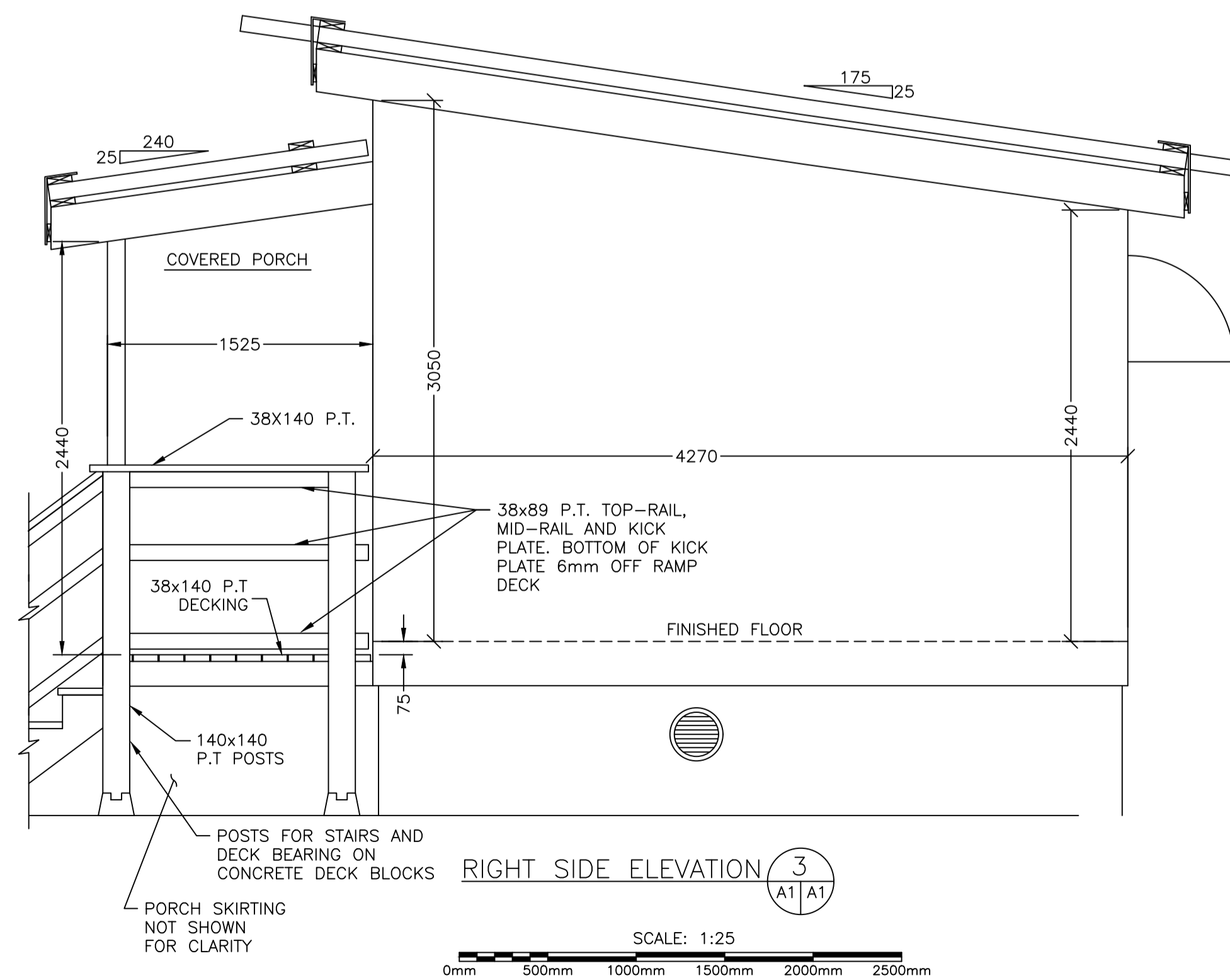
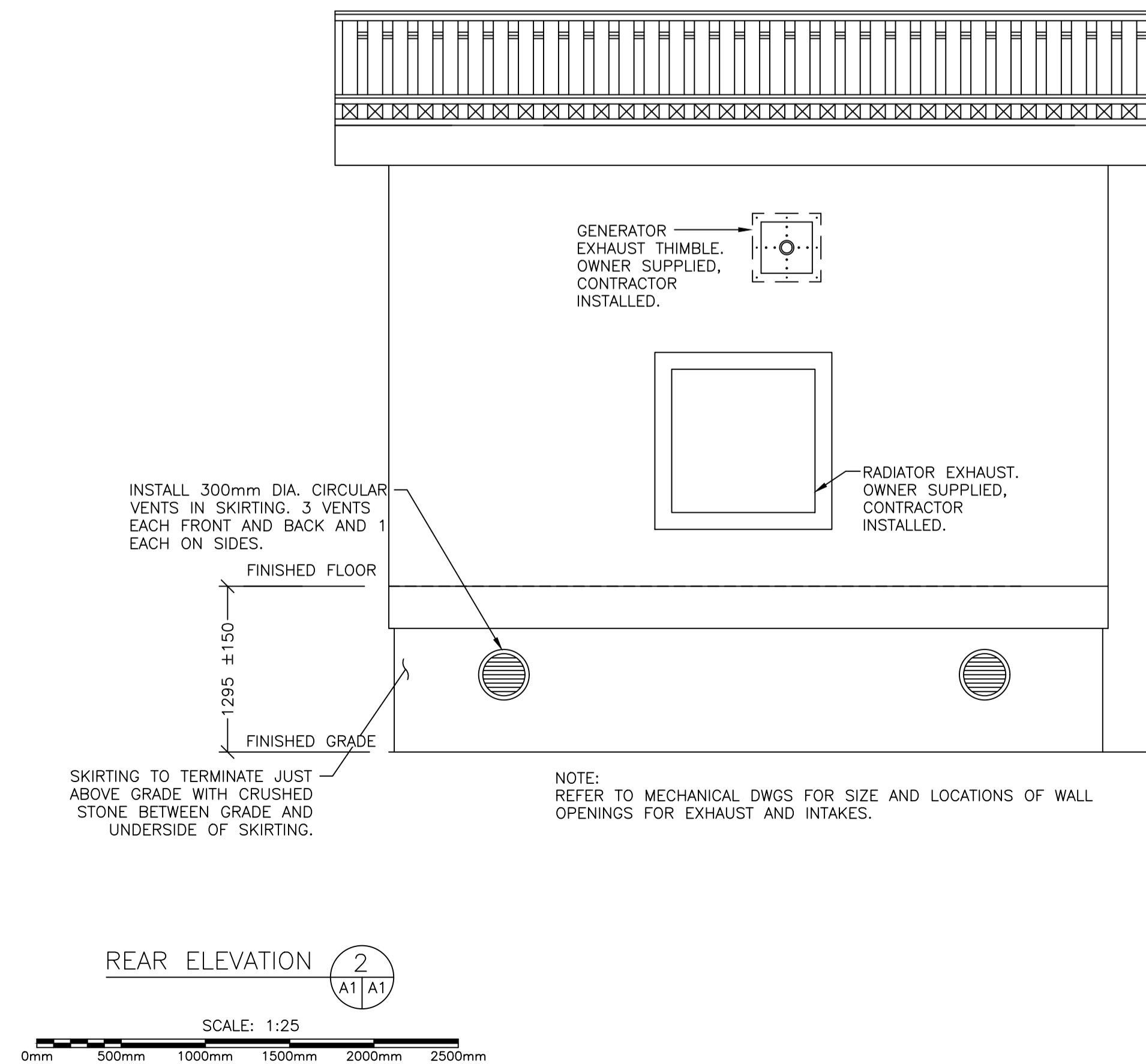
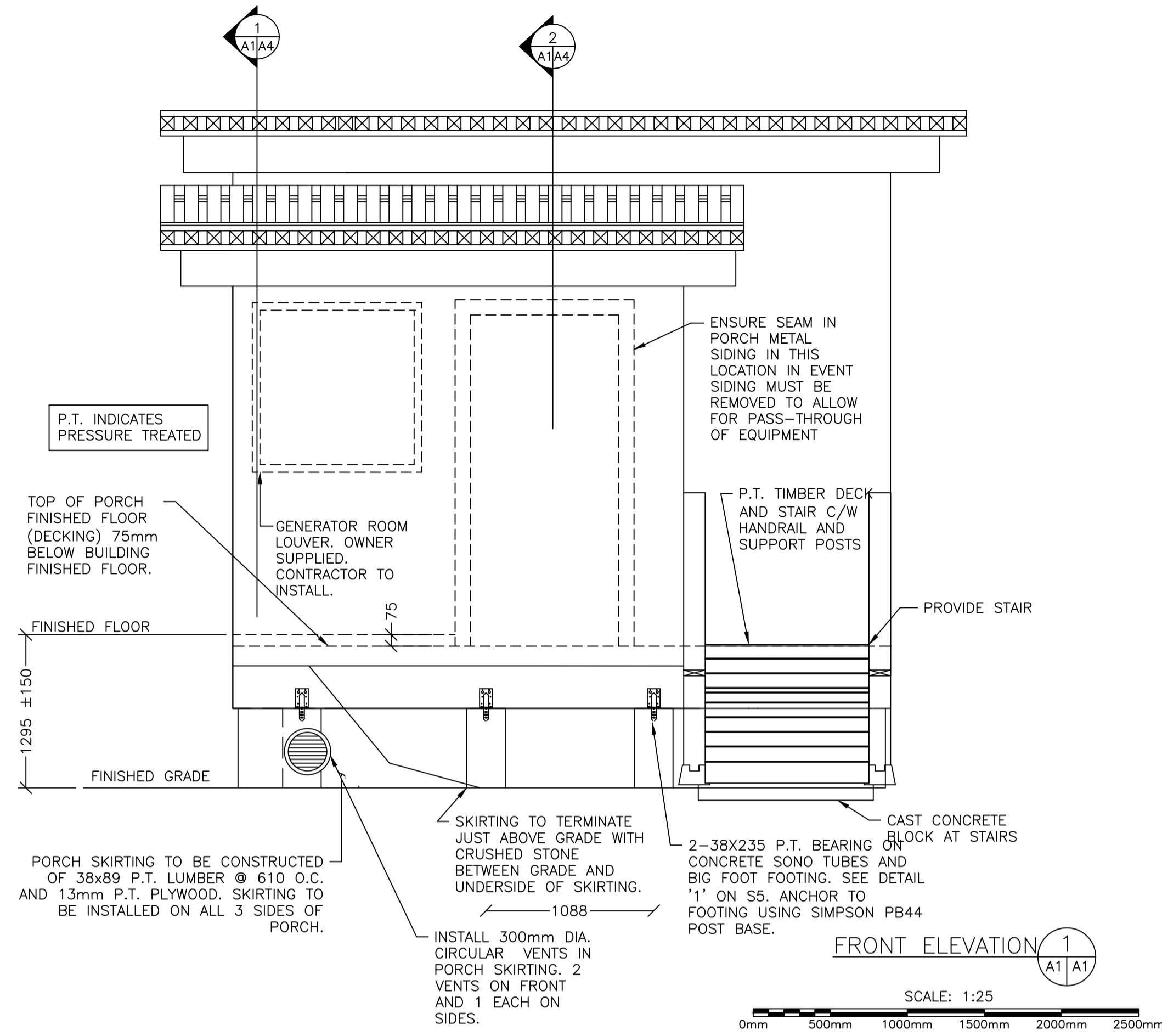
Garde cotiere

P.O. BOX 5667
ST. JOHN'S, NEWFOUNDLAND AND LABRADOR
A1C 5X1

VHF GENERATOR BUILDING — ST. LAWRENCE

DRAWING LIST:

A1	ELEVATIONS
A2	FLOOR, ROOF AND ICE-SHIELD PLANS
A3	SECTIONS AND DETAILS
A4	TYPICAL DETAILS
A5	DOOR SCHEDULE AND DETAILS
S1	FRAMING PLAN, SECTIONS AND DETAILS
S2	FOUNDATION SECTIONS AND DETAILS
M1	VENTILATION SYSTEM PLANS AND DETAILS
M2	MECHANICAL PENETRATIONS
E1	ELECTRICAL LAYOUT AND LEGEND
E2	ELECTRICAL DETAILS
E3	ELECTRICAL DETAILS AND PANEL SCHEDULES
E4	GROUNDING PLAN
N1	ARCHITECTURAL AND STRUCTURAL NOTES
N2	MECHANICAL NOTES
N3	ELECTRICAL NOTES



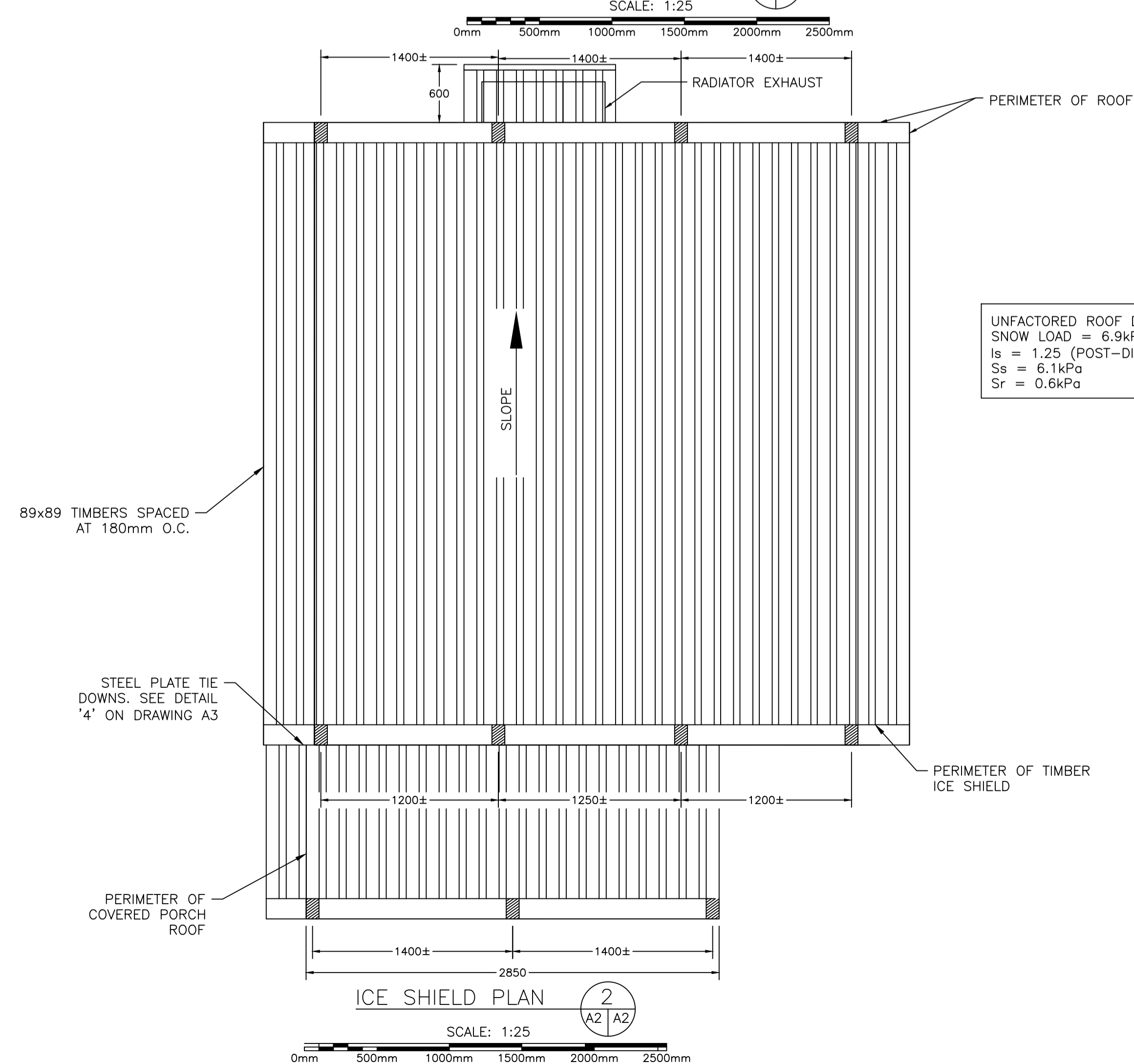
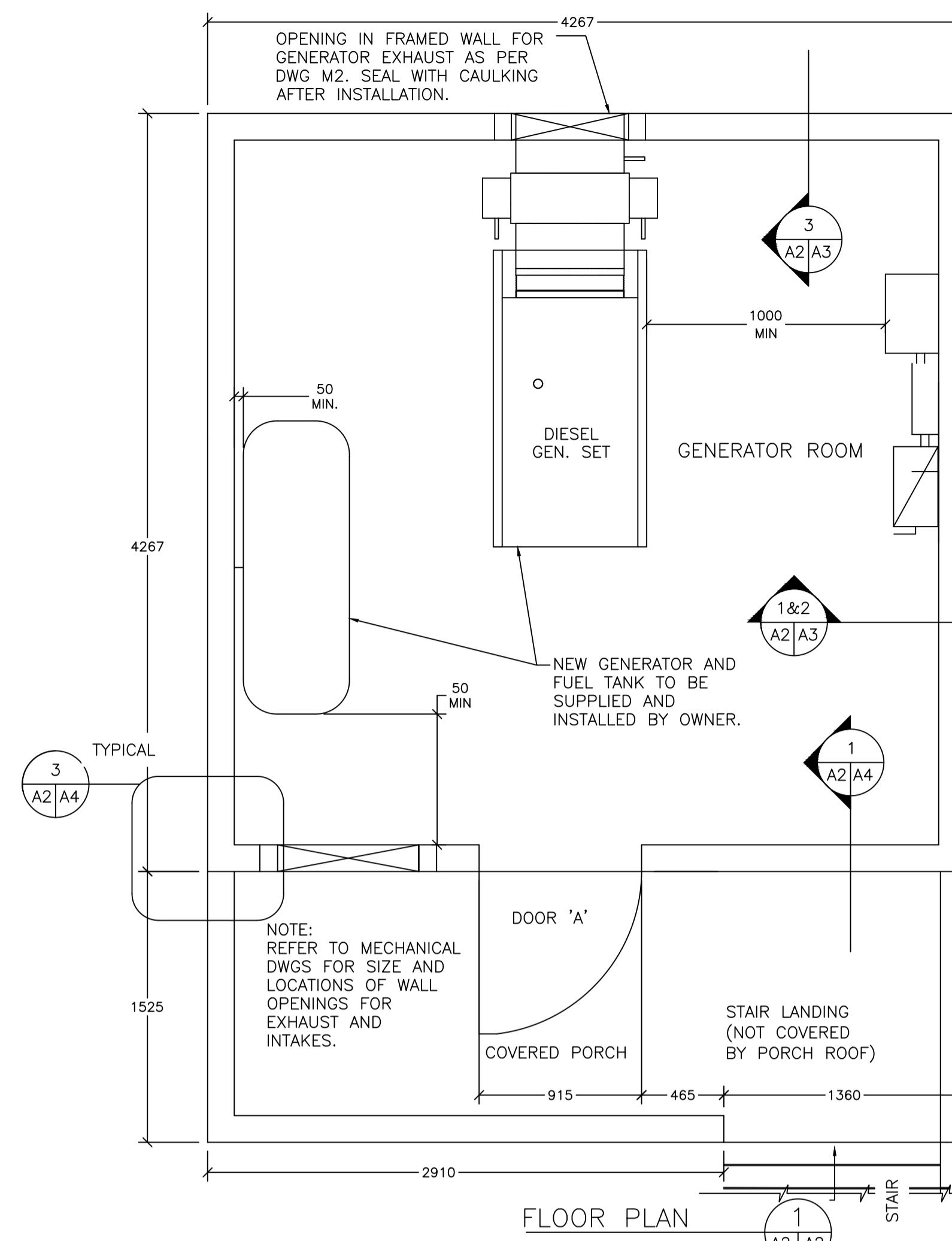
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Project - projet
MCTS GENERATOR BLDG
ST. LAWRENCE

Drawing - dessin
ELEVATIONS

drawn - dessiné	M.G.G.	designed - dessiné par	D.N.
date - date	AUGUST 2020	checked - vérifié	R.N.
scale - échelle	AS SHOWN	approved for tender - approuvé pour l'offre	R.N.
project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
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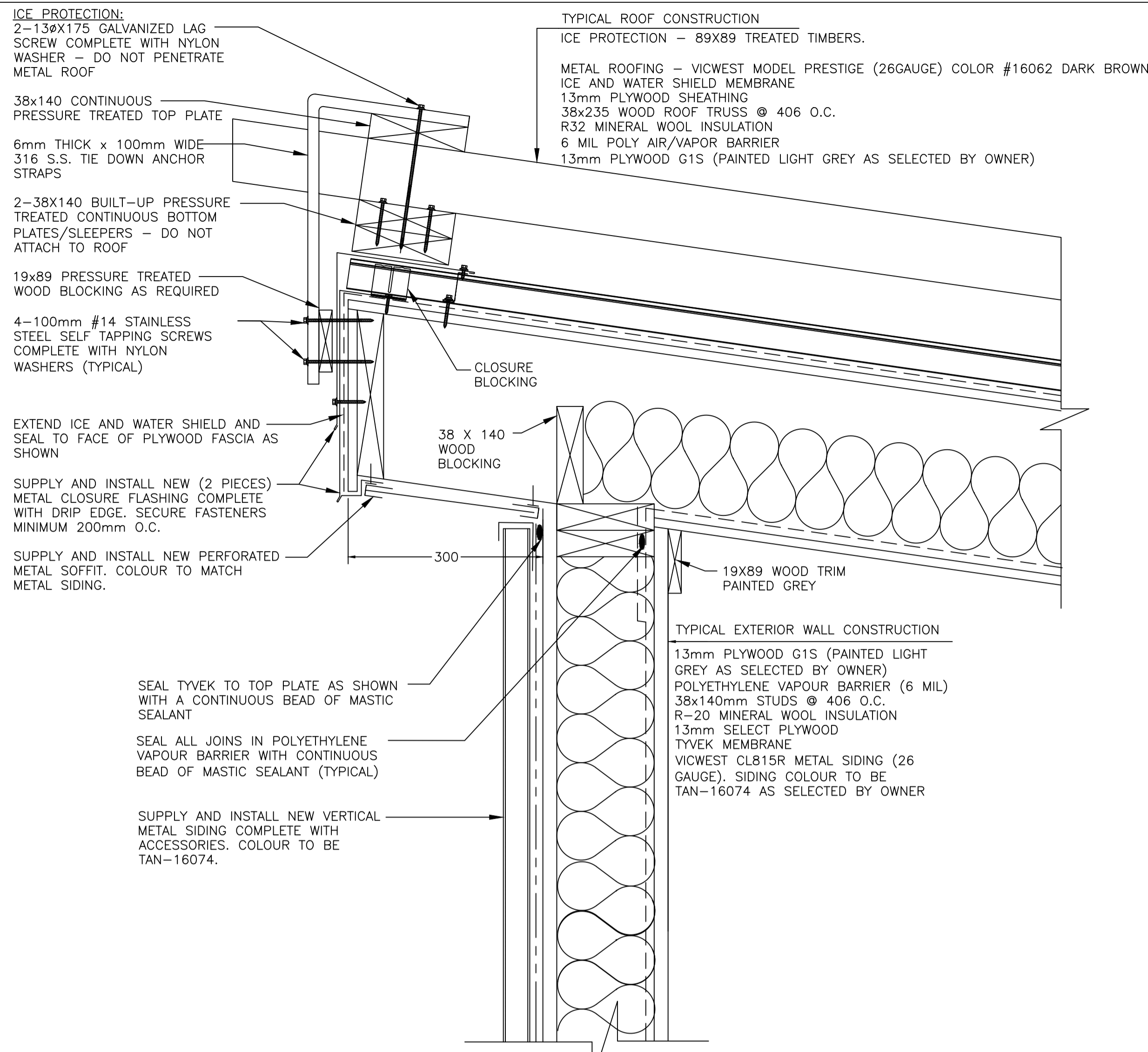
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	revision	date	par	approve

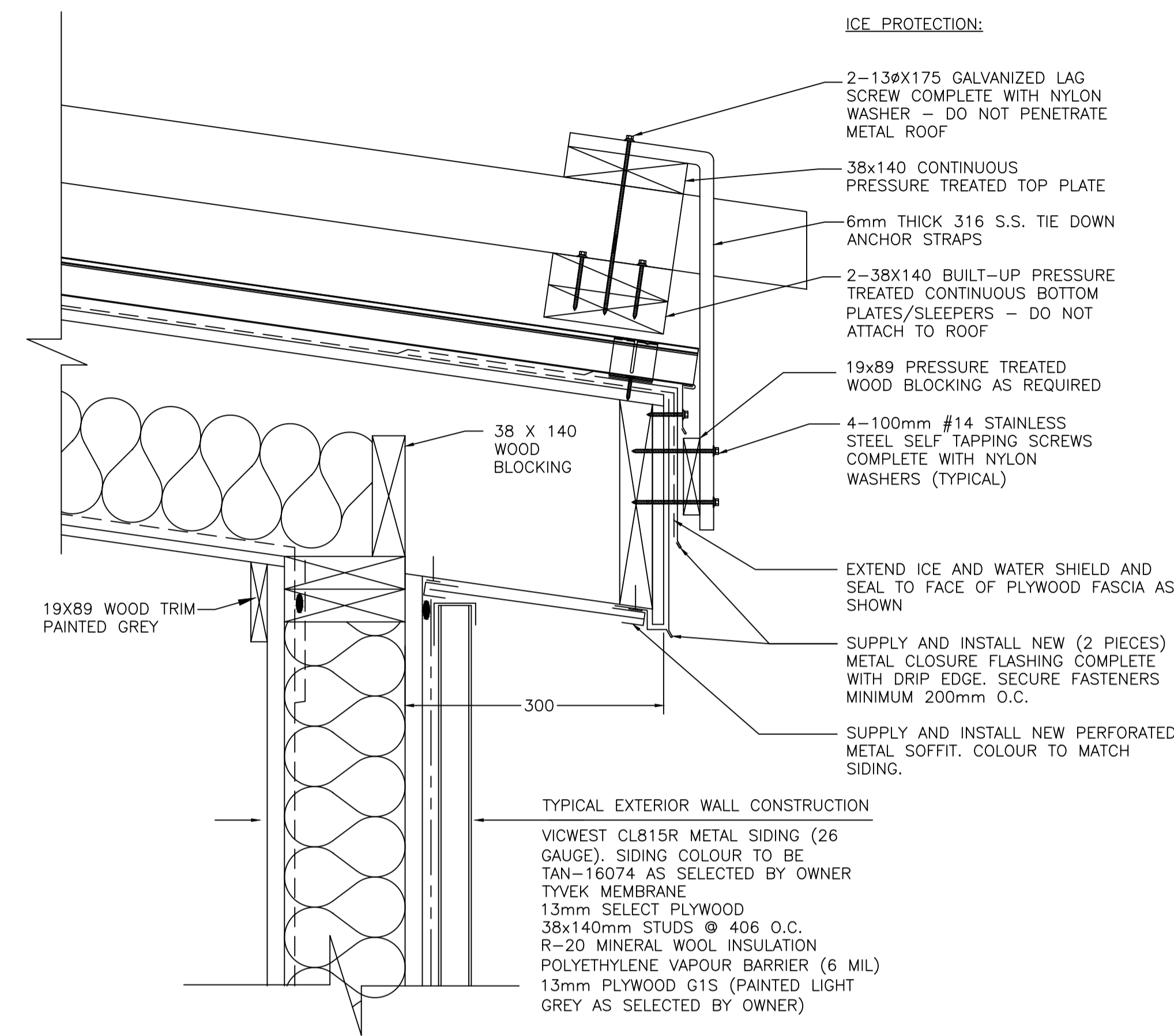
Project - projet
 MCTS GENERATOR BLDG
 ST. LAWRENCE

Drawing - dessin
 FLOOR, ROOF AND
 ICE-SHIELD PLANS

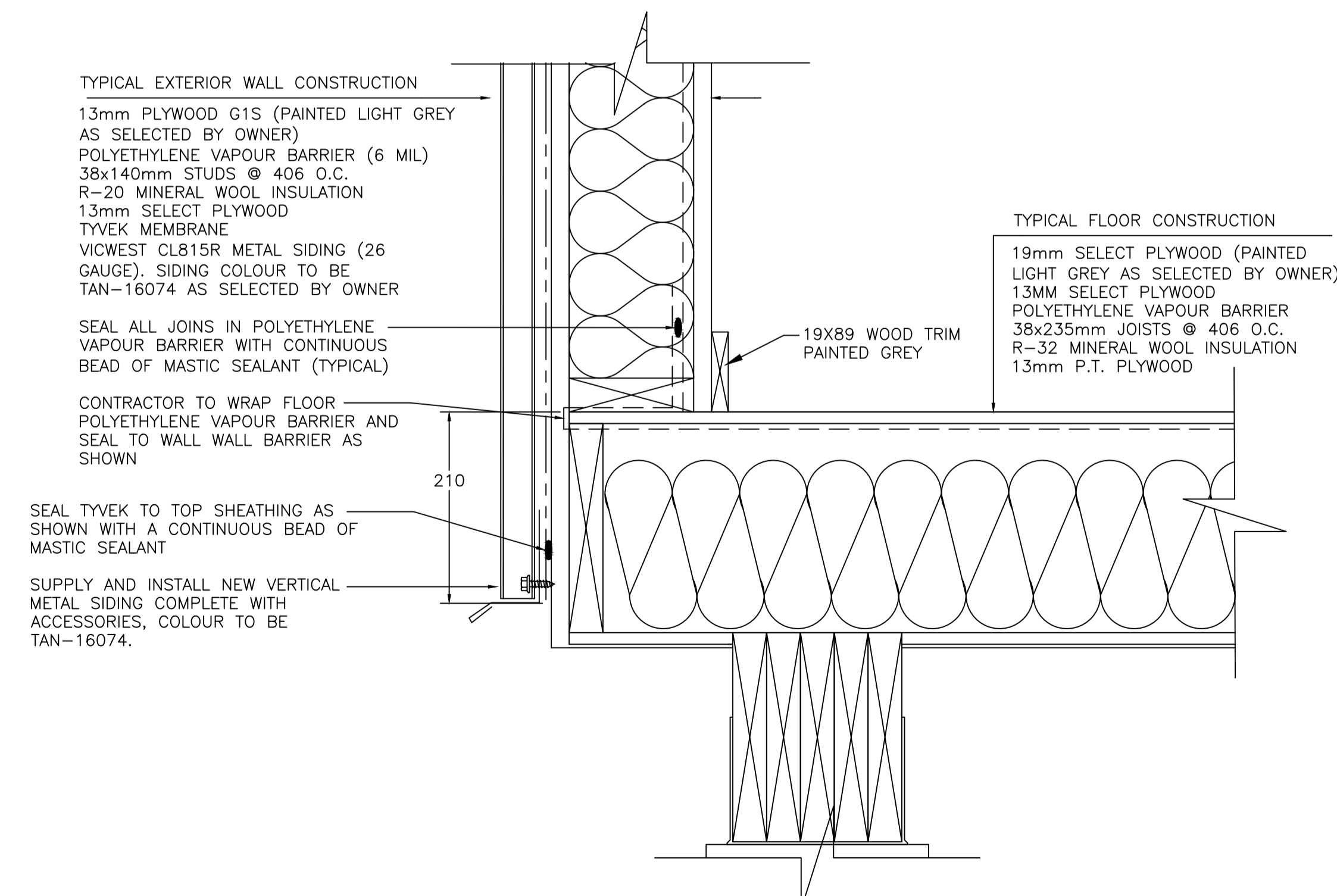
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date - date	AUGUST 2020	checked - verifie	R.N.
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project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
	01L1402B02902-A02	2 OF 16	



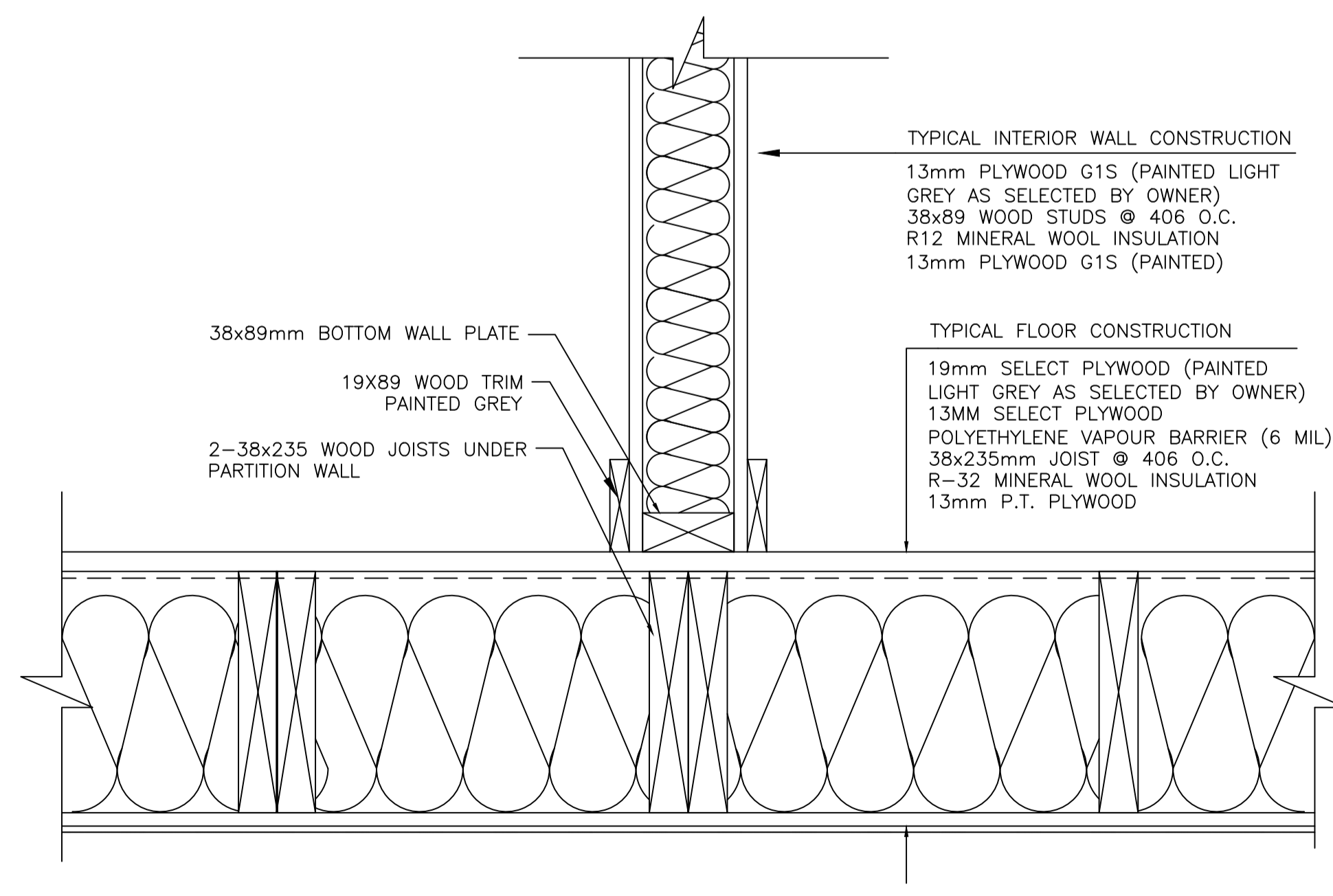
TYPICAL ROOF DETAIL WITH ICE PROTECTION 1
 SCALE: 1:5
 0mm 100mm 200mm 300mm 400mm 500mm



3 TYPICAL ROOF DETAIL WITH ICE PROTECTION
 SCALE: 1:5
 500mm 400mm 300mm 200mm 100mm 0mm



TYPICAL EXTERIOR WALL/FLOOR DETAIL 2
 SCALE: 1:5
 0mm 100mm 200mm 300mm 400mm 500mm



FLOOR/INTERIOR PARTITION WALL DETAIL 4
 SCALE: 1:5
 0mm 100mm 200mm 300mm 400mm 500mm

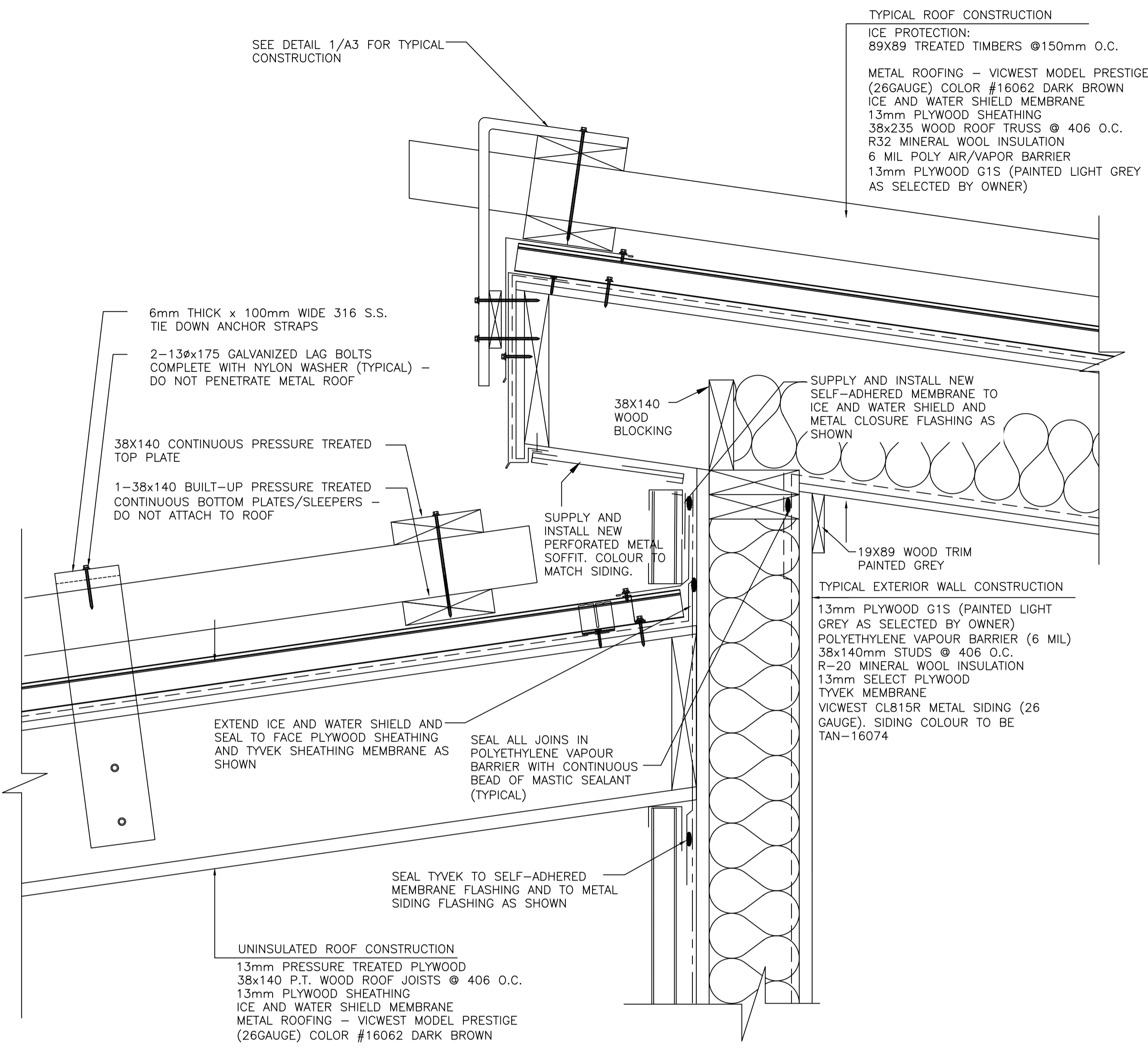
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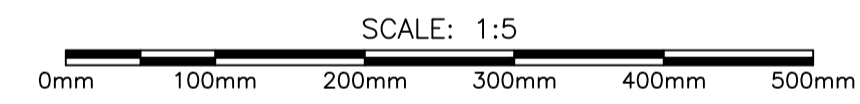
Project - projet
**MCTS GENERATOR BLDG
 ST. LAWRENCE**

Drawing - dessin
SECTIONS AND DETAILS

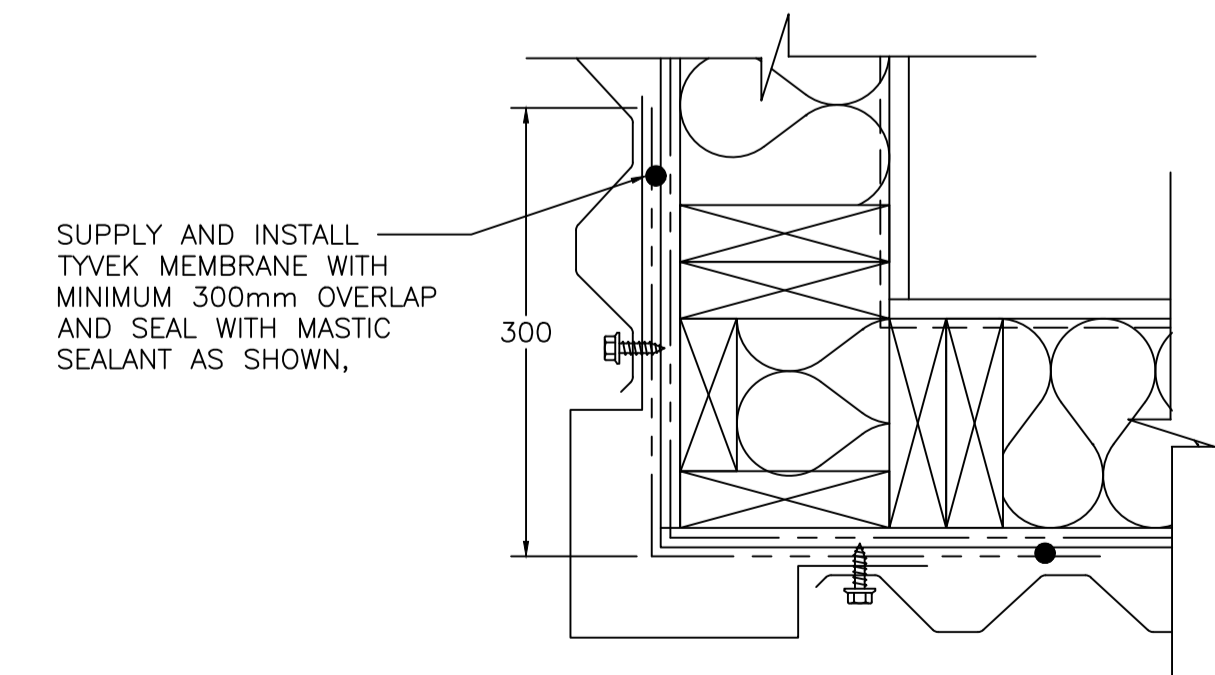
drawn - dessine M.G.G.	designed - dessine par D.N.
date - date AUGUST 2020	checked - verifie R.N.
scale - echelle AS SHOWN	approved for tender - approuve pour l'offre R.N.
project no. - projet no. 01L1402B02903-A03	sheet - feuille 3 OF 16



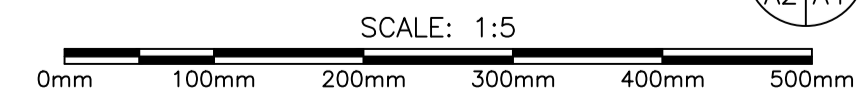
TYPICAL PORCH/TRAILER INTERFACE WITH ICE PROTECTION 1



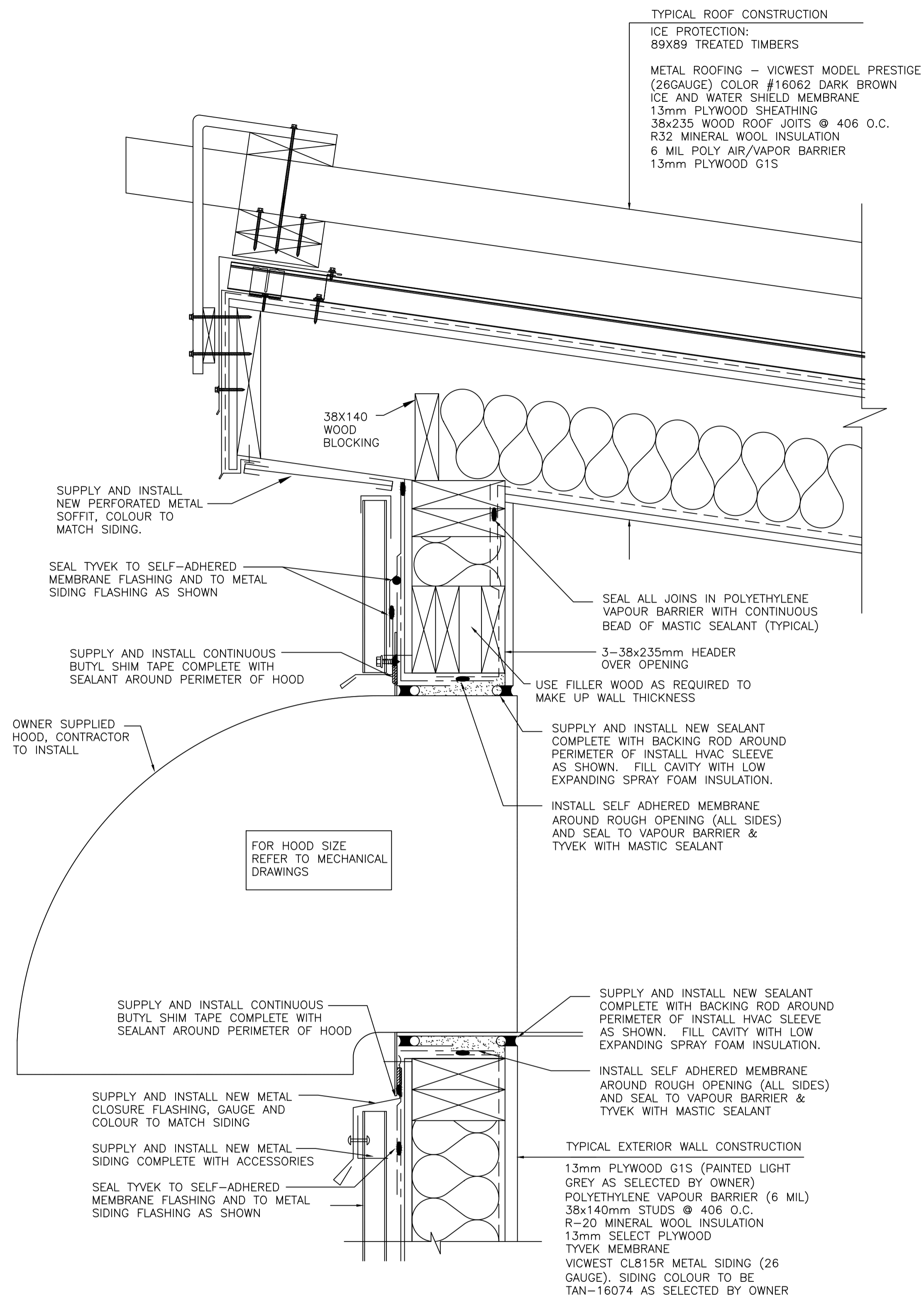
A2/A4



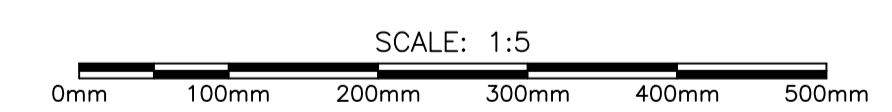
TYPICAL OUTSIDE CORNER DETAIL 3



A2/A4



TYPICAL MECHANICAL OPENING DETAIL 2



A2/A4

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Project – projet

MCTS GENERATOR BLDG
ST. LAWRENCE

Drawing – dessin

TYPICAL DETAILS

drawn – dessiné M.G.G. designed – dessinée par D.N.

date – date AUGUST 2020 checked – vérifié R.N.

scale – échelle AS SHOWN approved for tender – approuvé pour l'offre R.N.

project no. – projet no. drawing no. – no du dessin 01L1402B02904-A04 sheet – feuille 4 OF 16

DOOR FINISH SCHEDULE

REF.	LOCATION AND DESCRIPTION						DOORS				FRAMES			GLAZING			NOTES	HARDWARE										
	DOOR NUMBER	TYPE	WIDTH	HEIGHT	THICKNESS	LABEL (HOURS)	FACE	CORE	FINISH	GRILLE	MATERIAL	PROFILE	ELEVATION	FINISH	DOOR	SIDELIGHT		TRANSOM	BUTTS	PASSAGE LATCH SET	LOCK SET	CLOSER	PUSH / PULL	KICK PLATES	HOLDER STOP	THRESHOLD	WEATHER STRIPPING	DOOR BOTTOM
	A	HM	915	2050	45	0.75	A	PC	PT1	-	PGS	A	A	PT1	-	-	-	•	-	•	•	-	-	-	•	•	•	CRASH STOP, PANIC HARDWARE

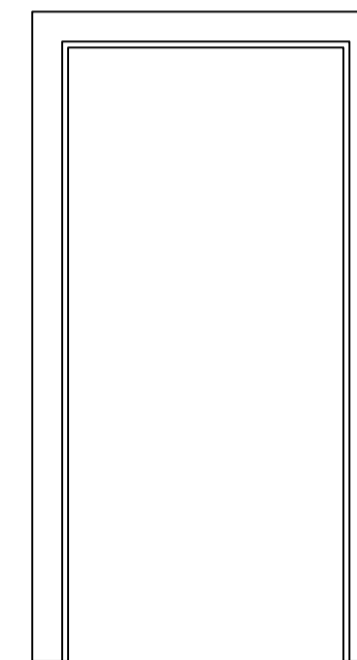
LEGEND

- HC - HONEYCOMB CORE
- PC - POLYSTYRENE CORE
- PGS - PAINTABLE GALVANNEAL STEEL
- HM - HOLLOW METAL
- WD - WOOD
- PT1 - PRIME AND PAINT TWO (2) COATS WITH ALKYD BASED PAINT IN SEMI-GLOSS SHEEN
- PT2 - PRIME AND PAINT TWO (2) COATS LATEX SEMI-GLOSS SHEEN



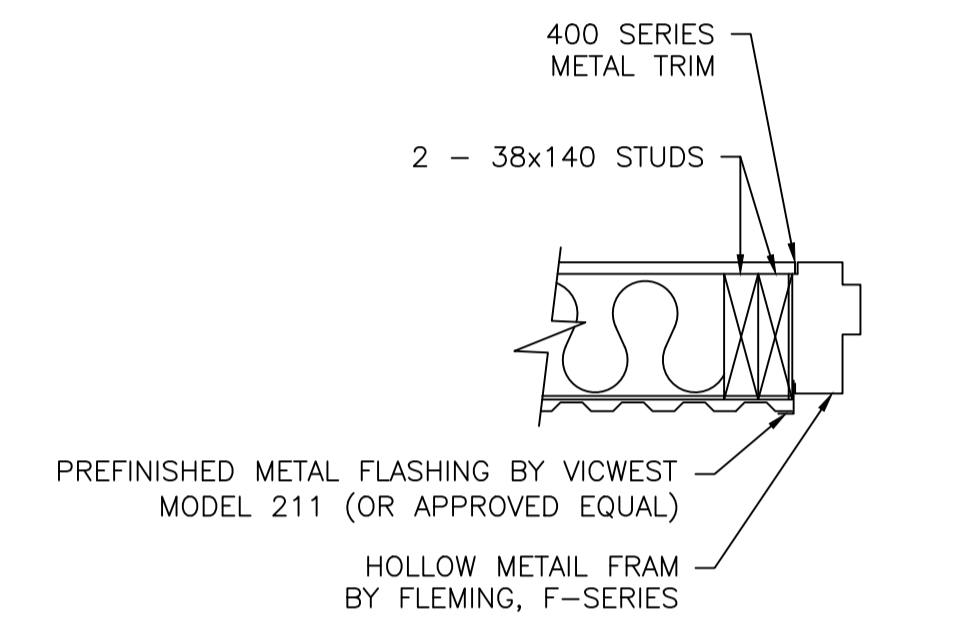
TYPE 'A'

DOOR TYPE DETAIL
NTS



TYPE 'A'

FRAME TYPE DETAIL
NTS



HOLLOW METAL FRAME
DOOR JAMB DETAIL TYPE 'A'
NTS

DOORS/FRAME/HARDWARE/NOTES:

1. ACCEPTABLE MATERIAL:
 - .1 DOOR FRAMES: FLEMING F16 SERIES WELDED FRAME.
 - .2 EXTERIOR DOORS: FLEMING D18 SERIES POLYSTYRENE CORE.
 - .3 HARDWARE (OR APPROVED EQUIVALENT):
LOCKSET: TO BE OWNER SUPPLIED FOLLOWING CONTRACT AWARD.
LATCH GUARD DR385A BY LOCKWOOD INDUSTRIES. LEVER HANDLE/DEADBOLT COMBO.

CLOSER: EN351-UO BY SARGENT
HINGES: MACPRO BY MCKINNEY - MPB91 NRP 114X101 (x6 PER LEAF)

WEATHER-STRIPPING: 303AV (2 X 2134) (1 X WIDTH) BY PEMKO
ADJUSTABLE WEATHER-STRIP ON THREE SIDES MITERED AT CORNERS.
EXTEND WEATHER-STRIPPING TO FLOOR. BUBBLE GASKET SEAL ON THREE SIDES.
DOOR BOTTOM: 345AV 914mm BY PEMKO
THRESHOLD: 185AT BY PEMKO
DOOR CHECK CHAINS: 3561 30-1/2" BY CANAROPA
2. INSTALL LABELED STEEL FIRE RATED DOORS AND FRAMES TO NFPA 80.
3. INSTALL DOORS AND FRAMES PER CSDFMA INSTALLATION GUIDE.
4. SET FRAMES PLUMB, SQUARE, LEVEL AND CORRECT ELEVATION.
5. SECURE ANCHORAGES AND CONNECTIONS TO ADJACENT CONSTRUCTION.
6. BRACE FRAMES RIGIDLY IN POSITION WHILE BUILDING-IN. INSTALL TEMPORARY HORIZONTAL WOOD SPREADER AT THIRD POINTS OF DOOR OPENING TO MAINTAIN FRAME WIDTH. PROVIDE VERTICAL SUPPORT AT CENTRE OF HEAD FOR OPENINGS OVER 1200mm WIDE. REMOVE TEMPORARY SPREADERS AFTER FRAMES ARE BUILT-IN.
7. MAKE ALLOWANCES FOR DEFLECTION OF STRUCTURE TO ENSURE STRUCTURAL LOADS ARE NOT TRANSMITTED TO FRAMES.
8. CAULK PERIMETER OF FRAMES. BETWEEN FRAME AND ADJACENT MATERIAL.
9. MAINTAIN CONTINUITY OF VAPOUR RETARDER.
10. PROVIDE EVEN MARGINS BETWEEN DOORS AND JAMBS AND DOOR FINISHED FLOOR AND THRESHOLDS AS FOLLOWS:
 - .1 HINGES SIDES: 1.0mm
 - .2 LATCHSIDE AND HEAD: 1.5mm
 - .3 FINISHED FLOOR AND THRESHOLDS: 13mm
11. ADJUST OPERABLE PARTS FOR CORRECT FUNCTION.
12. TOUCH UP WITH PRIMER FINISHES DAMAGED DURING INSTALLATION. FOLLOWING COMPLETION OF PRIMER APPLICATION, APPLY TWO (2) COATS OF EXTERIOR FINISH PAINT TO ALL DOOR SURFACES (COLOUR TO MATCH SIDING).
13. FILL EXPOSED FRAME ANCHORS SURFACES WITH IMPERFECTIONS WITH METALLIC PASTE FILLER AND SAND TO A UNIFORM SMOOTH FINISH.
14. INSTALL THREE (3) BUMPERS ON STRIKE JAMB FOR EACH DOOR.



A - INDICATES DETAIL NO.
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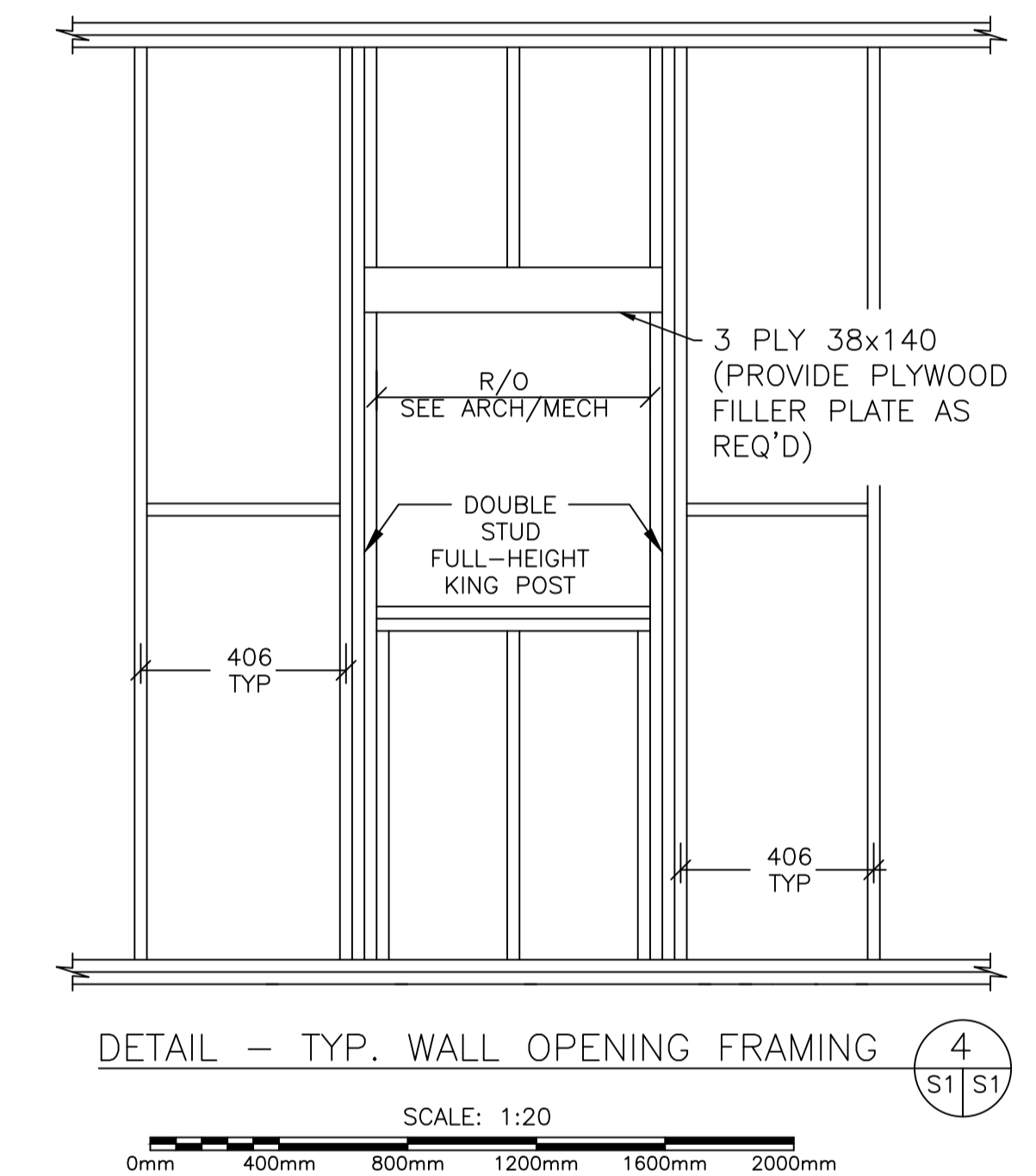
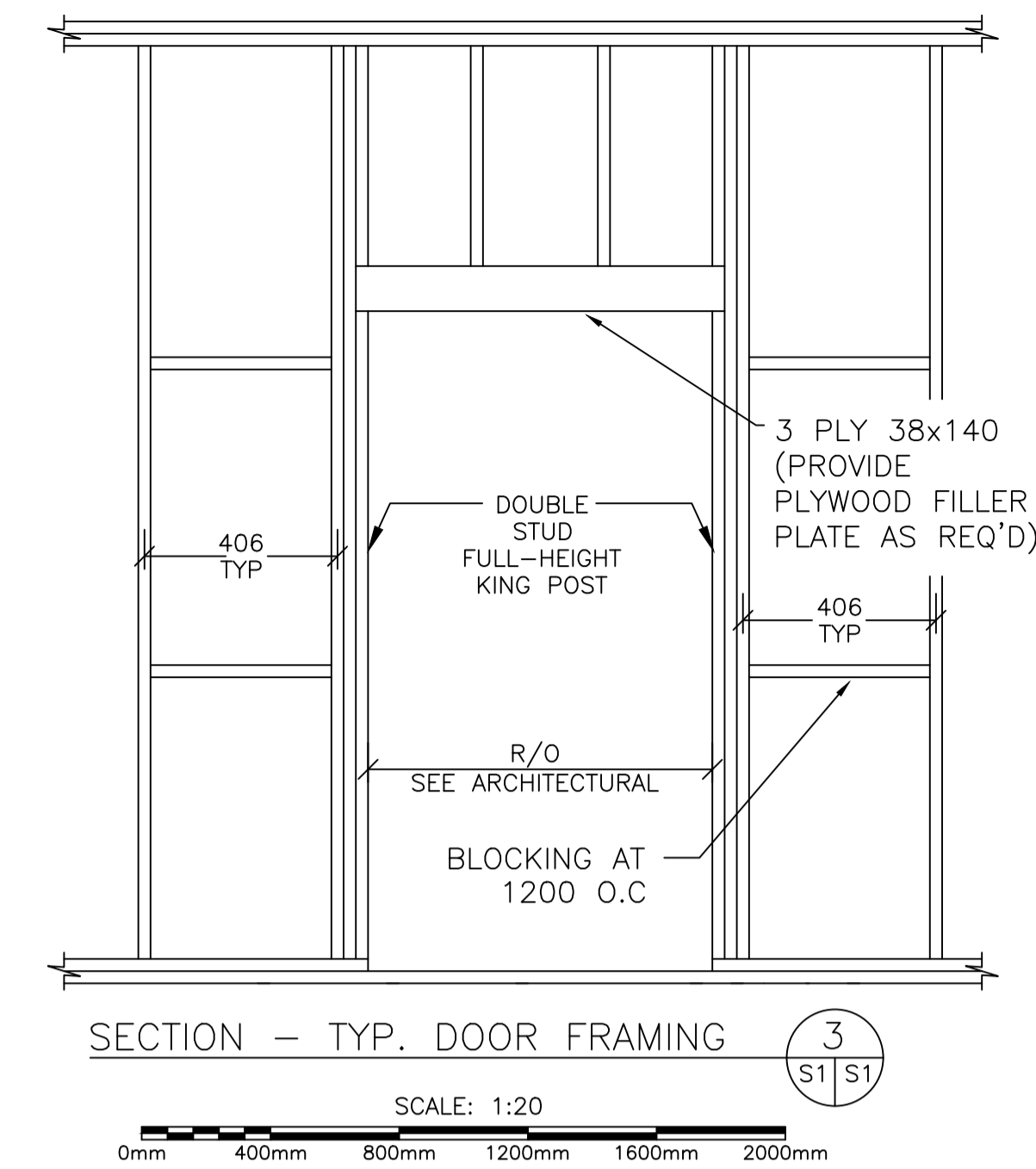
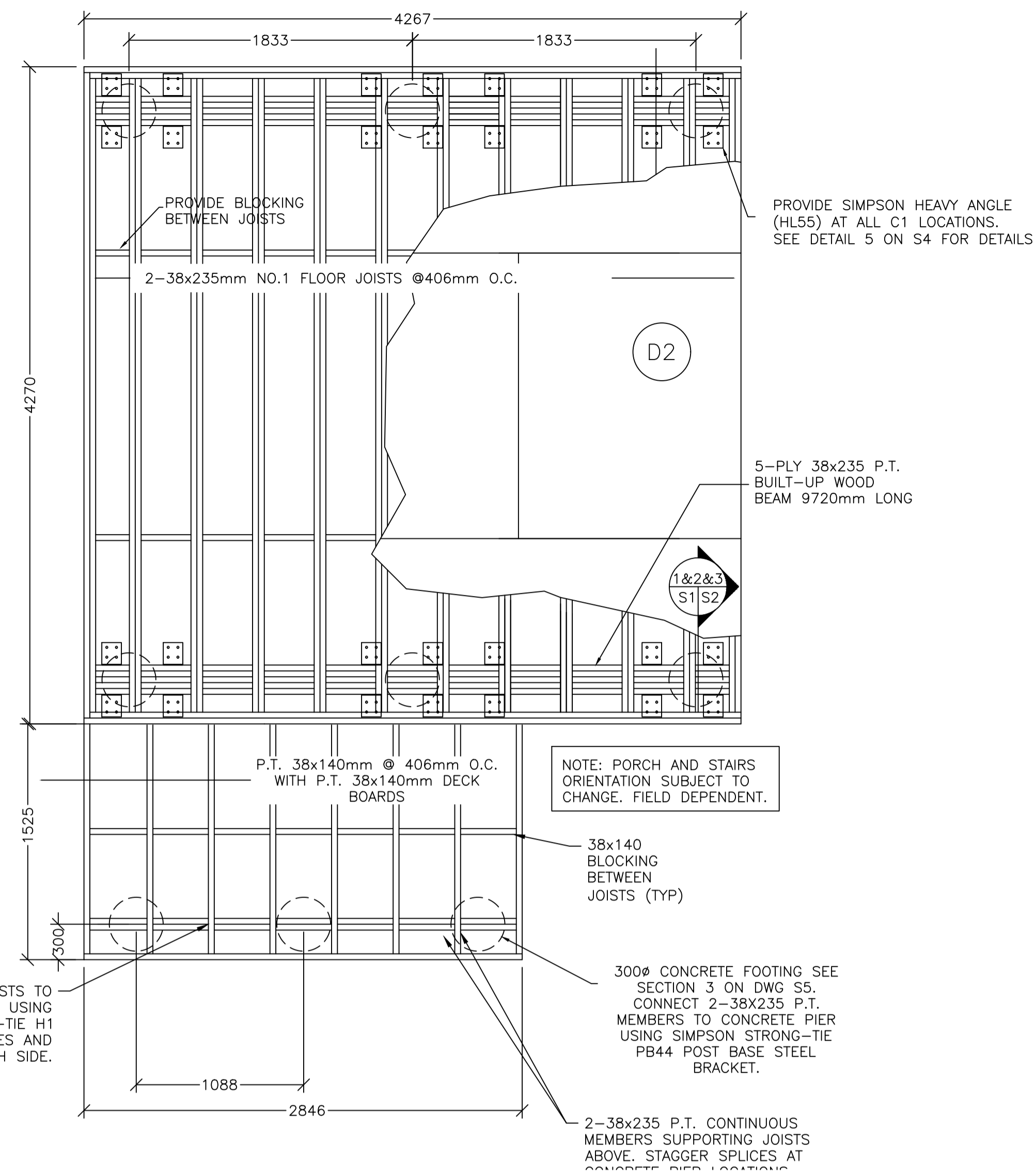
Project - projet

MCTS GENERATOR BLDG
ST. LAWRENCE

Drawing - dessin

DOOR SCHEDULE AND DETAILS

drawn - dessine	M.G.G.	designed - dessinée par	D.N.
date - date	AUGUST 2020	checked - vérifié	R.N.
scale - échelle	AS SHOWN	approved for tender - approuvé pour l'offre	R.N.
project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
	01L1402B02905-A05	5 OF 16	



- STRUCTURAL TIMBER NOTES**
- ALL TIMBER MEMBERS (TRUSSES, JOISTS, GLUE LAMINATED, PLYWOOD, ETC.) TO BE DESIGNED IN ACCORDANCE WITH CSA 086 LATEST EDITION.
 - FABRICATOR SHALL SUBMIT SHOP DRAWINGS STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF NEWFOUNDLAND & LABRADOR PRIOR TO COMMENCEMENT OF FABRICATION.
 - WOOD JOISTS, BEAMS AND STUDS TO BE SPRUCE-PINE-FIR GRADE No.1/No.2
 - ALL SURFACES OF PRESSURE TREATED LUMBER THAT ARE EXPOSED THROUGH FIELD CUTTING, TRIMMING OR BORING MUST BE RE-TREATED WITH A LIBERAL APPLICATION OF PRESERVATIVE BEFORE INSTALLATION. INCISED LUMBER IS NOT PERMITTED.

PLYWOOD DIAPHRAGM SCHEDULE

MARK	DESCRIPTION
D1	16mm PLYWOOD SHEATHING (BLOCKED AT EDGES) NAILED TO FRAMING MEMBERS WITH 64mm NAILS AT 100 O.C. @ PANEL EDGES AND 300 O.C. OVER INTERMEDIATE FRAMING MEMBERS.
D2	19mm/13mm PLYWOOD SHEATHING (BLOCKED AT EDGES) NAILED TO FRAMING MEMBERS WITH 76mm NAILS AT 100 O.C. @ PANEL EDGES AND 300 O.C. OVER INTERMEDIATE FRAMING MEMBERS.

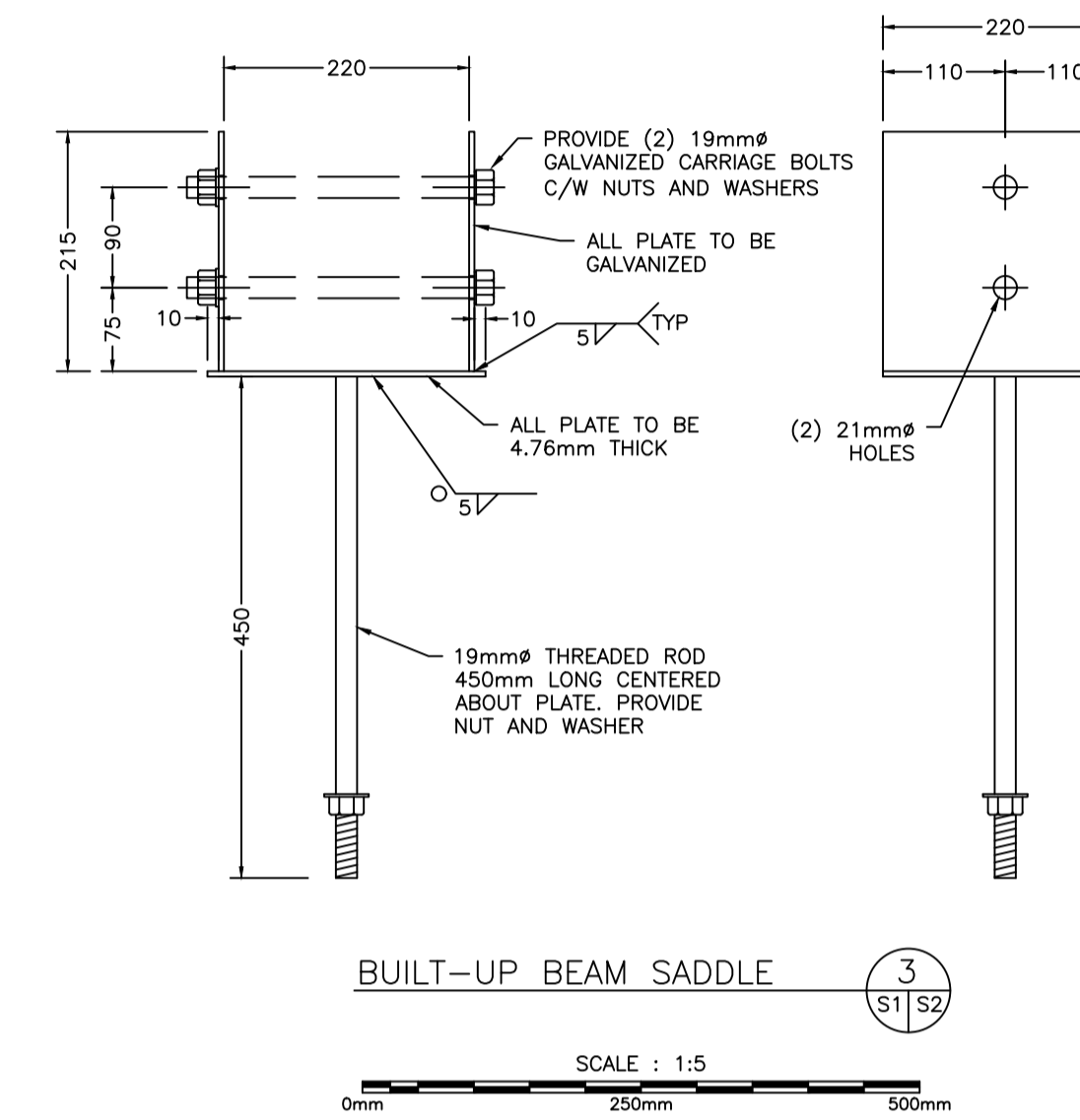
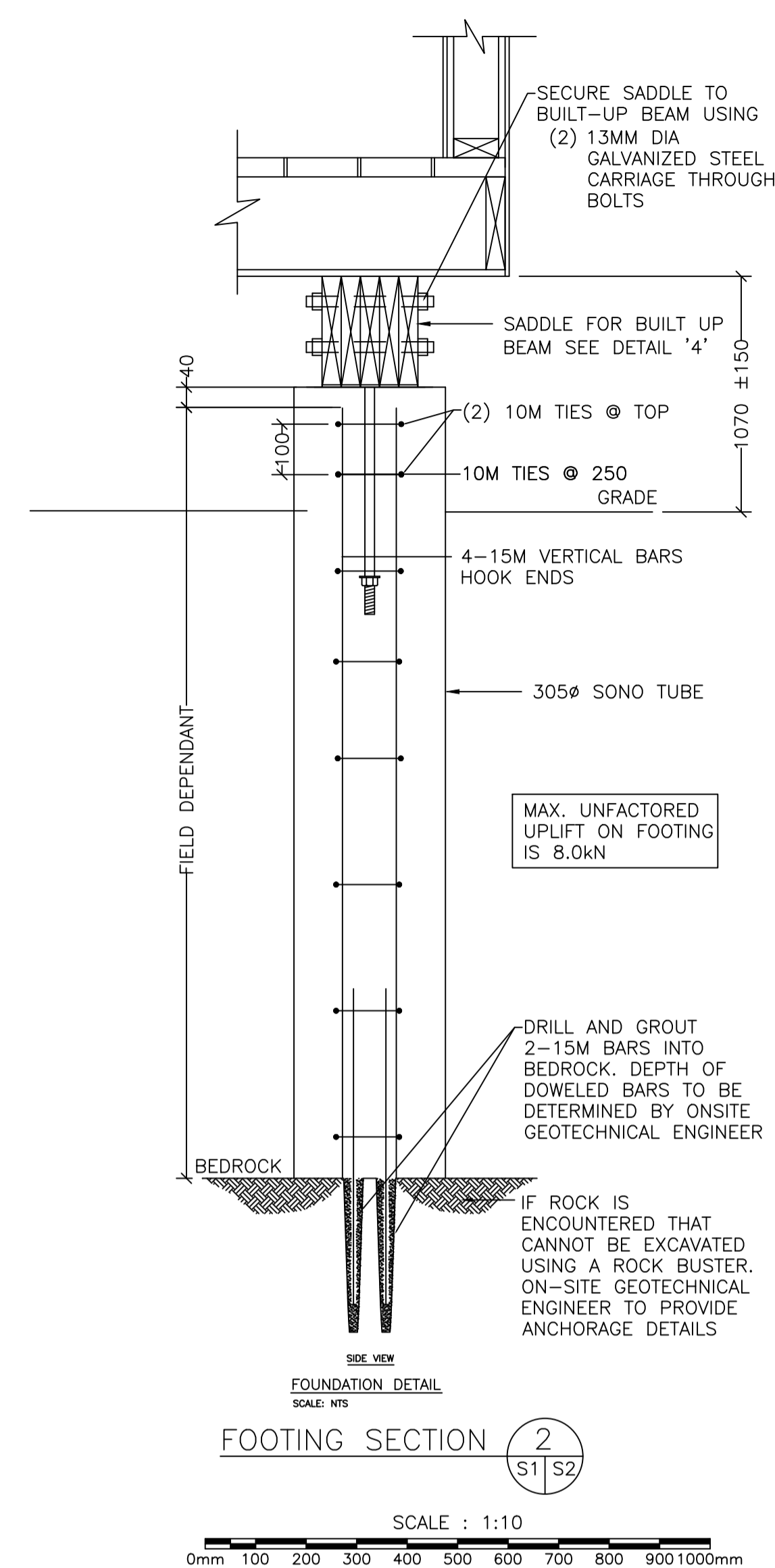
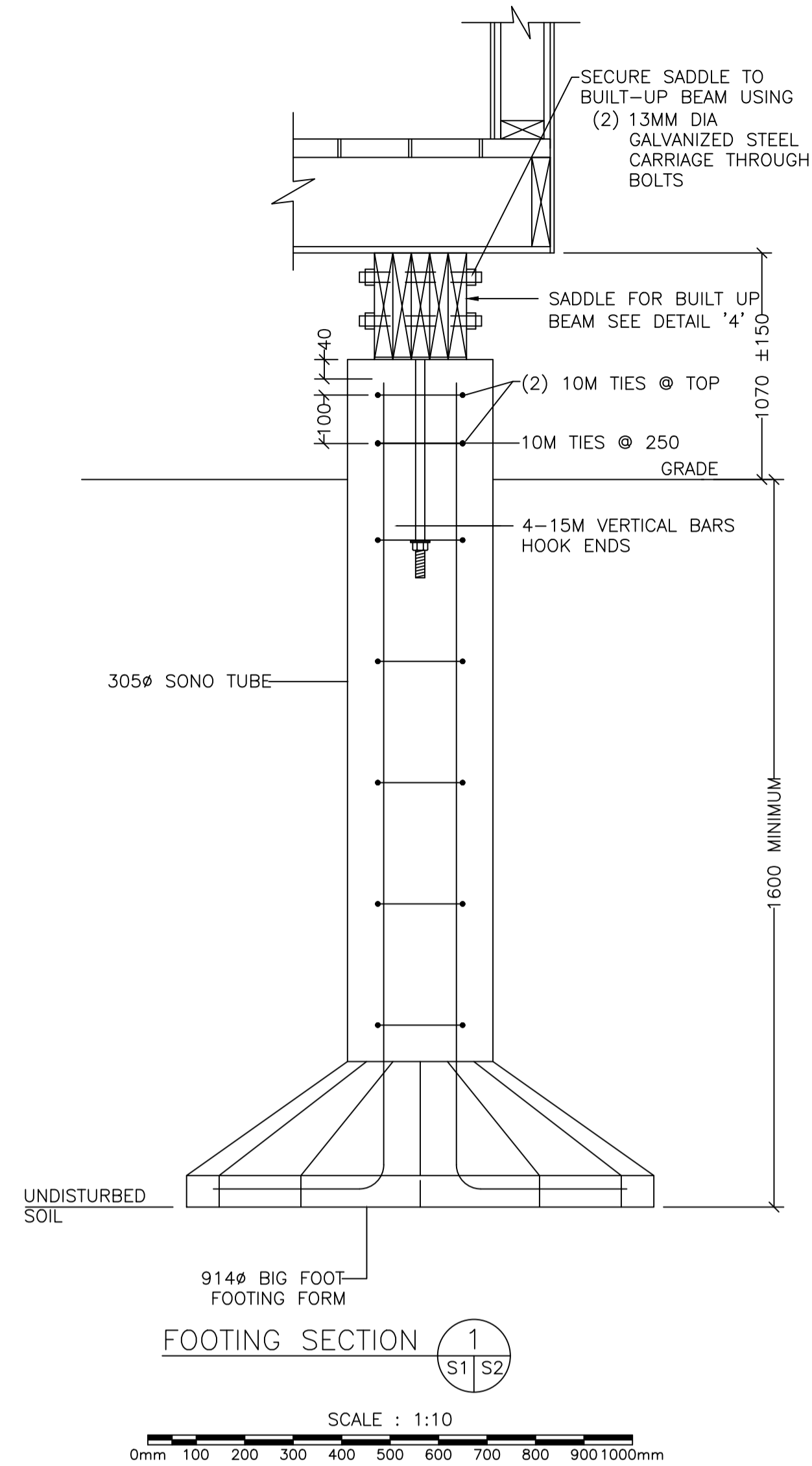
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Project - projet
MCTS GENERATOR BLDG
ST. LAWRENCE

Drawing - dessin
FRAMING PLAN,
SECTIONS AND DETAILS

drawn - dessine	M.G.G.	designed - dessine par	R.N.
date - date	AUGUST 2020	checked - verifie	V.P.
scale - echelle	AS SHOWN	approved for tender - approuve pour l'offre	R.N.
project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
	01L1402B02906-S01	6 OF 16	



FOUNDATION NOTES

- ALL BEARING CAPACITIES AND SOIL CONDITIONS TO BE CONFIRMED BY A GEOTECHNICAL ENGINEER LICENSED TO PRACTICE IN THE PROVINCE OF NEWFOUNDLAND AND LABRADOR.
 - ALL FOOTINGS ARE TO REST ON UNDISTURBED TILL HAVING A MINIMUM BEARING CAPACITY OF 150 KPa U.N.O.
 - IF FOOTINGS REST ON COMPACTED BACK FILL, THEN ALL FOOTING ELEVATIONS ARE TO BE CONFIRMED BY A GEOTECHNICAL ENGINEER BEFORE POURING.
 - ANY SOFT SPOT ENCOUNTERED UNDER FOOTINGS SHALL BE REMOVED AND FILLED WITH MASS CONCRETE OF MIN 20 MPa TO U/S OF FOOTINGS.
 - THE UNDERSIDE OF COLUMN FOOTINGS SHALL BE AT LEAST 1600mm BELOW THE FINISHED GRADE U.N.O.
 - DO NOT PLACE FOOTINGS ON FROZEN GROUND.
- THE LINE OF SLOPE BETWEEN ADJACENT EXCAVATIONS FOR FOOTINGS OR TRENCHES OR ALONG STEPPED FOOTINGS SHALL NOT EXCEED 1 VERTICAL TO 1 HORIZONTAL. MAXIMUM STEP IS 750mm.
- BACKFILL MATERIALS
 - BACKFILL PROPERTIES TO THE FOLLOWING REQUIREMENTS:
 - CRUSHED, PIT RUN OR SCREENED STONE, GRAVEL OR SAND.
 - GRADATIONS TO BE WITHIN LIMITS SPECIFIED WHEN TESTED TO ASTM C136 AND ASTM C117. SIEVE SIZES TO CAN/CGSB.8.1.
 - BACKFILL AND FILL MATERIAL TO BE PLACED IN 300mm LIFTS.
- | SIEVE DESIGNATION | % PASSING |
|-------------------|-----------|
| 50.8 mm | 100 |
| 25.4 mm | 50-100 |
| 19 mm | - |
| 15.9 mm | - |
| 9.5 mm | - |
| 4.75 mm | 20-55 |
| 1.20 mm | 10-35 |
| .30 mm | 5-20 |
| 0.075 mm | 2-8 |
- DO NOT BACKFILL AROUND OR OVER CAST-IN-PLACE CONCRETE WITHIN 48 h AFTER PLACING CONCRETE.
 - PLACE BACKFILL LAYERS SIMULTANEOUSLY ON BOTH SIDES OF INSTALLED WORK TO EQUALIZE LOADING. DIFFERENCE NOT TO EXCEED 300mm.
 - COMPACTION UNDER FOOTINGS TO 98% STANDARD PROCTOR DENSITY.
 - DEWATER EXCAVATIONS TO ENSURE CONCRETE AND SERVICES ARE PLACED IN THE DRY.
 - PROTECT EXISTING BUILDING AND SURFACE FEATURES FROM DAMAGE WHILE WORK IS IN PROGRESS. IN THE EVENT OF DAMAGE, IMMEDIATELY MAKE REPAIR TO APPROVAL OF ENGINEER.

CAST IN PLACE CONCRETE NOTES

- ALL CONCRETE PRODUCTION AND PLACEMENT INCLUDING WEATHER PROTECTION TO CONFORM TO CSA A23.1 LATEST EDITION. ALL TESTING TO CONFORM TO CSA 23.2 LATEST EDITION.
- ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 32 MPa U.N.O. FOOTINGS/PIERS: 32 MPa, MAXIMUM SLUMP 75mm, EXPOSURE CLASS F-2
- CLEAR CONCRETE COVER TO REINFORCING PER CSA A23.1:

FOOTINGS:	75mm
PIERS:	50mm
- ALL REINFORCING TO CONFORM TO CSA G30.18 LATEST EDITION. ALL REINFORCING TO HAVE A MINIMUM YIELD OF 400 MPa.
- ALL REINFORCING STEEL SHALL BE DETAILED, FABRICATED AND SUPPORTED IN ACCORDANCE WITH CSA A23.1 LATEST EDITION.
- ALL DOWELS ARE TO BE TIED TO VERTICAL REBAR AND IN PROPER POSITION BEFORE POURING CONCRETE. PLACING DOWELS AFTER CONCRETE IS POURED IS UNACCEPTABLE.
- FORM WORK MUST NOT BE REMOVED UNTIL CONCRETE HAS ATTAINED SUFFICIENT STRENGTH TO SUSTAIN ALL LOADINGS.
- LAP SPLICE ALL FOOTING DOWELS CLASS "B" TENSION SPLICE TO VERTICALS IN PIERS AND WALLS. ALL OTHER OTHER REINFORCING STEEL SHALL BE LAPPED A MINIMUM OF 24 BAR DIAMETERS, 300mm MIN U.N.O.
- SUBMIT SHOP DRAWINGS ON ALL CONCRETE ANCHORS. CONCRETE ANCHORS TO BE INSTALLED TO AVOID EXISTING REBAR.
- SUBMIT REINFORCING STEEL SHOP DRAWINGS FOR REVIEW BY ENGINEER PRIOR TO FABRICATION OF REINFORCING.



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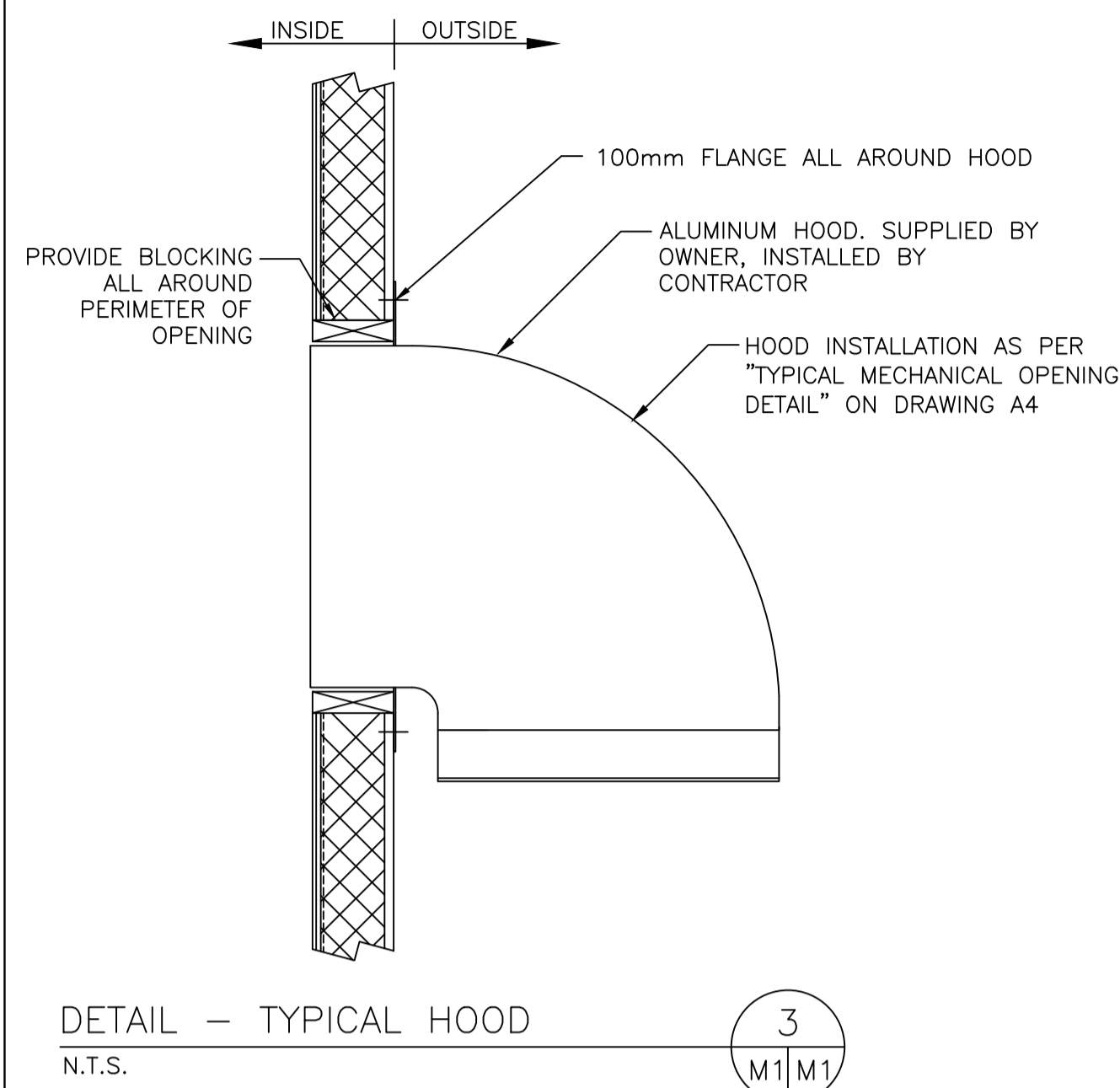
Project - projet

MCTS GENERATOR BLDG
ST. LAWRENCE

Drawing - dessin

FOUNDATIONS
SECTIONS AND DETAILS

drawn - dessiné	M.G.G.	designed - dessiné par	R.N.
date - date	AUGUST 2020	checked - vérifié	V.P.
scale - échelle	AS SHOWN	approved for tender - approuvé pour l'offre	R.N.
project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
	01L1402B02907-S02	7 OF 16	

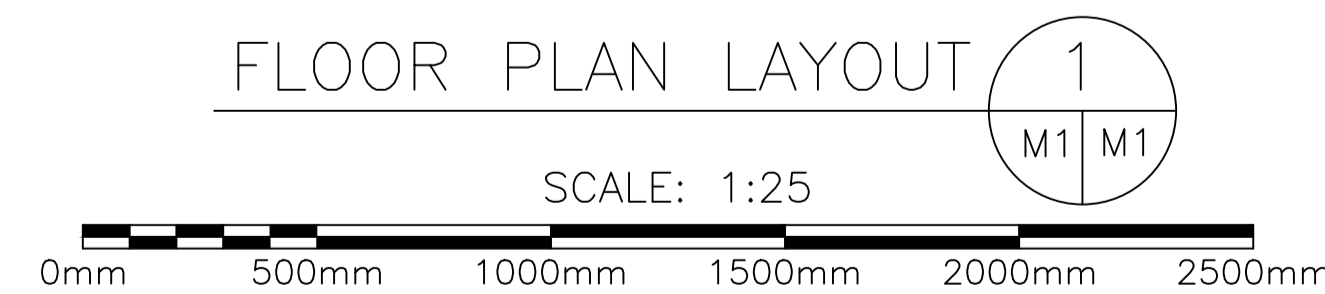
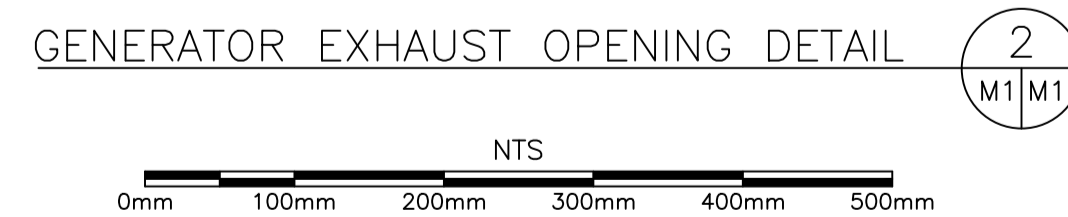
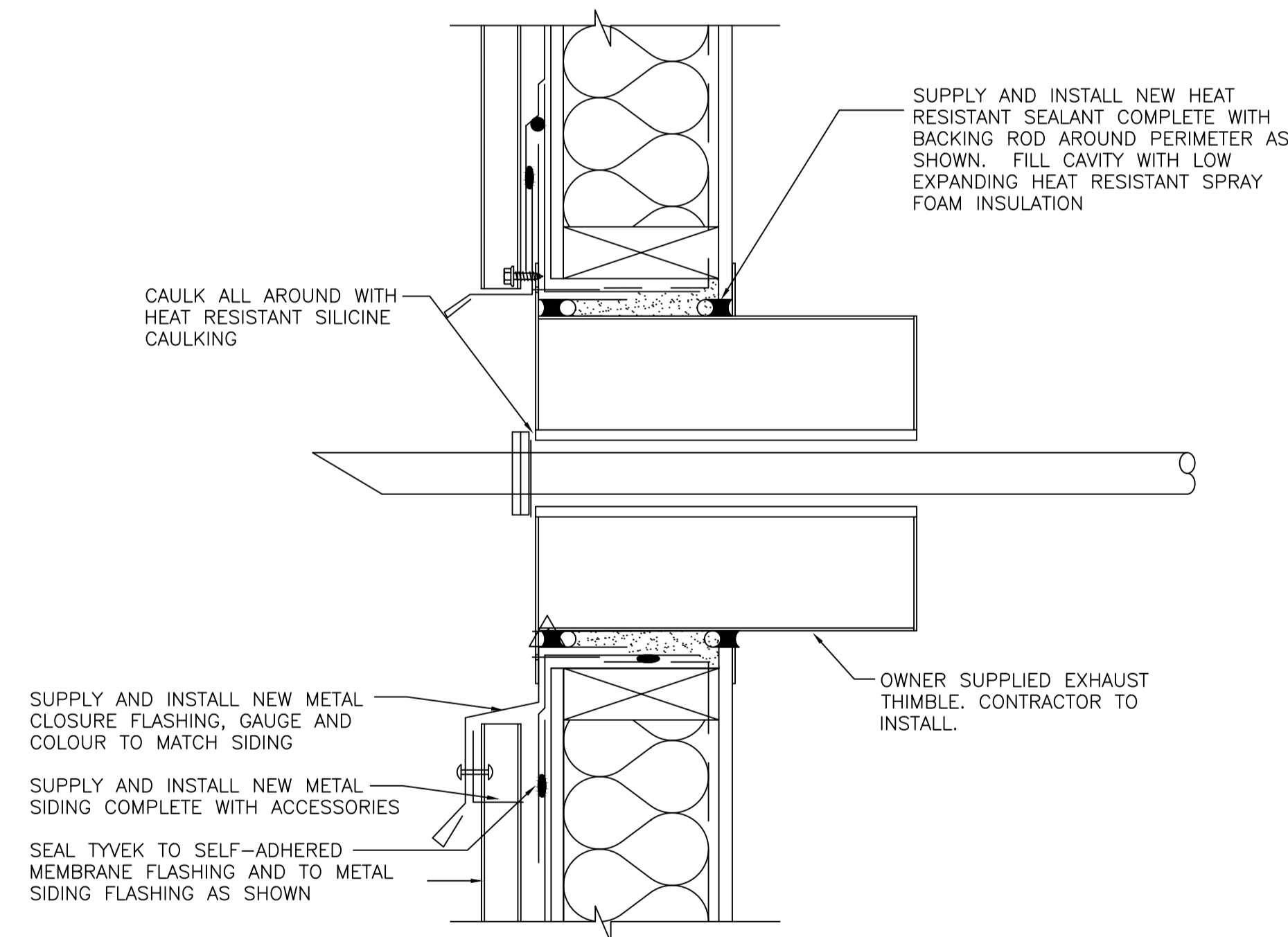
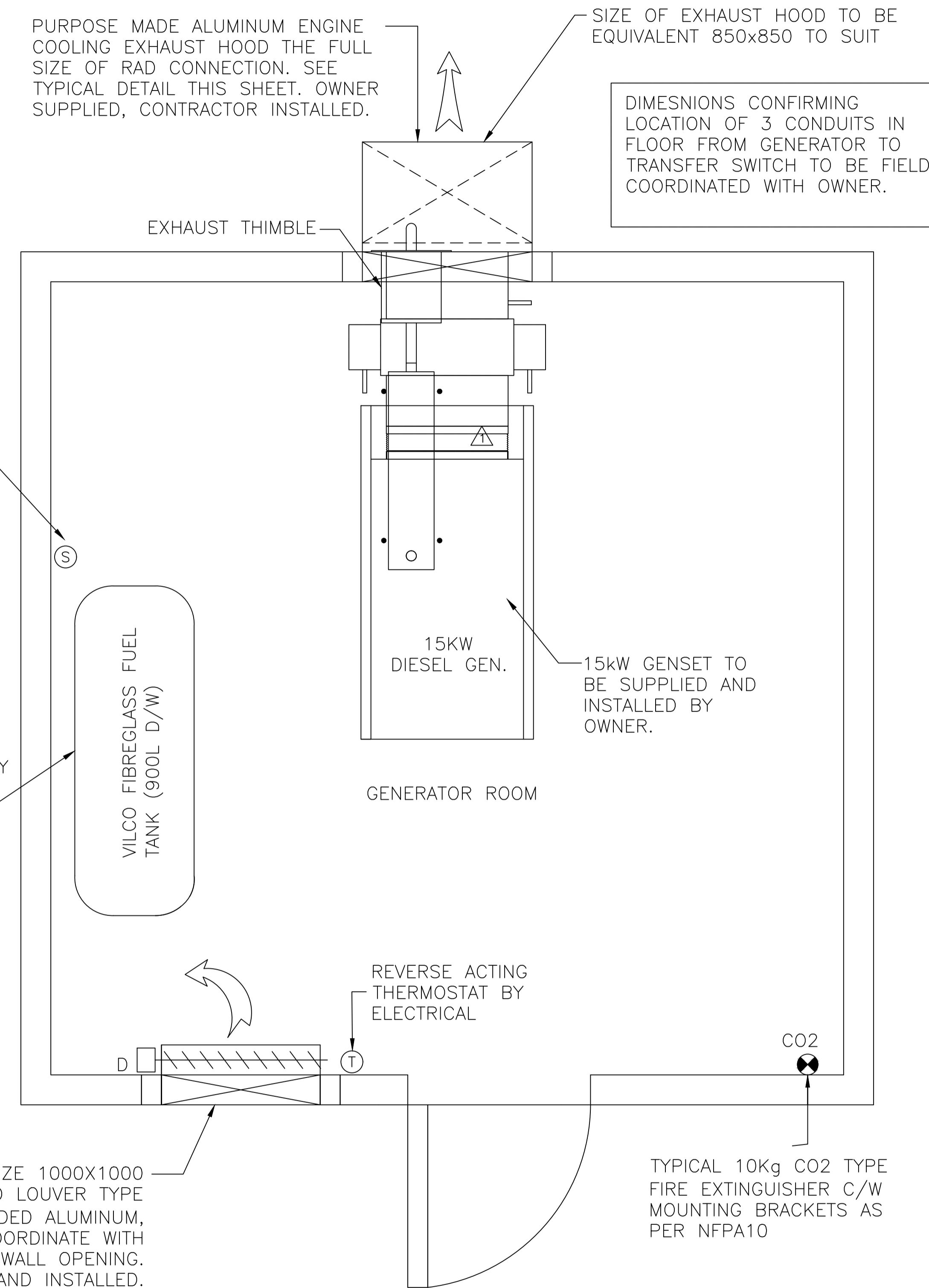


GAS DETECTOR SUITABLE FOR MONITORING OF FLAMMABLE, TOXIC AND OXYGEN GAS HAZARDS. MONITOR TO BE HONEYWELL SENSEPOINT XCD OR APPROVED EQUAL. OWNER SUPPLY & INSTALL.

PURPOSE MADE ALUMINUM ENGINE COOLING EXHAUST HOOD THE FULL SIZE OF RAD CONNECTION. SEE TYPICAL DETAIL THIS SHEET. OWNER SUPPLIED, CONTRACTOR INSTALLED.

SIZE OF EXHAUST HOOD TO BE EQUIVALENT 850x850 TO SUIT

DIMENSIONS CONFIRMING LOCATION OF 3 CONDUITS IN FLOOR FROM GENERATOR TO TRANSFER SWITCH TO BE FIELD COORDINATED WITH OWNER.



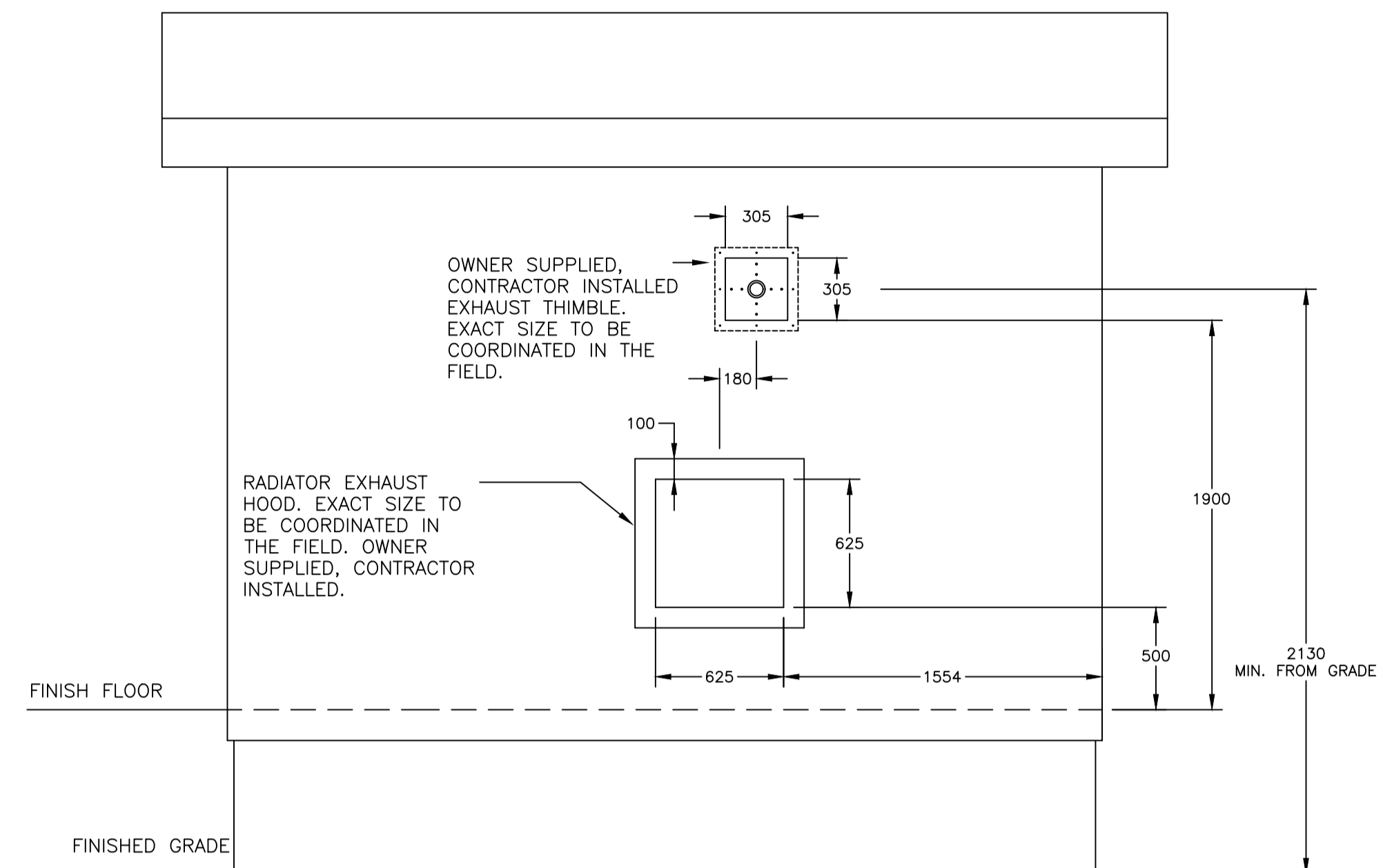
A - INDICATES DETAIL NO.
 B - INDICATED SHEET DETAIL IS REQUIRED
 C - INDICATES SHEET DETAIL IS DRAWN

2	REVISED	28/10/2020	MH	RB
1	ISSUED FOR CONSTRUCTION	16/11/2018	JS	RN
0	ISSUED FOR TENDER	18/06/20	JS	RN
no. no	revision	date	by	approved
	revision	date	par	approve

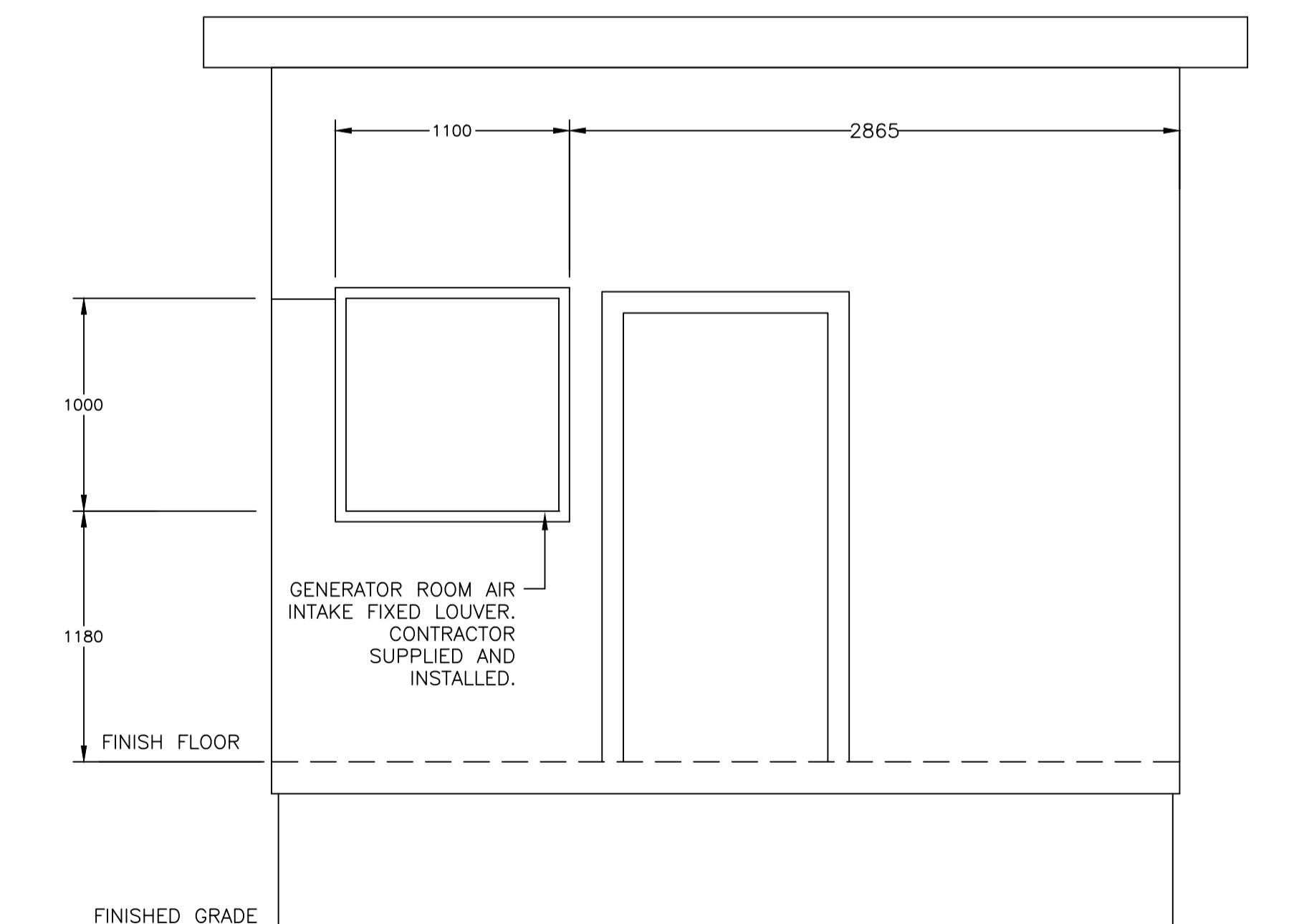
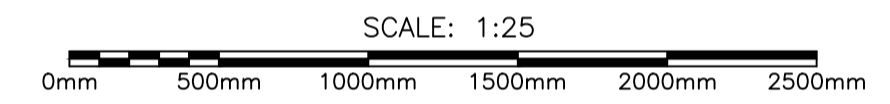
Project - projet
 MCTS GENERATOR BLDG
 ST. LAWRENCE

Drawing - dessin
 PLANS AND DETAILS

drawn - dessine	M.G.G.	designed - dessine par	T.T.
date - date	AUGUST 2020	checked - verifie	J.H.
scale - echelle	AS SHOWN	approved for tender - approuve pour l'offre	R.N.
project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
	01L1402B02908-M01	8 OF 16	



REAR ELEVATION 1



FRONT ELEVATION 2



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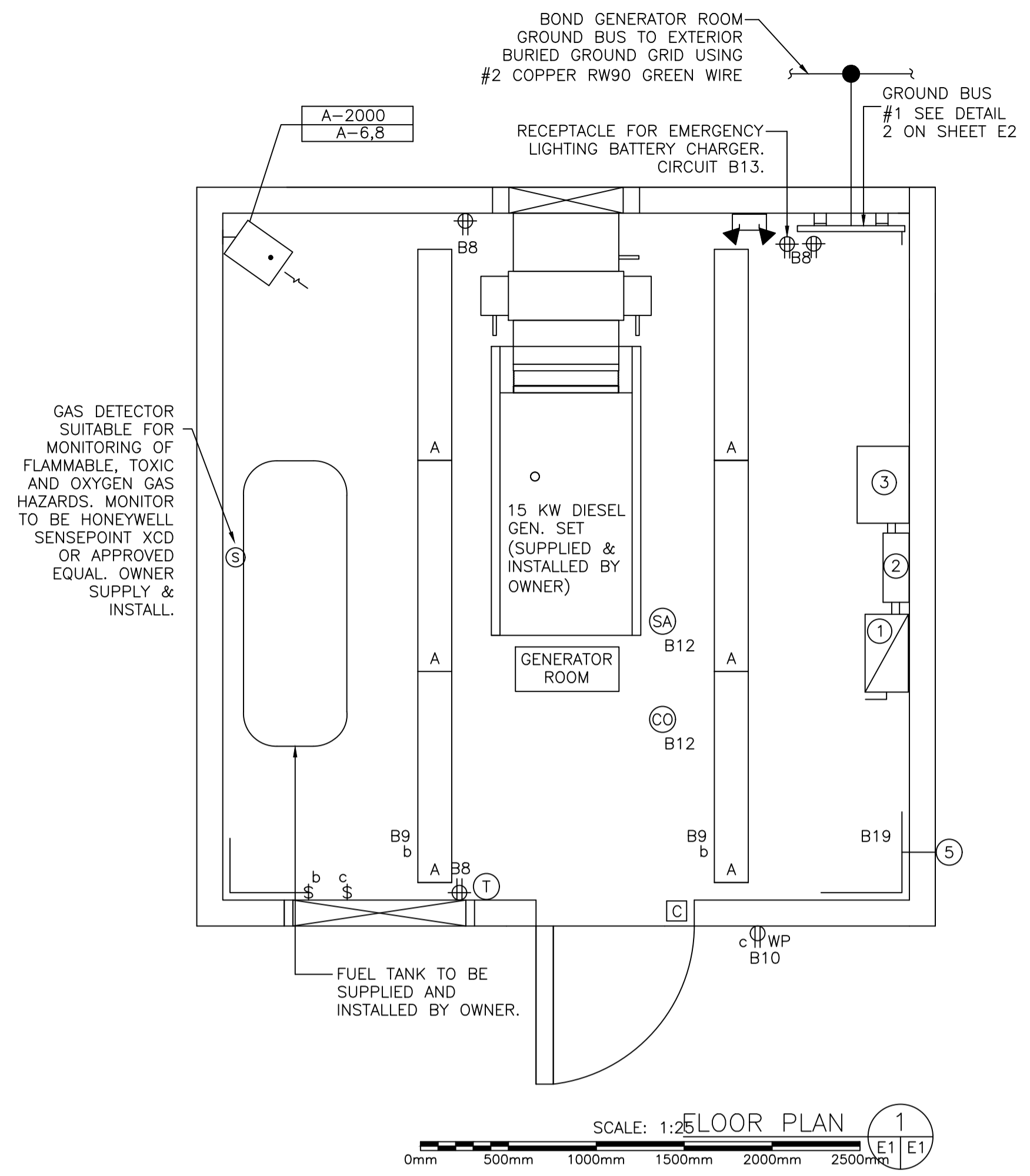
Project - projet

MCTS GENERATOR BLDG
ST. LAWRENCE

Drawing - dessin

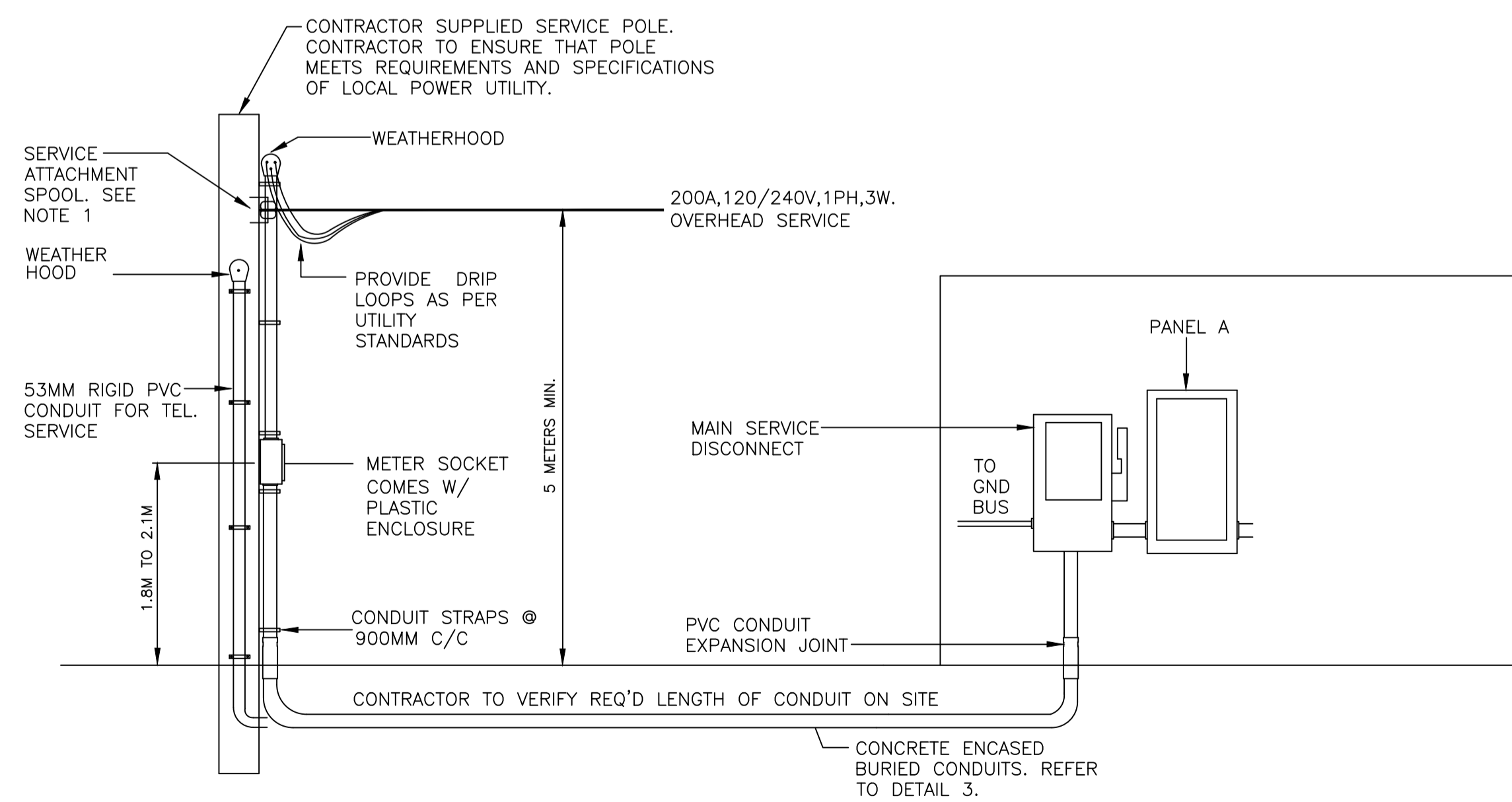
MECHANICAL PENETRATIONS

drawn - dessine	M.G.G.	designed - dessine par	T.T.
date - date	AUGUST 2020	checked - verifie	J.H.
scale - echelle	AS SHOWN	approved for tender - approuve pour l'offre	R.N.
project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
	01L1402B02909-M02	9 OF 16	



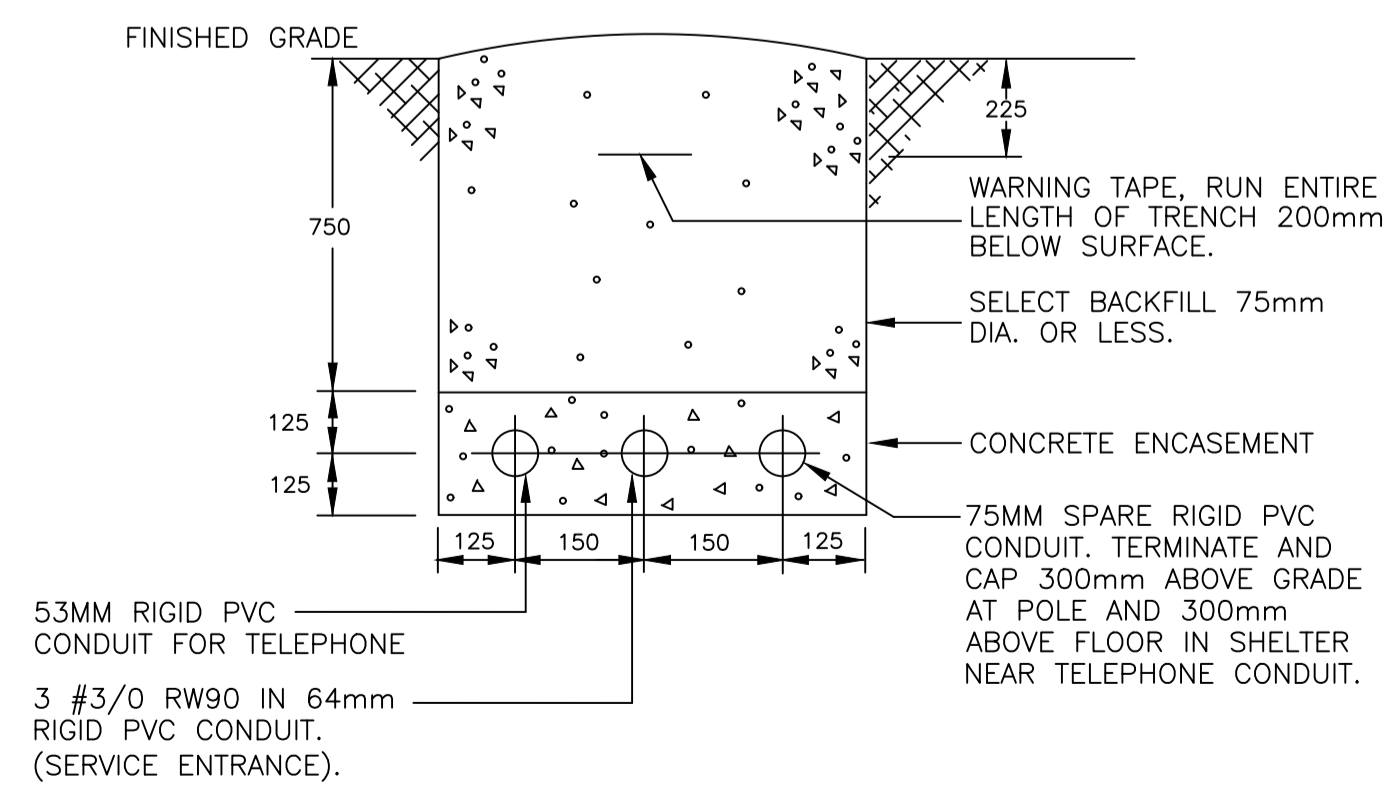
- EQUIPMENT DESCRIPTION**
- MAIN SERVICE ENTRANCE DISCONNECT SWITCH 200A/200AF, 120/240V. 1Ø, 2P, SOLID NEUTRAL, BY SQUARE-D / SCHNEIDER ELECTRIC.
 - MAIN DISTRIBUTION PANEL BOARD DP-A 200A. 120/240V. 1Ø, 3W. SEE PANEL DETAIL.
 - AUTOMATIC TRANSFER SWITCH. OWNER SUPPLIED, CONTRACTOR INSTALLED.
 - EMERGENCY DISTRIBUTION PANEL BOARD EP-B 100A. 120/240V. 1Ø, 3W. SEE PANEL DETAIL.
 - TWO COMPARTMENT WIREWAY AROUND FULL PERIMETER OF EQUIPMENT ROOM. LOCATE IN UPPER CORNER OF WALL AS PER DETAIL 3, SHEET E2. WIREWAY TO BE USED FOR WIRING OF DEVICES SHOWN IN EQUIPMENT ROOM. WIREWAY TO BE HOOKED UP TO PANEL EP-B.

- LEGEND**
- SINGLE POLE SWITCH 120V. 15A. #PS15AC1-1 BY PASS & SEYMOUR, INSTALLED IN SURFACE MOUNTED BOX #CIFS-1G-1/2 WITH #CIFS-9 COVER BY THOMAS & BETTS. INDICATES LIGHTS CONTROLLED
 - GANGED TOGGLE SWITCHES
 - DUPLEX OUTLET 15A. 120V. #5262-1 BY PASS & SEYMOUR, INSTALLED IN SURFACE MOUNTED BOX #CIFS-1G-1/2 WITH #CDR COVER BY THOMAS & BETTS.
 - SAME AS ABOVE EXCEPT MOUNTED 1050MM ABOVE FINISHED FLOOR.
 - TELEPHONE OUTLET. RUN TELEPHONE WIRING IN 21MM EMT CONDUIT TO TELEPHONE EQUIPMENT
 - EMERGENCY LIGHTING UNIT. 120V AC. C/W 2 - 12VOLT 6W LED MR16 LAMP HEADS. MOUNT 2100MM AFF. PROVIDE L5-15R ADJACENT RECEPTACLE TEST SWITCH. SERIES #12ESL144-2-LJ BY EMERGI-LITE.
 - DOUBLE ADJUSTABLE REMOTE HEAD FOR EMERGENCY LIGHTING. 12 VOLT 5W LED MR16. MOUNT 2100MM AFF. RUN 2 #12 RW90 IN 21mm CONDUIT TO EMERGENCY LIGHTING UNIT. SERIES #EF150-D-LIC BY EMERGI-LITE.
 - ELECTRIC UNIT HEATER. SUSPENDED UNIT HEATER 2000W. 240V. 1Ø #OAS2038 BY OUELLET.
 - GAS DETECTOR. SEE MECHANICAL DRAWINGS FOR DETAIL.
 - LOW VOLTAGE VICONICS VT7200 THERMOSTAT. SUPPLIED & INSTALLED BY DIV. 26.
 - LOW VOLTAGE HONEYWELL FOCUS PRO 5000 THERMOSTAT. SUPPLIED & INSTALLED BY DIV. 26.
 - SMOKE ALARM AMERICAN SENSORS ESA5011 C/W RM3A RELAY MODULE. TIE INTO SECURITY SYSTEM. REFER TO DETAILS 3 & 5 ON DWG E2. (INTERCONNECT SMOKE ALARMS SUCH THAT WHEN ONE SOUNDS THEY ALL SOUND.)
 - CARBON MONOXIDE RELAY.
 - CONNECTION TO MECHANICAL OR ELECTRICAL EQUIPMENT
 - CARBON MONOXIDE ALARM. KIDDE#900-0L20 C/W RM3A RELAY MODULE. TIE INTO SECURITY SYSTEM. REFER TO DETAILS 3 & 5 ON DRAWING E2.
 - SURFACE MOUNTED 1.22m LONG 42W LED LUMINAIRE C/W ENERGY EFFICIENT 120V ELECTRIC DRIVER, FROST ACRYLIC LENS AND END CAP. 5000 LUMEN OUTPUT, 4000K CCT, MIN. CRI 80. LITHONIA CAT. #Z1DL485000LMFST12040KPLRWH OR APPROVED EQUAL.
 - EXTERIOR WALL MOUNTED LED LUMINAIRE WITH PHOTOCELL CONTROL, IMPACT RESISTANT POLYCARBONATE LENS, 120V, 19W, 1070 LUMENS, 5000K CCT. LITHONIA CATALOG #TWSLED-1-50K-120-PE OR APPROVED EQUAL.
 - PROVIDE CSA TYPE 3 (NEMA 3) RATED OUTDOOR JUNCTION BOX FOR CONNECTION TO A/C UNITS. PROVIDE 2#10 + 1#10 GND FOR EACH OUTDOOR A/C UNIT IN 21mmC FROM PANEL B TO THE JUNCTION BOX AND LEAVE 300mm OF COILED WIRE IN THE JUNCTION FOR CONNECTION TO A/C UNITS BY A/C CONTRACTOR. EXACT LOCATION OF JUNCTION BOX TO BE DETERMINED IN THE FIELD. SIZE JUNCTION BOX PER CEC.
 - ELECTRIC BASEBOARD HEATER. 7 FOOT LONG, 3750W, 240V. DOUBLE 20A BREAKER FOR 3750W OF HEAT.
 - EMERGENCY STOP SWITCH TIED BACK TO AUTOMATIC TRANSFER SWITCH IN GENERATOR ROOM.



- NOTES**
- SERVICE ATTACHMENT SPOOL SHALL BE LOCATED NOT LESS THAN 4.5M ABOVE GRADE AS PER CEC.
 - SERVICE INSTALLATION SHALL BE AS PER CEC AND UTILITY STANDARDS.

SERVICE ENTRANCE ELEVATION 2
N.T.S. E1 E1



UNDERGROUND SERVICE ENTRANCE TRENCH SECTION 3
N.T.S. E1 E1

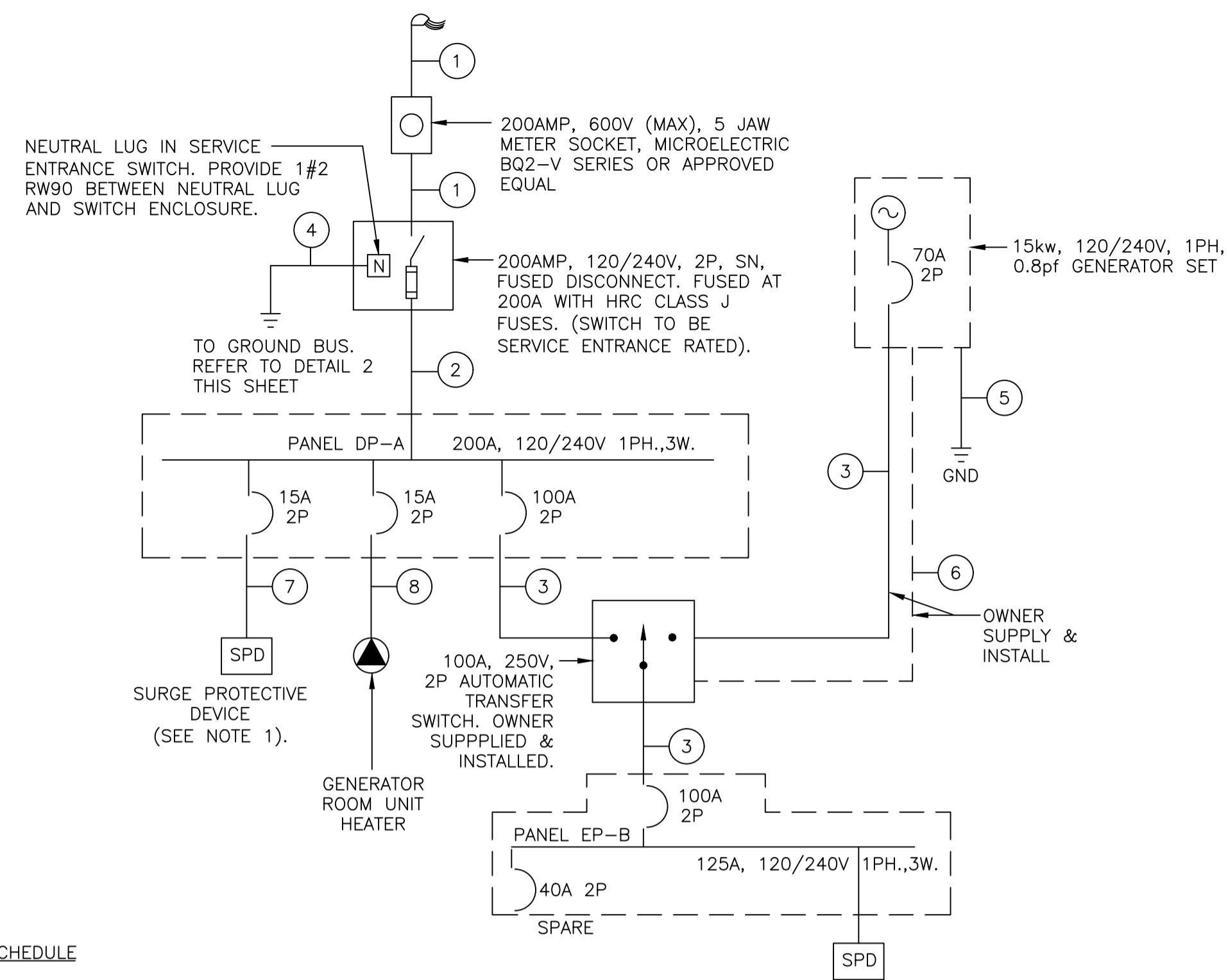
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no. no.	revision revision	date date	by par	approved approve

Project - projet
MCTS GENERATOR BLDG ST. LAWRENCE

Drawing - dessin
ELECTRICAL LAYOUT AND LEGEND

drawn - dessine	M.G.G.	designed - dessine par	K.W.
date - date	AUGUST 2020	checked - verifie	D.C.
scale - echelle	AS SHOWN	approved for tender - approuve pour l'offre	R.N.
project no. - projet no.	drawing no. - no du dessin	sheet - feuille	
	01L1402B02910-E01	10 OF 16	

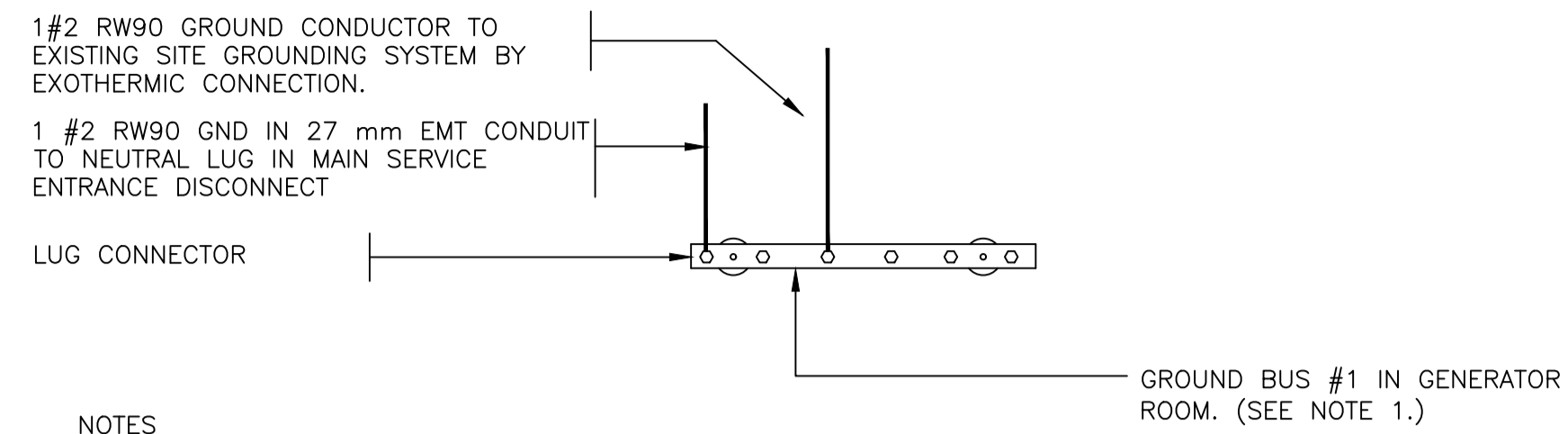


FEEDER SCHEDULE

- ① - UTILITY TO BE COMPLETED AS PART OF THIS CONTRACT. 3 #3/0 XLPE.
- ② - 3 #3/0 RW90 +GND IN 53mm CONDUIT.
- ③ - 3 #3 RW90 + GND IN 35mm CONDUIT.
- ④ - 1 #2 RW90 GND IN 27mm CONDUIT.
- ⑤ - 1 #6 RW90 GND IN 21mm CONDUIT.
- ⑥ - 6 #12 RW90 + GND STRANDED IN 21mm CONDUIT.
- ⑦ - WIRE SUPPLIED WITH SPD. MOUNT SPD ON THE PANEL ENCLOSURE AND RUN WIRE AS STRAIGHT AS POSSIBLE TO THE DOUBLE 30A SPD BREAKER. WIRE LENGTH FROM SPD TO BREAKER SHALL NOT EXCEED 150mm
- ⑧ - 2 #12 RW90 + GND IN 21mm CONDUIT

- 1. SURGE PROTECTIVE DEVICE TO BE OWNER SUPPLIED AND INSTALLED.
- 2. TRANSFER SWITCH (OWNER SUPPLIED, CONTRACTOR INSTALLED) HAS A SWITCHED NEUTRAL. BOND NEUTRAL TO GROUND AT THE GENERATOR.

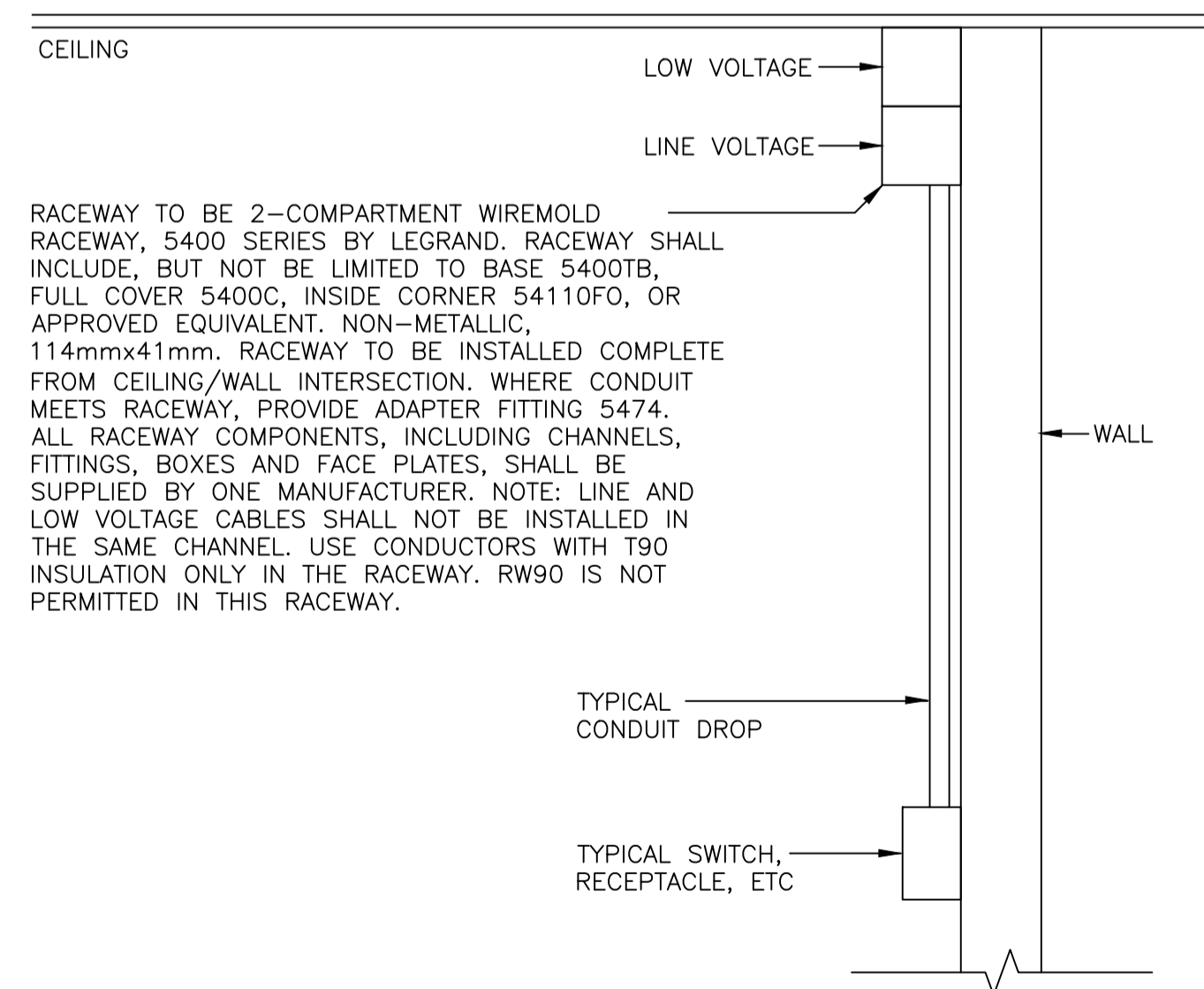
SINGLE LINE DIAGRAM
N.T.S.



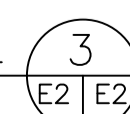
NOTES

- 1. GROUND BUSES SHALL BE ANDREW COMMSCOPE CAT.# UGBKIT-0424. INSTALL AS PER MANUFACTURER'S INSTRUCTIONS.

GROUND BUS DETAIL
N.T.S.



PERIMETER WIREWAY DETAIL
N.T.S.



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Project - projet

MCTS GENERATOR BLDG
ST. LAWRENCE

Drawing - dessin

ELECTRICAL DETAILS

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date - date	AUGUST 2020	checked - verifie	D.C.
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project no. - projet no. drawing no. - no du dessin sheet - feuille
01L1402B02911-E02 11 OF 16

PANEL: DP-A **LOCATION:** GENERATOR ROOM **MOUNTING:** SURFACE

PANEL MODEL: SEE NOTE 1 **SERVICE:** 120/240, 1Ph., 3W BRANCH_BKR_I.C.:10,000 A. RMS Sym.

DATE: **PANEL SIZE:** 200 Amp MAINS, **BREAKER TYPE:** SEE NOTE 2
NON-COMBINATION

LOAD DESCRIPTION	LOAD WATTS	WIRE SIZE	BKR. SIZE	CIRCUIT NO.	BKR. SIZE	WIRE SIZE	LOAD WATTS	LOAD DESCRIPTION
SPARE (LOSS OF POWER RELAY)		#12	15A 2P	1 2 3 4	100A 2P	#3	8830 8830	EP-B
SURGE PROTECTION DEVICE		#12	30A 2P	5 6 7 8	20A 2P	#12	1000 1000	GENERATOR ROOM HEATER
(GEN. LOSS RELAY)		#12	15A 2P	9 10 11 12	15A #12	1000 600		SPARE (COOLANT HEATER) SPARE (GEN. BATT CHARGER)
SPARE		#12	15A	13 14	15A #12			SPARE
SPARE		#12	15A	15 16	15A #12			SPARE
SPARE		#12	15A	17 18	15A #12			SPARE
SPARE		#12	15A	19 20	15A #12			SPARE
SPARE		#12	15A	21 22	15A #12			SPARE
SPARE		#12	15A	23 24	15A #12			SPARE

COMMENTS: + LOCK ON DEVICE CONNECTED TO BREAKER.

NOTES: 1. SIEMENS TUB B38, INSERT P1A30MC250AT, TRIM S38B.
2. BRANCH BREAKERS TYPE B.

PANEL DETAIL DP-A
N.T.S.



PANEL: EP-B **LOCATION:** EQUIPMENT ROOM **MOUNTING:** SURFACE

PANEL MODEL: SEE NOTE 1 **SERVICE:** 120/240, 1Ph., 3W BRANCH_BKR_I.C.:10,000 A. RMS Sym.

DATE: **PANEL SIZE:** 125 Amp MAINS, **BREAKER TYPE:** SEE NOTE 2
NON-COMBINATION

LOAD DESCRIPTION	LOAD WATTS	WIRE SIZE	BKR. SIZE	CIRCUIT NO.	BKR. SIZE	WIRE SIZE	LOAD WATTS	LOAD DESCRIPTION
SPARE		#12	15A	1 2	20A 2P	#12	1800 1800	A/C UNIT #1
SPARE (HEATER EQUIPMENT ROOM)	1000 1000	#12	15A 2P	3 4 5 6 7 8	15A #12			EMERG LTS + REC - GENERATOR ROOM
LIGHTING - INTERIOR	420	#12	15A	9 10	15A #12			REC - EXTERIOR
LIGHTING - EXTERIOR	20	#12	15A	11 12	15A #12			SMOKE/CO ALARM & GAS DET.
REC - BATTERY CHARGER	100	#12	15A	13 14	15A #12			REC - EQUIPMENT ROOM
SPARE (EQUIP. RM VENT)	100	#12	15A	15 16	15A #12			REC - EQUIPMENT ROOM
SPARE (EXHAUST FAN)	864	#12	15A	17 18	15A #12			TOWER LIGHTING
SPARE (VENT CONTROL)	50	#12	15A	19 20	15A #12			SPARE
SPARE (VENT CONTROL)	50	#12	15A	21 22	15A #12			REC - TELEPHONE EQUIP.
SPARE (REC - RACK 1)	900	#12	15A	23 24	15A #12			SPARE (REC - RACK 2)
SPARE (REC - RACK 3)	750	#12	15A	25 26	15A #12			SPARE (REC - RACK 4)
SPARE (REC-RACK5(FUTURE))	750	#12	15A	27 28	15A #12			SPARE (REC-RACK6(FUTURE))
SPARE	120	#12	15A	29 30	15A #12			SPARE
SPARE	120	#12	15A	31 32	15A #12			SPARE
SPARE		#12	15A	33 34	15A #12			SPARE
SPARE		#12	15A	35 36	15A #12			SPARE
SPARE		#12	15A	37 38	15A #12			SPARE
SPARE (PANEL UPS-C)	2600 2600	#8	60A 2P	39 40 41 42	100A 2P	#12		SPD

COMMENTS: + LOCK ON DEVICE CONNECTED TO BREAKER.

NOTES: 1. SIEMENS TUB B44, INSERT P1A42MC250AT, TRIM S44B.
2. BREAKERS TYPE B.

PANEL DETAIL EP-B
N.T.S.



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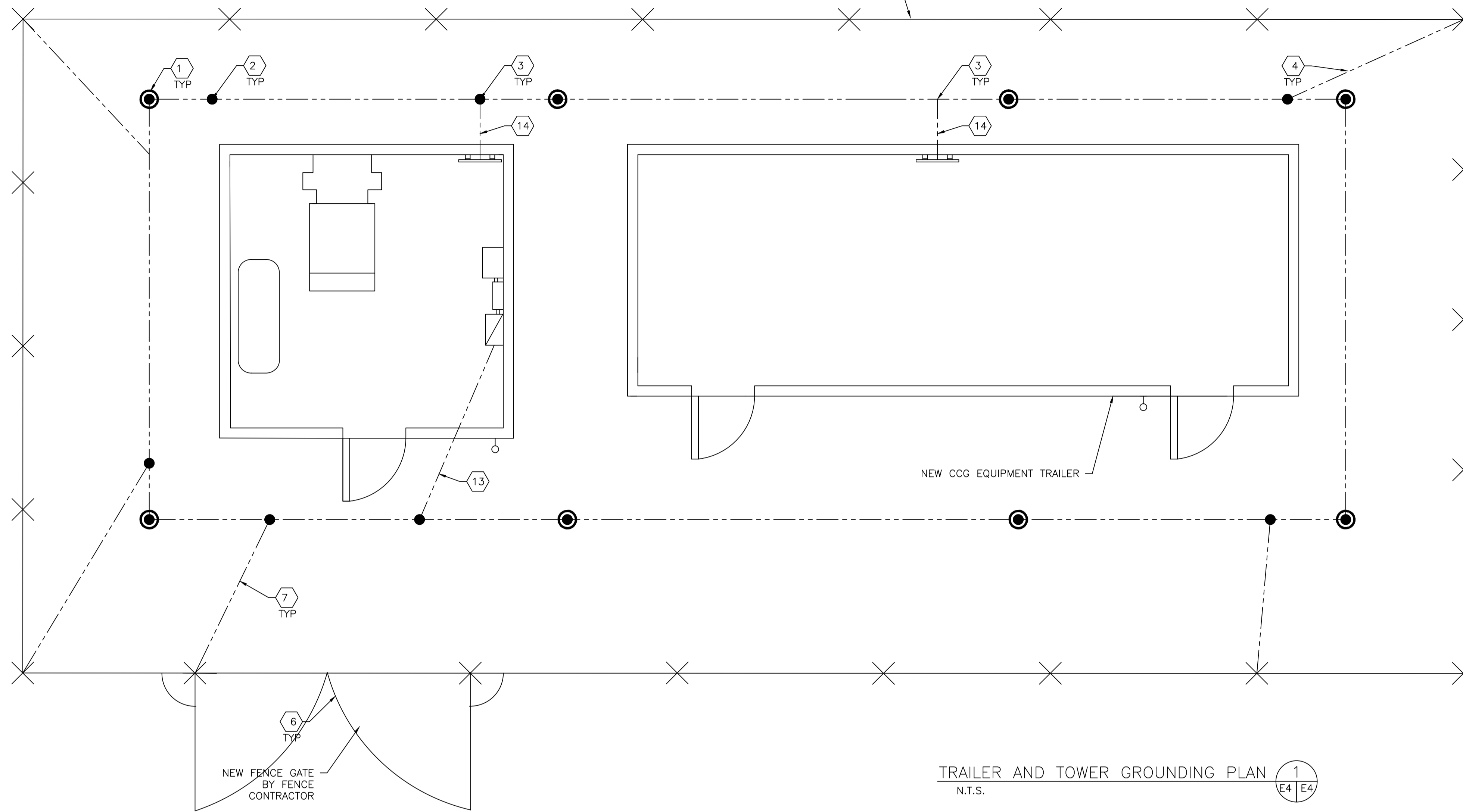
Project - projet
MCTS GENERATOR BLDG
ST. LAWRENCE

Drawing - dessin
ELECTRICAL DETAILS AND
PANEL SCHEDULES

drawn - dessiné	M.G.G.	designed - dessiné par	K.W.
date - date	AUGUST 2020	checked - vérifié	D.C.
scale - échelle	AS SHOWN	approved for tender - approuvé pour l'offre	R.N.

project no. - projet no. drawing no. - no du dessin sheet - feuille
01L1402B02912-E03 12 OF 16

NEW FENCE BY FENCE CONTRACTOR. FENCE PLAN SHOWN IS DIAGRAMMATIC FOR THE PURPOSE OF GROUNDING SCHEME. CONFIRM EXACT LOCATION AND SHAPE OF FENCE ON SITE



TRAILER AND TOWER GROUNDING PLAN (1)
N.T.S. E4 E4

- 1 19mmØ x 3m LONG COPPER CLAD STEEL GROUND ROD. 6 REQUIRED.
- 2 NEW TRAILER GROUND GRID. # 2/0 BARE STRANDED COPPER CONDUCTOR BURIED AT 700mm BELOW FINISHED GRADE.
- 3 EXOTHERMIC CONNECTION BELOW GRADE.
- 4 BOND FENCE TO GROUNDING SYSTEM AT 10m INTERVALS USING #2/0 BARE STRANDED COPPER CONDUCTOR.
- 5 BOND EXISTING TOWER GROUND RING TO NEW FENCE USING #2/0 BARE STRANDED COPPER CONDUCTOR.
- 6 PROVIDE FLEXIBLE BONDING STRAP BETWEEN STATIONARY GATE POST AND GATE FRAME.
- 7 BOND EACH STATIONARY GATE POST TO TRAILER GROUND GRID.
- 8 BOND NEW TRAILER GROUND GRID TO EXISTING TOWER GRID RING USING #2/0 BARE STRANDED COPPER CONDUCTOR AT 2 LOCATIONS MINIMUM 2m APART.
- 9 BOND EACH WAVE GUIDE POST TO TRAILER GROUND GRID USING #2 INSULATED COPPER CONDUCTOR.
- 10 BOND EXTERIOR GROUND BAR OF THE TRAILER TO TRAILER GROUND GRID USING #2/0 INSULATED COPPER CONDUCTOR.
- 11 MAINTAIN A 200mm GAP BETWEEN THE WAVEGUIDE BRIDGE AND THE TRAILER AND BOND WAVEGUIDE BRIDGE TO EXTERIOR GROUND BAR USING #2 INSULATED COPPER CONDUCTOR.
- 12 BOND INTERIOR GROUND BAR OF THE TRAILER TO TRAILER GROUND GRID USING #2/0 INSULATED COPPER WIRE.
- 13 BOND SERVICE ENTRANCE NEUTRAL TO TRAILER GROUND GRID USING #6 INSULATED COPPER CONDUCTOR.
- 14 BOND GENERATOR COMPARTMENT GROUND BAR TO TRAILER GROUND GRID USING #2/0 INSULATED STRANDED COPPER CONDUCTOR.



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Project - projet
MCTS GENERATOR BLDG
ST. LAWRENCE

Drawing - dessin
GROUNDING PLAN

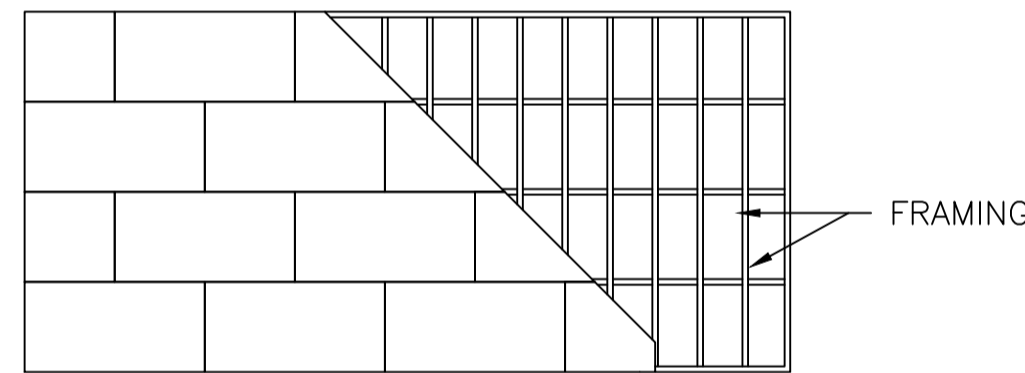
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	01L1402B02913-E04	13 OF 16	

GENERAL NOTES

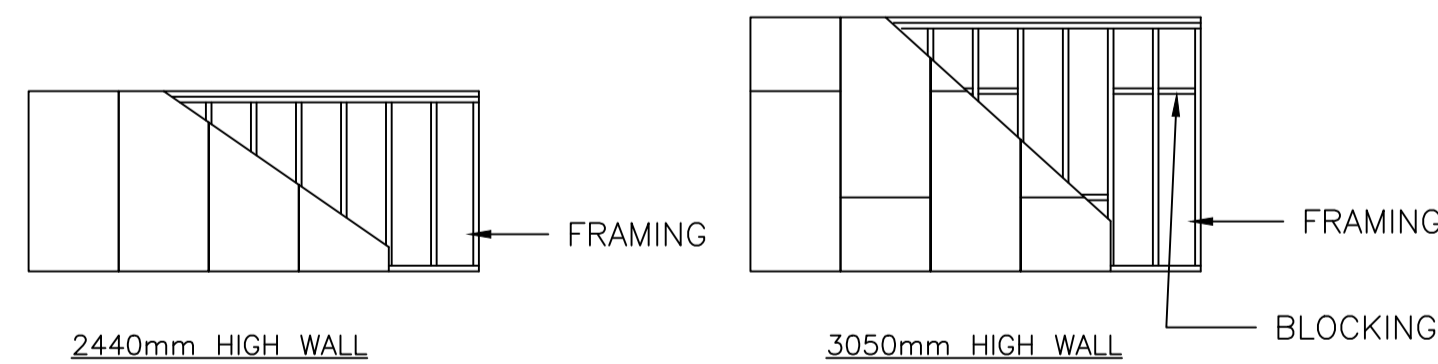
1. ALL WORKMANSHIP, EXCEPT WHERE NOTED OTHERWISE SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL BUILDING CODE OF CANADA (LATEST EDITION).
2. VERIFY ALL DIMENSIONS AND REPORT DISCREPANCIES BEFORE PROCEEDING WITH THE WORK. DO NOT SCALE THESE DRAWINGS.
3. FOR DIMENSIONS NOT GIVEN ON STRUCTURAL DRAWINGS SEE ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS.
4. FOR SIZE AND LOCATION OF MECHANICAL AND ELECTRICAL EQUIPMENT AND OPENINGS SEE MECHANICAL AND ELECTRICAL DRAWINGS. VERIFY ALL DIMENSIONS WITH THE MECHANICAL AND ELECTRICAL CONTRACTORS.
5. MAKE ADEQUATE PROVISIONS FOR CONSTRUCTION STRESSES, WEATHER PROTECTION AND FOR SUFFICIENT TEMPORARY BRACING AND SHORING TO KEEP THE STRUCTURE PLUMB AND LEVEL DURING ALL PHASES OF WORK. CONTRACTOR TO SUBMIT RESHORING DIAGRAMS FOR REVIEW STAMPED BY PROFESSIONAL ENGINEER AND LICENSED TO PRACTICE IN THE PROVINCE OF NEWFOUNDLAND & LABRADOR.
6. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO SAFEGUARD ALL EXISTING STRUCTURES AFFECTED BY THIS CONSTRUCTION.
7. ALL REQUIREMENTS FOR MECHANICAL AND ELECTRICAL EQUIPMENT AND ANY OTHER TRADES OR SERVICES AFFECTING THE STRUCTURE SHALL BE ESTABLISHED BY THE GENERAL CONTRACTOR IN CONSULTATION WITH CORRESPONDING MANUFACTURERS OR SUPPLIERS AND THE ARCHITECT AND THE ENGINEER.
8. DESIGN LOADS AS SHOWN ON DRAWINGS.
9. ALL LOADS AND FORCES SHOWN ON DRAWINGS ARE UNFACTORED U.N.O. IF LOADING TYPE IS NOT INDICATED, CONSIDER IT TO BE A LIVE LOAD. ALL LOADINGS ARE IN SYSTEM INTERNATIONAL UNITS U.N.O.

STRUCTURAL TIMBER NOTES

1. ALL TIMBER MEMBERS (TRUSSES, JOISTS, GLUE LAMINATED, PLYWOOD, ETC.) TO BE DESIGNED IN ACCORDANCE WITH CSA 086 LATEST EDITION.
2. FABRICATOR SHALL SUBMIT SHOP DRAWINGS STAMPED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF NEWFOUNDLAND & LABRADOR PRIOR TO COMMENCEMENT OF FABRICATION.
3. PROVIDE TRUSS PLATES WHERE BEARING WIDTH OF WOOD PLATES IS LESS THAN DESIGN WIDTH.
4. PROVIDE METAL TRUSS CONNECTORS FOR CONNECTION OR ROOF TRUSSES TO WOOD PLATES. GROSS UPLIFT LOAD FOR ROOF TRUSSES ARE 1.5 KPa U.N.O.
5. PLYWOOD NAILING SCHEDULE:
ROOF AND CEILING SHEATHING
 64mm NAILS @ 100 O.C. AT PLYWOOD EDGES
 64mm NAILS @ 300 O.C. AT INTERIOR OF SHEET
WALL SHEATHING
 64mm NAILS @ 150 O.C. AT PLYWOOD EDGES
 64mm NAILS @ 300 O.C. AT INTERIOR OF SHEET
6. WOOD JOISTS, BEAMS AND STUDS TO BE SPRUCE-PINE-FIR GRADE No.1/No.2
7. ROOF AND CEILING SHEATHING TO BE FULLY BLOCKED ATTACHED TO FRAMING IN FOLLOWING CONFIGURATION.



8. WALL SHEATHING TO BE FULLY BLOCKED AND ATTACHED TO FRAMING IN FOLLOWING CONFIGURATION.




9. SHEAR WALL HOLD-DOWN ANCHORS REQUIRED AT BOTH ENDS FOR EACH SEGMENT OF UNINTERRUPTED WALL.
10. ALL SURFACES OF PRESSURE TREATED LUMBER THAT ARE EXPOSED THROUGH FIELD CUTTING, TRIMMING OR BORING MUST BE RE-TREATED WITH A LIBERAL APPLICATION OF PRESERVATIVE BEFORE INSTALLATION.

INSULATION NOTES

1. ALL BATT INSULATION TO CAN/ULC S702.
2. INSULATION SHALL BE INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS.
3. INSTALL INSULATION WITH FACTORY APPLIED VAPOUR BARRIER FACING WARM SIDE OF BUILDING SPACES. LAP ENDS AND SIDE FLANGES OF MEMBRANE OVER FRAMING MEMBERS. RETAIN IN POSITION WITH STAPLES. INSTALLED AS RECOMMENDED BY MANUFACTURER. TAPE SEAL BUTT ENDS AND LAPPED SIDE FLANGES. DO NOT CUT OR TEAR VAPOUR BARRIER.

PAINTING NOTES

1. ALL WORK TO CONFORM TO LATEST MPI REQUIREMENTS FOR INTERIOR PAINTING WORK INCLUDING PREPARATION AND PRIMING.
2. STANDARD OF ACCEPTANCE AS FOLLOWS:
 WALLS: NO DEFECTS VISIBLE FROM A DISTANCE OF 1000mm AT 90 DEGREES TO SURFACE
 CEILINGS:NO DEFECTS VISIBLE FROM FLOOR AT 45 DEGREES TO SURFACE WHEN VIEWED USING FINAL LIGHTING SOURCE.
 FINAL COAT TO EXHIBIT UNIFORMITY OF COLOUR AND UNIFORMITY OF SHEEN ACROSS FULL SURFACE AREA.
3. SUBMIT PRODUCT DATA AND MANUFACTURER'S INSTALLATION/SPPICATION FOR EACH PAINT AND COATING PRODUCT TO BE USED.
4. PAINT MATERIALS FOR PAINT SYSTEMS SHALL BE PRODUCTS OF A SINGLE MANUFACTURER.
5. ONLY QUALIFIED PRODUCTS WITH E2 "ENVIRONMENTALLY FRIENDLY" RATING ARE ACCEPTABLE FOR USE ON THIS PROJECT.
6. UPON COMPLETION, SUBMIT RECORDS OF PRODUCTS USED. LIST PRODUCTS IN RELATION TO FINISH SYSTEM AND INCLUDE THE FOLLOWING:
 - 6.1. PRODUCT NAME, TYPE AND USE
 - 6.2. MANUFACTURER'S PRODUCT NUMBER
 - 6.3. COLOUR NUMBER
 - 6.4. MPI ENVIRONMENTALLY FRIENDLY CLASSIFICATION SYSTEM RATING
 - 6.5. MANUFACTURER'S MATERIAL SAFETY DATA SHEETS (MSDS)
7. SITE REQUIREMENTS
 - 8.1 HEATING, VENTILATION AND LIGHTING:
 - a) PERFORM NO PAINTING WORK UNLESS ADEQUATE AND CONTINUOUS VENTILATION AND SUFFICIENT HEATING FACILITIES ARE IN PLACE TO MAINTAIN AMBIENT AIR AND SUBSTRATE TEMPERATURES ABOVE 10 OC FOR 24 HOURS BEFORE, DURING AND AFTER PAINT APPLICATION UNTIL PAINT HAS CURED SUFFICIENTLY.
 - b) WHERE REQUIRED, PROVIDE CONTINUOUS VENTILATION FOR SEVEN DAYS AFTER COMPLETION OF APPLICATION OF PAINT.
 - c) PERFORM NO PAINTING WORK UNLESS A MINIMUM LIGHTING LEVEL OF 323 LUX IS PROVIDED ON SURFACES TO BE PAINTED. ADEQUATE LIGHTING FACILITIES SHALL BE PROVIDED BY GENERAL CONTRACTOR.
 - 8.2 TEMPERATURE, HUMIDITY AND SUBSTRATE MOISTURE CONTENT LEVELS:
 - a) UNLESS SPECIFICALLY PRE-APPROVED BY THE SPECIFYING BODY, PAINT INSPECTION AGENCY AND THE APPLIED PRODUCT MANUFACTURER, PERFORM NO PAINTING WORK WHEN:
 - AMBIENT AIR AND SUBSTRATE TEMPERATURES ARE BELOW 10 OC.
 - SUBSTRATE TEMPERATURE IS OVER 32 OC UNLESS PAINT IS SPECIFICALLY FORMULATED FOR APPLICATION AT HIGH TEMPERATURES.
 - SUBSTRATE AND AMBIENT AIR TEMPERATURES ARE EXPECTED TO FALL OUTSIDE MPI OR PAINT MANUFACTURERS PRESCRIBED LIMITS.
 - THE RELATIVE HUMIDITY IS ABOVE 85% OR WHEN THE DEW POINT IS LESS THAN 3 OC VARIANCE BETWEEN THE AIR/SURFACE TEMPERATURE.
 - RAIN OR SNOW ARE FORECAST TO OCCUR BEFORE PAINT HAS THOROUGHLY CURED OR WHEN IT IS FOGGY, MISTY, RAINING OR SNOWING AT SITE.
 - b) PERFORM NO PAINTING WORK WHEN THE MAXIMUM MOISTURE CONTENT OF THE SUBSTRATE EXCEEDS:
 - 15% FOR WOOD.
 - c) CONDUCT MOISTURE TESTS USING A PROPERLY CALIBRATED ELECTRONIC MOISTURE METER, EXCEPT TEST CONCRETE FLOORS FOR MOISTURE USING A SIMPLE "COVER PATCH TEST".
 - d) TEST CONCRETE, MASONRY AND PLASTER SURFACES FOR ALKALINITY AS REQUIRED.
 - 8.3 SURFACE AND ENVIRONMENTAL CONDITIONS:
 - a) APPLY PAINT FINISH ONLY IN AREAS WHERE DUST IS NO LONGER BEING GENERATED BY RELATED CONSTRUCTION OPERATIONS OR WHEN WIND OR VENTILATION CONDITIONS ARE SUCH THAT AIRBORNE PARTICLES WILL NOT AFFECT QUALITY OF FINISHED SURFACE.
 - b) APPLY PAINT ONLY TO ADEQUATELY PREPARED SURFACES AND TO SURFACES WITHIN MOISTURE LIMITS NOTED HEREIN.
 - c) APPLY PAINT ONLY WHEN PREVIOUS COAT OF PAINT IS DRY OR ADEQUATELY CURED.
 - 8.4 ADDITIONAL INTERIOR APPLICATION REQUIREMENTS:
 - a) APPLY PAINT FINISHES ONLY WHEN TEMPERATURE AT LOCATION OF INSTALLATION CAN BE SATISFACTORILY MAINTAINED WITHIN MANUFACTURER'S RECOMMENDATIONS.


 A - INDICATES DETAIL NO.
 B - INDICATED SHEET DETAIL IS REQUIRED
 C - INDICATES SHEET DETAIL IS DRAWN

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ST. LAWRENCE

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PART 1: GENERAL

1.13 COMMISSIONING

- .1 PROVIDE ALL NECESSARY LABOUR, MATERIALS, TOOLS, AND EQUIPMENT FOR IMPLEMENTING ALL REQUIRED COMMISSIONING ACTIVITIES INCLUDING: ALL CHECKING, TESTING, ADJUSTING, AND FINE TUNING OF SYSTEM SET POINTS AND TO PUT SYSTEMS INTO OPERATION.
- .2 COMPLETE A SYSTEMATIC VERIFICATION PROCEDURE TO ENSURE THAT:
 - .1 EQUIPMENT AND MATERIAL DELIVERED AND INSTALLED ARE AS PER APPROVED SHOP DRAWINGS, IN ACCORDANCE WITH ALL APPLICABLE CODES, NORMAL GOOD PRACTICE, MANUFACTURER'S INSTALLATION GUIDELINES, AND REQUIREMENTS OF THESE SPECIFICATIONS,
 - .2 PIPING AND DUCTWORK IS PRESSURE TESTED AS REQUIRED,
 - .3 EQUIPMENT IS SAFE TO BE STARTED.
- .3 COMPLETE A SYSTEMATIC VERIFICATION PROCEDURE TO ENSURE THAT EQUIPMENT AND SYSTEMS OPERATE SAFELY, EFFICIENTLY, AND IN GENERAL CONFORMITY WITH THE DESIGN INTENT INCLUDING:
 - .1 VERIFYING OPERATING CONDITIONS,
 - .2 VERIFYING PROPER OPERATION OF ALL SAFETY DEVICES,
 - .3 VERIFYING HYDRONIC SYSTEM FLUIDS ARE CLEAN AND TREATED AS PER SPECIFICATIONS,
 - .4 VERIFYING CONTROL SYSTEM OPERATION,
 - .5 VERIFYING SATISFACTORY EQUIPMENT OPERATING POINTS (PUMPS AND FANS) AND MOTOR LOADING,
 - .6 VERIFYING LINKAGE BETWEEN INTERACTING SYSTEMS,

1.4 CARE, OPERATION AND START-UP

- .1 MANUFACTURERS OR THEIR AGENTS TO UNDERTAKE EQUIPMENT START-UP WHERE REQUIRED BY THE SPECIFICATIONS OR WHERE REQUIRED BY THE EQUIPMENT MANUFACTURER AS A CONDITION OF WARRANTY. WHERE MANUFACTURER IS NOT REQUIRED TO DO START-UP, CARRY OUT IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.
- .2 INSTRUCT OPERATING PERSONNEL IN THE OPERATION, CARE, MAINTENANCE OF EQUIPMENT.

1.15 TESTING

- .1 TEST ALL PIPING TO 150% OF OPERATING PRESSURE FOR 8 HOURS, OR AS REQUIRED BY CODES.

1.17 IDENTIFICATION

- .1 IDENTIFY ALL EQUIPMENT WITH ENGRAVED LAMACOID PLATES.
- .2 IDENTIFY ALL VALVES WITH NUMBERED BRASS TAGS. RECORD VALVE NUMBERS, SERVICE AND NORMAL POSITION ON VALVES SCHEDULE. INCLUDE VALVE SCHEDULE IN MAINTENANCE MANUALS.

PART 2 INSULATION

2.1 GENERAL

- .1 INSULATION TO NFPA-90-A MAXIMUM FLAME-SPREAD AND SMOKE-DEVELOPED RATINGS OF 25 AND 50 RESPECTIVELY. INSTALL ALL INSULATION AS PER MANUFACTURER'S RECOMMENDATIONS.
- .2 THERMAL CONDUCTIVITY ("K" FACTOR) NOT TO EXCEED SPECIFIED VALUES AT 24 DEGREES C MEAN TEMPERATURE WHEN TESTED IN ACCORDANCE WITH ASTM C 335.

2.2 PRODUCT

- .1 TIAC CODE A-2: RIGID MOULDED CALCIUM SILICATE IN SECTIONS AND BLOCKS, AND WITH SPECIAL SHAPES TO SUIT PROJECT REQUIREMENTS.
 - .1 INSULATION: ASTM C533.
 - .2 MAXIMUM "K" FACTOR: ASTM C533.
 - .3 DESIGN TO PERMIT PERIODIC REMOVAL AND RE-INSTALLATION.
- .2 SECUREMENT
 - .1 TAPE: SELF-ADHESIVE, ALUMINUM, PLAIN, 50 MM WIDE MINIMUM.
 - .2 TIE WIRE: 1.5 MM DIAMETER STAINLESS STEEL.
 - .3 BANDS: STAINLESS STEEL, 19 MM WIDE, 0.5 MM THICK.
 - .4 FACING: 25 MM GALVANIZED STEEL HEXAGONAL WIRE MESH ON ONE FACE OF INSULATION.
 - .5 FASTENERS: 4 MM DIAMETER PINS WITH 35 MM DIAMETER OR SQUARE CLIPS.
- .3 JACKETS
 - .1 ALUMINUM: TO 0.5 MM THICK WITH LONGITUDINAL SLIP JOINTS AND 50 MM END LAPS, 0.4 MM THICK DIE SHAPED FITTING COVERS WITH FACTORY ATTACHED PROTECTIVE LINER ON INTERIOR SURFACE.

2.3 EXECUTION

- .1 INSTALL IN ACCORDANCE WITH TIAC NATIONAL STANDARDS AND AS PER MANUFACTURER'S RECOMMENDATIONS.
- .2 RE-COVER ALL GENERATOR EXHAUST PIPING AND MUFFLER WITH INSULATED JACKET.
- .3 PROVIDE INSULATION SHIELDS AT ALL PIPE HANGERS.
- .4 PIPE AND DUCT INSULATION SCHEDULE.

SERVICE	TIAC CODE	THICKNESS
ENGINE EXHAUST	A-2	50 MM

PART 3: FIRE PROTECTION

3.1 GENERAL

- .1 REFERENCES
 - .1 PROVINCIAL AND LOCAL BUILDING CODES, AND FIRE REGULATIONS AS APPROVED BY THE AUTHORITY HAVING JURISDICTION.
 - .2 NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS:
 - .1 NFPA 10 – PORTABLE FIRE EXTINGUISHERS

PART 4: PIPING, VALVES AND FITTINGS

4.1 GENERAL

- .1 PROVIDE COMPLETE, FULLY OPERATIONAL PIPING SYSTEMS COMPLETE WITH ALL ISOLATION, CHECK, PRESSURE REDUCING AND BACKFLOW PREVENTION VALVES AS INDICATED AND FURTHER AS REQUIRED FOR PROPER SYSTEM OPERATION AND TO SATISFY LOCAL CODES.

4.2 PRODUCTS

- .1 PIPE AND FITTINGS
 - .1 STEEL: ASTM A53 GRADE B, SEAMLESS UP TO NPS 2, ERW FOR LARGER
 - .2 SERVICE:

SERVICE	PIPE SIZE	MATERIAL	FITTINGS
FUEL OIL	ALL	SCHEDULE 40 STAINLESS STEEL	SCREWED
GENERATOR EXHAUST	NPS 3 AND OVER	SCHEDULE 40 STEEL	WELDED
- .2 VALVES
 - .1 GATE VALVES:
 - .1 NPS2 AND UNDER: BRONZE BODY, RISING STEM; TO MSS-SP-80, CLASS 125, 860 KPA SOLID WEDGE DISC, HANDWHEEL OPERATOR
 - .2 GLOBE VALVES:
 - .1 NPS 2 AND UNDER: TO MSS-SP-80, CLASS 125, 860 KPA, BRONZE BODY, SCREWED OVER BONNET, RENEWABLE BRONZE DISC (COMPOSITION DISC SUITABLE FOR OIL SERVICE)
 - .3 CHECK VALVES:
 - .1 NPS 2 AND UNDER: SWING TYPE, TO MSS-SP-80, CLASS 125, 860 KPA, BRONZE BODY, BRONZE SWING DISC (RENEWABLE COMPOSITION DISC SUITABLE FOR OIL SERVICE), SCREW IN CAP, REGRINDABLE SEAT
 - .4 BALL VALVES:
 - .1 NPS 2 AND UNDER: BRONZE BODY, TFE SEAL, HARD CHROME BALL, 4 MPA, WOG, HANDLE OPERATOR

4.3 EXECUTION

- .1 NPS2 AND UNDER: SCREWED FITTINGS WITH PTFE TAPE OR LEAD-FREE PIPE DOPE.
- .2 CONNECT TO EQUIPMENT WITH UNIONS OR FLANGES. INSTALL PIPING OR MINIMIZE PIPE DISMANTLING FOR EQUIPMENT REMOVAL.
- .3 EACH PIECE OF EQUIPMENT TO BE ISOLATED BY GATE, OR BALL VALVES.
- .4 INSTALL VALVES WITH STEMS IN UPRIGHT OR HORIZONTAL POSITION. DO NOT INSTALL STEMS IN INVERTED POSITION.
- .5 PROVIDE SPRING HANGERS AND FLEXIBLE CONNECTIONS WHEN MAKING CONNECTION TO VIBRATION ISOLATED EQUIPMENT. OIL LINES TO DIESEL GENERATORS SHALL HAVE A MINIMUM 12" (300MM) LONG FLEXIBLE STAINLESS STEEL BRAID REINFORCED CONNECTIONS.
- .6 PROVIDE ALL PIPING TO FUEL TANK AND BETWEEN TANK AND ENGINE INCLUDE FILL, VENTS, SUPPLY AND RETURN, AND ALL CONNECTIONS TO FUEL TANK, AND ENGINE. GRADE PIPING AT 1% BACK TO TANK.
- .7 SUPPORT ALL PIPING FROM STRUCTURAL MEMBERS AS APPROVED BY ENGINEER. WHEN STRUCTURAL MEMBERS ARE NOT SUITABLE LOCATION, PROVIDE SUPPLEMENTARY MEMBERS SUCH AS STEEL CHANNELS OR ANGLES (OBTAIN APPROVAL PRIOR TO FABRICATION). HANGER SYSTEMS TO BE STEEL ROD AND CLEVIS, ANGLE IRON OR CHANNEL. STRAP HANGER NOT TO BE USED.
- .8 PIPE SUPPORTS SHALL MEET REQUIREMENTS OF ANSI B31.1. USE ROD DIAMETERS AND SUPPORT SPACING AS SHOWN BELOW WITH THE FOLLOWING EXCEPTIONS:
 - .1 SUPPORT APPROVED MECHANICAL JOINT PIPING WITH AT LEAST TWO HANGERS BETWEEN EACH JOINT OR FITTING.
 - .2 SUPPORT PLASTIC PIPE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

PIPE SIZE NPS	ROD DIAMETER	MAXIMUM SPACING STEEL	COPPER
½	10 MM	1.8 M	1.5 M
¾ TO 1 ¼	10 MM	2.1M	1.8 M
1 ½	10 MM	2.7 M	2.4 M
2	10 MM	3.0 M	2.7 M
2 ½ TO 3	10 MM	3.6 M	3.0 M
4	10 MM	3.6 M	3.6 M
6	10 MM	4.8 M	

PART 5: HEATING, VENTILATION AND AIR CONDITIONING

5.1 GENERAL

- .1 PROVIDE ALL LABOUR, MATERIALS AND EQUIPMENT REQUIRED FOR COMPLETE HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS GENERALLY INCLUDE THE FOLLOWING:

5.2 PRODUCTS

- .1 WALL MOUNTED EXHAUSTER:
 - .1 FULLY ASSEMBLED, STURDILY CONSTRUCTED DIRECT DRIVE, WALL MOUNTED HORIZONTAL EXHAUST FAN, DURABLE POWER COATED FINISH, HEAVY DUTY OSHA MOTOR/GUARD, ENCLOSED AIR OVER MOTOR WITH OVERLOAD PROTECTION, DISCONNECT SWITCH. FAN SPECIFICATIONS: "LFI" MODEL P24-1V, 124 BLADE DIAMETER, DIMENSION 29.25"x29.25", AIR FLOW 3,520CFM @ 0.25" STATIC PRESSURE. ELECTRICAL POWER SUPPLY: 115/1/60, 1/3HP.
 - .2 STANDARD OF ACCEPTANCE: LFI OR EQUAL.
- .2 INTERIOR DUCTWORK SHALL BE FABRICATED FROM GALVANIZED STEEL TO ASTM A525 G90 DESIGNATION. METAL GAUGE SHALL BE IN ACCORDANCE WITH SMACNA STANDARDS.
- .3 EXTERIOR HOODS DUCTWORK SHALL BE FABRICATED FROM ALUMINUM TYPE 3003-H-14 SHEET MATERIAL. METAL GAUGE SHALL BE IN ACCORDANCE WITH SMACNA STANDARDS.
- .4 INTAKE/RELIEF DAMPERS: ALUMINUM FRAME WITH POLYURETHANE POCKETS, ALUMINUM BLADES WITH POLYURETHANE INTERNALLY INSULATION (R-2.25 MINIMUM), SILICONE BLADE AND SIDE SEALS, AMCA CERTIFIED, SALT WATER RESISTANCE INCLUDING STAINLESS STEEL HARDWARE.
 - .1 STANDARD OF ACCEPTANCE: TAMCO 9000 SW.

5.3 EXECUTION

- .1 INSTALL ALL EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.
- .2 ALL EQUIPMENT TO BE VIBRATION ISOLATED. USE RUBBER ISOLATORS FOR EQUIPMENT LESS THAN 30 KG SPRING ISOLATORS FOR LARGER EQUIPMENT.
- .3 PROVIDE TYPE "L" COPPER WITH COPPER FITTINGS CONDENSATE PIPING FROM WALL MOUNTED INDOOR UNIT.
- .4 MANUFACTURE AND INSTALL ALL DUCTWORK IN ACCORDANCE WITH THE RECOMMENDATION OF SMACNA.
- .5 ALL DUCTWORK CONNECTION TO ISOLATED EQUIPMENT TO BE MADE USING 100 MM FLEXIBLE CONNECTORS.
- .6 SEAL ALL JOINTS IN DUCTWORK.
- .7 MAKE TRANSITIONS, OFFSETS OR EASEMENTS IN DUCT SYSTEMS WHERE REQUIRED TO AVOID CONFLICT WITH STRUCTURE OR OTHER TRADES. COORDINATE LOCATION OF DUCTWORK WITH OTHER TRADES TO MINIMIZE ALTERATIONS.

PART 6: DIESEL GENERATOR INSTALLATION

6.1 GENERAL

- .1 DIESEL ELECTRIC GENERATOR IS SPECIFIED UNDER THE ELECTRICAL SECTION, INCLUDING MUFFLER AND EXHAUST FLEXIBLE CONNECTIONS.

6.2 PRODUCTS

- .1 MUFFLER AND EXHAUST FLEXIBLE CONNECTIONS PROVIDED WITH GENERATOR.
- .2 ABOVE GROUND OIL STORAGE TANK SHALL BE FIBERGLASS REINFORCED PLASTIC, VILCO OR OTHER APPROVED MANUFACTURER. SUITABLE FOR ABOVE GROUND INSTALLATION, UNDERWRITER'S APPROVED AND LABELLED.
- .3 TANK SHALL BE 200 IMPERIAL GALLONS (909 LITERS) COMPLETE WITH TOP INLET, VENTS, LEVEL GAUGE CONNECTION, DRAIN VALVE, AND OUTLET AND RETURN CONNECTIONS.
- .4 PROVIDE TANK WITH GAUGE GLASS FOR FULL HEIGHT OF TANK COMPLETE WITH GAUGE COCKS.
- .5 FUEL LEVEL GAUGE C/W ALARM WIRING. OWNER TO SUPPLY PRODUCT INFORMATION.
- .6 AFTER ALL TESTS AND PLANT ACCEPTANCE, TANK SHALL BE COMPLETELY FILLED WITH OIL, GRADE AS APPLICABLE. PROVIDE CERTIFICATE THAT THE TANK HAS BEEN FILLED. INCLUDE FOR COST OF OIL FOR TESTING AND TO FILL SYSTEM AFTER TESTS.
- .7 PROVIDE WIRING SCHEMATIC FOR REVIEW.

6.3 EXECUTION

- .1 INSTALL EXHAUST PIPE, MUFFLER, FLEXIBLE PIPE CONNECTION AND FLAPPER VALVE OR RAIN CAP IN EXHAUST PIPE. PROVIDE A COMPLETE INSTALLATION FROM THE GENERATOR ENGINE FLANGE.
- .2 INSTALL A FLEXIBLE CONNECTION ON THE GENERATOR RADIATOR AND PROVIDE ALL DUCTWORK, MOTORIZED DAMPERS, AND WEATHER-PROOF HOODS FOR EXHAUST, OUTSIDE AIR INTAKE AND RECIRCULATING AIR.
- .4 PROVIDE A CONDENSATE DRAIN PIPE FROM THE MUFFLER.

PART 7: CONTROLS SYSTEM

7.1 GENERAL

- .1 PROVIDE ALL THERMOSTATS, SENSORS, ACTUATORS, CONTROLLER, OPERATORS AND ACCESSORIES AS REQUIRED FOR FULL OPERATIONAL SEQUENCE AS DESCRIBED HEREIN.

7.2 PRODUCTS

- .1 WIRING: ALL WIRING TO BE IN ACCORDANCE WITH ELECTRICAL SPECIFICATION.

7.3 EXECUTION

- .1 GENERAL
 - .1 INSTALL SYSTEMS AND RELATED CONTROLS USING FACTORY TRAINED JOURNEYMAN CERTIFIED BY THE PROVINCE OF NEWFOUNDLAND LABRADOR.

7.4 SEQUENCE OF OPERATION

- .1 MOTORIZED DAMPERS FOR CONTROL OPERATION (GENERATOR ROOM)
 - .1 REFER TO DRAWING M1.
- .2 WALL MOUNTED EXHAUST FAN (ELECTRICAL/EQUIPMENT ROOM)
 - .1 IN FAILURE OF HEAT PUMP UNITS AND SPACE THERMOSTAT CALLS FOR COOLING, MOTORIZED DAMPER ASSOACITED TO EXHAUST FAN 100% OPEN, EXHAUST FAN "ON", INTAKE AIR DAMPER 100% OPEN. BOTH DAMPERS ARE CLOSED AND EXHAUST FAN "OFF" WHEN THERMOSTAT REACH TEMPERATURE SET-POINT.
 - .2 EXHAUST FAN "OFF AND BOTH DAMPERS IN CLOSE POSITION WHEN HEAT PUMP UNITS ARE IN OPERATION.



Fisheries
and Oceans
Coast Guard

Pêches
et Océans
Garde côtière



A - INDICATES DETAIL NO.
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ST. LAWRENCE**

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260000 GENERAL

- PERFORM DETAILED VERIFICATION OF WORK PRIOR TO ORDERING THE ELECTRICAL EQUIPMENT AND COMMENCING CONSTRUCTION. VERIFY EQUIPMENT DIMENSIONS WITH THE VENDOR AND ENSURE THE EQUIPMENT WILL FIT IN THE AVAILABLE SPACE. ISSUE A WRITTEN NOTICE TO THE ENGINEER OF ANY DISCREPANCIES.
- SUBMIT SHOP DRAWINGS, PRODUCT DATA AND SAMPLES IN ACCORDANCE WITH SPECIFICATIONS. INDICATE DETAILS OF CONSTRUCTION, DIMENSIONS, CAPACITIES, WEIGHTS AND ELECTRICAL PERFORMANCE CHARACTERISTICS OF EQUIPMENT OR MATERIAL. WHERE APPLICABLE INCLUDE WIRING AND SINGLE LINE DIAGRAMS. ADVERTISING OR SALES LITERATURE WILL NOT BE ACCEPTABLE AS SHOP DRAWINGS.
- PROVIDE ALL LABOR, MATERIAL, EQUIPMENT, INSURANCE AND SERVICES TO COMPLETE ELECTRICAL INSTALLATION IN THE TELECOM EQUIPMENT BUILDING IN ACCORDANCE WITH THE DESIGN AND SPECIFICATIONS AND PRESENT IT AS FULLY OPERATIONAL TO THE SATISFACTION OF THE OWNER.
- CARRY OUT WORK IN ACCORDANCE WITH ALL APPLICABLE CODES STANDARDS, ORDINANCES AND HEALTH & SAFETY RULES.
- COORDINATE THE WORK PERTAINING TO POWER, GROUNDING AND COMMUNICATIONS FOR EQUIPMENT WITH SUPPLIER PRIOR TO ROUGH-IN. FINAL TERMINATIONS TO BE AT THE DIRECTION OF THE EQUIPMENT SUPPLIER.
- PROVIDE ALL CUTTING AND PATCHING NECESSARY FOR THE INSTALLATION OF THE ELECTRICAL WORK. ANY DAMAGE DONE TO THE WORK ALREADY IN PLACE BY REASON OF THIS WORK SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE BY A QUALIFIED TRADESPERSON EXPERIENCED IN SUCH WORK. PATCHING SHALL BE UNIFORM IN APPEARANCE AND SHALL MATCH THE SURROUNDING SURFACE. DO NOT CUT STRUCTURAL MEMBERS WITHOUT APPROVAL OF THE STRUCTURAL ENGINEER.
- FABRICATION AND INSTALLATION OF THE COMPLETE ELECTRICAL SYSTEM SHALL BE DONE IN A FIRST CLASS WORKMANSHIP BY QUALIFIED PERSONNEL EXPERIENCED IN SUCH WORK AND SHALL SCHEDULE THE WORK IN AN ORDERLY MANNER SO AS NOT TO IMPEDE PROGRESS OF THE PROJECT.
- AT THE COMPLETION OF THE ELECTRICAL INSTALLATION PROVIDE THREE SETS OF OPERATION AND MAINTENANCE MANUALS, BOUND IN 3-RING HARD COVER BINDERS, DULY LABELED, AND CONTAINING COMPLETE LIST OF REPLACEMENT PARTS, SHOP DRAWINGS AND CATALOG INFORMATION OF ALL MAJOR EQUIPMENT, SUCH AS, DISTRIBUTION BOARD, GENERATOR, ATS, LUMINARIES, PANEL BOARD, PANEL SCHEDULE, MOTOR STARTERS, SECURITY SYSTEM, CABLE RACKS, ETC.
- COMPLETE INSTALLATION SHALL BE GUARANTEED FOR A PERIOD OF ONE (1) YEAR AFTER THE DATE OF WRITTEN ACCEPTANCE OF THE EQUIPMENT BUILDING BY OWNER. ANY WORK, MATERIAL OR EQUIPMENT FOUND TO BE FAULTY DURING THAT PERIOD SHALL BE CORRECTED AT ONCE, UPON WRITTEN NOTIFICATION, AT THE EXPENSE OF THE CONTRACTOR.

260500 BASIC MATERIALS AND METHODS

- INSTALLATION, MATERIALS, EQUIPMENT AND WORKMANSHIP SHALL CONFORM TO THE APPLICABLE PROVISIONS OF THE LOCAL ELECTRICAL CODE AND THE TERMS, CONDITIONS AND REGULATIONS OF THE AUTHORITY HAVING LAWFUL JURISDICTION PERTAINING TO THE WORK REQUIRED. ALL MATERIAL, EQUIPMENT AND DEVICES SHALL CONFORM TO THE APPLICABLE CSA AND ULC STANDARDS.
- ALL MATERIALS AND EQUIPMENT SHALL BE NEW. MATERIALS AND EQUIPMENT SHALL BE THE STANDARD PRODUCTS OF MANUFACTURER'S CURRENT DESIGN. ANY FIRST-CLASS PRODUCT MADE BY A REPUTABLE MANUFACTURER MAY BE USED PROVIDING IT CONFORMS TO THE DESIGN REQUIREMENTS AND MEETS THE APPROVAL OF THE ENGINEER AND THE OWNER. APPROVALS SHALL BE OBTAINED PRIOR TO PURCHASE.
- ARRANGE CONDUIT, WIRING, EQUIPMENT, AND OTHER WORK GENERALLY AS SHOWN, PROVIDING PROPER CLEARANCES AND ACCESS. CAREFULLY EXAMINE ALL CONTRACT DRAWINGS AND FIT THE WORK IN EACH LOCATION WITHOUT SUBSTANTIAL ALTERATION. WHERE DEPARTURES ARE PROPOSED BECAUSE OF FIELD CONDITIONS OR OTHER CAUSES, PREPARE AND SUBMIT DETAILED DRAWINGS FOR ACCEPTANCE. THE RIGHT IS RESERVED TO MAKE REASONABLE CHANGES IN LOCATION OF EQUIPMENT, CONDUIT, AND WIRING UP TO THE TIME OF ROUGH-IN OR FABRICATION.
- THE CONTRACT DRAWINGS ARE GENERALLY DIAGRAMMATIC AND ALL OFFSETS, BENDS, FITTINGS AND ACCESSORIES ARE NOT NECESSARILY SHOWN. PROVIDE ALL SUCH ITEMS AS MAY BE REQUIRED TO FIT THE WORK TO THE CONDITIONS.
- MOUNTING HEIGHTS OF ALL WIRING DEVICES SHALL BE VERIFIED WITH THE OWNER PRIOR TO INSTALLATION.

260510 IDENTIFICATION

- ALL EQUIPMENT SHALL BE IDENTIFIED USING NAMEPLATES AND LABELS.
- NAMEPLATES SHALL BE 1/8" (3mm) THICK PLASTIC ENGRAVING SHEET, WHITE FACE, BLACK CORE, ENGRAVED WITH EQUIPMENT IDENTIFICATION AND ATTACHED TO EQUIPMENT WITH SELF-TAPPING SCREWS. CHEMICAL ADHESION PLATES ARE NOT ACCEPTABLE. LETTERS SHALL BE MINIMUM 1/4" (6mm) HIGH.
- LABELS SHALL BE EMBOSSED PLASTIC WITH MINIMUM 1/4" (6mm) HIGH LETTERS. LABELS SHALL BE USED FOR IDENTIFYING CONDUIT, CABLES, JUNCTION BOXES, RECEPTACLES, ETC.
- WORDING ON NAMEPLATES AND LABELS MUST BE APPROVED BY THE ENGINEER PRIOR TO MANUFACTURING.

260520 CONDUCTORS AND CONNECTORS

- UNLESS NOTED OTHERWISE, ALL CONDUCTORS SHALL BE COPPER, MINIMUM SIZE #12 AWG, WITH THERMOPLASTIC OR CROSS-LINKED POLYETHYLENE INSULATION CONFORMING TO THE APPLICABLE LOCAL ELECTRICAL CODE. INSULATION SHALL BE RATED FOR 90°C. CONDUCTORS SHALL BE COLOR CODED IN ACCORDANCE WITH THE LOCAL ELECTRICAL CODE.
- UNLESS NOTED OTHERWISE, ALL CONDUCTORS USED FOR GROUNDING SHALL BE COPPER AND SHALL HAVE GREEN INSULATION.
- FOR COPPER CONDUCTORS #6 AWG AND SMALLER USE 3M SCOTCH-LOK OR T&B STA-KON COMPRESSION TYPE CONNECTORS WITH INTEGRAL OR SEPARATE INSULATION CAPS. FOR COPPER CONDUCTORS LARGER THAN #6 AWG USE SOLDERLESS, IDENT HEX SCREW OR BOLT TYPE PRESSURE CONNECTORS OR DOUBLE COMPRESSION C-CLAMP CONNECTORS, UNLESS SPECIFIED OTHERWISE ON DRAWINGS.
- UNLESS NOTED OTHERWISE, ALL LUGS SHALL BE TIN PLATED COPPER, TWO-HOLE, LONG BARREL, COMPRESSION TYPE.
- CONDUCTOR LENGTHS SHALL BE CONTINUOUS FROM TERMINATION TO TERMINATION WITHOUT SPLICES. SPLICES ARE NOT ACCEPTABLE. IF SPLICES ARE UNAVOIDABLE PRIOR APPROVAL FROM THE ENGINEER MUST BE OBTAINED.

262823 SAFETY SWITCHES AND PROTECTIVE DEVICES

- ENCLOSED, NON-FUSIBLE AND FUSIBLE SAFETY (DISCONNECT) SWITCHES SHALL BE CSA APPROVED, SIZED AS INDICATED ON DRAWINGS.
- UNLESS NOTED OTHERWISE, PROVIDE CLASS J TIME DELAY FUSES FOR MAIN FEEDERS; CLASS RK1 TIME DELAY FUSES FOR MOTOR CIRCUITS AND CLASS RK5 NON-TIME-DELAY FOR OTHER BRANCH CIRCUITS.
- PROVIDE TWO (2) SETS OF SPARE FUSES AND A FUSE CABINET FOR EACH LOCATION WHERE FUSES ARE INSTALLED.
- PROVIDE MOLDED CASE, BOLT-ON TYPE, AND THERMAL MAGNETIC TRIP CIRCUIT BREAKERS AS SHOWN AND AS REQUIRED FOR THIS PROJECT. MULTIPLE POLE BREAKERS SHALL BE SINGLE HANDLE, COMMON TRIP. PROVIDE HANDLE LOCKING DEVICES WHERE INDICATED. INTERRUPTING RATING TO MATCH REQUIRED AVAILABLE FAULT CURRENTS.

260534 RACEWAYS, CABLE RACKS AND BOXES

- ALL CONDUIT SHALL BE CSA APPROVED AND ULC LABELED.
- UNLESS NOTED OTHERWISE, CONDUIT INSTALLED ON THE EXTERIOR OF THE EQUIPMENT BUILDING IS PERMITTED TO BE RIGID PVC. CONDUIT INSIDE THE BUILDING IN AREAS WHERE SAFE FROM MECHANICAL DAMAGE SHALL BE EMT. CONDUIT IN IN AREAS OF RISK OF PHYSICAL DAMAGE SHALL BE RIGID STEEL.
- ALL EMPTY CONDUIT INSTALLED FOR FUTURE INSTALLATION OF WIRES AND CABLES SHALL HAVE A PULL CORD. PULL CORD SHALL BE LABELED AT BOTH ENDS FOR EASY IDENTIFICATION.
- ENCLOSURES AND CABINETS SHALL BE MADE OF STEEL BOX WITH REMOVABLE INTERIOR PANEL AND HINGED FRONT COVER, FINISHED INSIDE AND OUT WITH MANUFACTURER'S STANDARD ENAMEL. DOOR SHALL BE EQUIPPED WITH FLUSH LATCH AND CONCEALED HINGE. MANUFACTURERS: HOFFMANN, O-2/GEDNEY, T&B OR APPROVED EQUAL.

262400 SERVICE AND DISTRIBUTION

- VERIFY ALL DIMENSIONS AND CLEARANCES BY FIELD MEASUREMENTS BEFORE INSTALLATION.
- BRANCH CIRCUIT PANELBOARDS SHALL BE OF THE TYPE AND RATINGS AS SHOWN ON DRAWINGS.

263214 EMERGENCY POWER SYSTEM

- OWNER SUPPLIED WITH CONNECTIONS (HVAC/ELEC) AS PART OF THIS CONTRACT.

260528 GROUNDING

- ALL SAFETY GROUNDING OF THE ELECTRICAL EQUIPMENT SHALL BE CARRIED OUT IN ACCORDANCE WITH THE LATEST EDITION OF THE LOCAL ELECTRICAL CODE.
- ALL LIGHTNING PROTECTION SYSTEM GROUNDING SHALL BE CARRIED OUT IN ACCORDANCE WITH THE LATEST ISSUE OF CAN/CSA – B72.
- DC OR REFERENCE GROUNDING SHALL BE DONE IN ACCORDANCE WITH DC PLANT MANUFACTURER'S GROUNDING STANDARDS AND AS REQUIRED BY THE OWNER.
- MAINTAIN OWNER'S INSTRUCTIONS FOR ALL GROUNDING RELATED REQUIREMENTS.
- ALL INTERIOR GROUNDING AND BONDING CONDUCTORS SHALL BE CONNECTED USING HEAVY-DUTY COMPRESSION FITTINGS. MECHANICAL OR SOLDER TYPE CONNECTIONS ARE NOT PERMITTED.
- ALL GROUND BARS SHALL BE AS SHOWN ON THE DRAWINGS.
- IN ORDER TO MITIGATE HIGH FREQUENCY NOISE EFFECTIVELY THE GROUNDING CONDUCTORS SHALL BE RUN AS STRAIGHT AS POSSIBLE WITH MINIMUM NUMBER OF DIRECTION CHANGES. SHARP 90° BENDS OR KINKS ARE NOT PERMITTED. WHEN THE DIRECTION OF THE CONDUCTOR MUST CHANGE, IT SHALL BE DONE GRADUALLY. MINIMUM BENDING RADIUS OF GROUNDING CONDUCTORS OTHER THAN THE ELECTRICAL SAFETY GROUND CONDUCTORS SHALL BE AS FOLLOWS:

CONDUCTOR SIZE	MINIMUM BENDING RADIUS TO INSIDE EDGE
#12 AWG TO #8 AWG	3" (75mm)
#6 AWG TO #1/0 AWG	6" (150mm)
#2/0 AWG TO 750 KCMIL	12" (300mm)

- ALL GROUND LUG AND COMPRESSION CONNECTIONS SHALL BE COATED WITH ANTI-OXIDANT AGENT, SUCH AS NO-OX, NOALOX, PENETROX OR KOPRSIELD.

266000 TESTING AND COMMISSIONING

- CARRY OUT TESTING AND COMMISSIONING OF ALL MAJOR ELECTRICAL EQUIPMENT SUCH AS DISTRIBUTION BOARDS, GENERATOR, AUTOMATIC TRANSFER SWITCH, MOTOR STARTERS ETC. ENGAGE THE SERVICES OF SUPPLIERS OF EQUIPMENT IN FACILITATING TESTING AND COMMISSIONING.
- COORDINATE ALL TESTING PROCEDURES AND TIMES WITH THE EQUIPMENT SUPPLIER.
- INCLUDE TESTING AND COMMISSIONING REPORTS IN THE OPERATIONS AND MAINTENANCE MANUALS.

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

281300 SECURITY SYSTEM

- SECURITY SYSTEM MANUFACTURER/SUPPLIER IS TO BE SELECTED BY THE OWNER DURING THE COURSE OF THE PROJECT.
- PROVIDE PULL CORD IN ALL EMPTY CONDUIT RUNS. LABEL PULL CORD AT BOTH ENDS FOR EASY IDENTIFICATION.
- OWNER'S SECURITY SYSTEM CONTRACTOR SHALL BE RESPONSIBLE FOR SUPPLY, INSTALLATION, TERMINATION, TESTING AND COMMISSIONING OF THE SECURITY SYSTEM.



A – INDICATES DETAIL NO.
B – INDICATED SHEET DETAIL IS REQUIRED
C – INDICATES SHEET DETAIL IS DRAWN

2	REVISED	28/10/2020	MH	RB
1	ISSUED FOR CONSTRUCTION	17/06/19	JS	RN
0	ISSUED FOR TENDER	16/08/17	JS	RN
no. no	revision revision	date date	by par	approved approve

Project – projet
MCTS GENERATOR BLDG
ST. LAWRENCE

Drawing – dessin
ELECTRICAL NOTES

drawn – dessine	J.S.	designed – dessine par	M.M.
date – date	MAY 2017	checked – vérifie	R.N.
scale – echelle	AS SHOWN	approved for tender – approuve pour l'offre	R.N.
project no. – projet no.	drawing no. – no du dessin	sheet – feuille	
	01L1402B02916–N3	16 OF 16	

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 07 92 10 - Joint Sealing.

1.2 MEASUREMENT PROCEDURES

- .1 No measurement will be made under this Section. Include costs in items of work for which concrete formwork is required.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-[94], Concrete Materials and Methods of Concrete Construction.
 - .2 CAN/CSA-O86.1-[94], Engineering Design in Wood (Limit States Design).
 - .3 CSA O121-[M1978], Douglas Fir Plywood.
 - .4 CSA O151-[M1978], Canadian Softwood Plywood.
 - .5 CSA O153-[M1980], Poplar Plywood.
 - .6 CAN3-O188.0-[M78], Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard.
 - .7 CSA O437 Series-[93], Standards for OSB and Waferboard.
 - .8 CAN/CSA-S269.3-[M92], Concrete Formwork.
- .2 Council of Forest Industries of British Columbia (COFI)
 - .1 COFI Exterior Plywood for Concrete Formwork.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings for formwork in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.
- .3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
- .4 Indicate sequence of erection and removal of formwork as directed by Engineer.
- .5 Each shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.

Part 2 Products**2.1 MATERIALS**

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.
- .2 Pan forms: removable as indicated.
- .3 Form ties:
 - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.
 - .2 All such devices shall be arranged to prevent such that when the forms are removed, no permanently embedded tie metal shall be less than 15mm from the form face.
- .4 Form release agent: non-toxic, biodegradable, low VOC.
- .5 Sealant: to Section 07 92 10 - Joint Sealing.

Part 3 Execution**3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork and ensure dimensions agree with drawings.
- .2 Obtain Engineer's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Do not place shores and mud sills on frozen ground.
- .5 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .6 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.

□

CONCRETE FORMING AND ACCESSORIES

- .7 Align form joints and make watertight. Keep form joints to minimum.
- .8 Use 25 mm chamfer strips on external corners unless specified otherwise.
- .9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .10 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .11 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.

3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 7 days for slabs, decks and other structural members, or 3 days when replaced immediately with adequate shoring to standard specified for falsework.
- .2 Remove formwork when concrete has reached 90 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .4 Space reshoring in each principal direction at not more than 3000 mm apart.
- .5 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 315R-[80], Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
- .2 American National Standards Institute/American Concrete Institute (ANSI/ACI)
 - .1 ANSI/ACI 315-[80], Details and Detailing of Concrete Reinforcement.
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 775/A 775M- [91c], Specification for Epoxy-Coated Reinforcing Steel Bars.
- .4 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-[94], Concrete Materials and Methods of Concrete Construction.
 - .2 CAN3-A23.3-[94], Design of Concrete Structures for Buildings.
 - .3 CSA G30.3-[M1983(R1991)], Cold Drawn Steel Wire for Concrete Reinforcement.
 - .4 CSA G30.5-[M1983(R1991)], Welded Steel Wire Fabric for Concrete Reinforcement.
 - .5 CSA G30.14-[M1983(R1991)], Deformed Steel Wire for Concrete Reinforcement.
 - .6 CSA G30.15-[M1983(R1991)], Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
 - .7 CAN/CSA-G30.18-[M92], Billet-Steel Bars for Concrete Reinforcement.
 - .8 CAN/CSA-G40.21-[M92], Structural Quality Steels.
 - .9 CAN/CSA-G164-[M92], Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .10 CSA W186-[M1990], Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00- Submittal Procedures.
- .2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Engineer, with identifying code marks to permit correct placement without reference to structural drawings. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada.

CONCRETE REINFORCING

- .3 Detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise indicated.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 MATERIALS**

- .1 Substitute different size bars only if permitted in writing by Engineer.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to CSA G30.3.
- .4 Deformed steel wire for concrete reinforcement: to CSA G30.14.
- .5 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
- .6 Mechanical splices: subject to approval of Engineer.
- .7 Plain round bars: to CAN/CSA-G40.21.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada..
- .2 Obtain Engineer's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Engineer, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

- .1 Upon request, provide Engineer with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.
- .2 Upon request inform Engineer of proposed source of material to be supplied.

CONCRETE REINFORCING

Part 3 Execution**3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Engineer.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN/CSA-A23.1.
- .2 Prior to placing concrete, obtain Engineer's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 03 10 00 - Concrete Forming and Accessories.
- .2 Section 03 20 00 - Concrete Reinforcing.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C109/C109M-[95], Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens).
 - .2 ASTM C260-[94], Specification for Air-Entraining Admixtures for Concrete.
 - .3 ASTM C309-[94], Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .4 ASTM C332-[87(1991)], Specification for Lightweight Aggregates for Insulating Concrete.
 - .5 ASTM C494-[92], Specification for Chemical Admixtures for Concrete.
 - .6 ASTM C827-[95a], Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.
 - .7 ASTM C939-[94a], Test Method for Flow of Grout for Preplaced-Aggregate Concrete.
 - .8 ASTM D412-[92], Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
 - .9 ASTM D624-[91], Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .10 ASTM D1751-[83(1991)], Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - .11 ASTM D1752-[84(1992)], Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2-[M88], Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
 - .2 CAN/CGSB-51.34-[M86], Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .3 CGSB 81-GP-1M-[77], Flooring, Conductive and Spark Resistant.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A5-[93], Portland Cement.
 - .2 CAN/CSA-A23.1-[94], Concrete Materials and Methods of Concrete Construction.
 - .3 CAN/CSA-A23.2-[94], Methods of Test for Concrete.

CAST-IN-PLACE CONCRETE

- .4 CAN/CSA-A23.5-[M86(R1992)], Supplementary Cementing Materials.
- .5 CAN/CSA A363-[M88(R1996)], Cementitious Hydraulic Slag.

1.3 CERTIFICATES

- .1 Submit certificates in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Minimum 4 weeks prior to starting concrete work submit to Engineer manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
 - .1 Portland cement.
 - .2 Grout.
 - .3 Admixtures.
 - .4 Aggregates.
 - .5 Water.
 - .6 Waterstops.
 - .7 Waterstop joints.
 - .8 Joint filler.
- .3 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1.
- .4 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

1.4 QUALITY ASSURANCE

- .1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01 45 00 - Quality Control for Engineer's approval for following items:
 - .1 Falsework erection.
 - .2 Curing.
 - .3 Finishes.
 - .4 Formwork removal.
 - .5 Joints.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Use excess concrete for: post footing anchorage, step footing.
- .3 Use trigger operated spray nozzles for water hoses.
- .4 Designate a cleaning area for tools to limit water use and runoff.
- .5 Carefully coordinate the specified concrete work with weather conditions.

CAST-IN-PLACE CONCRETE

- .6 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.
- .7 Choose least harmful, appropriate cleaning method which will perform adequately.

Part 2 Products**2.1 MATERIALS**

- .1 Portland cement: to CAN/CSA-A5.
- .2 Water: to CAN/CSA-A23.1.
- .3 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density.
- .4 Air entraining admixture: to ASTM C260.
- .5 Chemical admixtures: to ASTM C494. Engineer to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .6 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 27.5 MPa at 28 days.
- .7 Curing compound: to CAN/CSA-A23.1 white and to ASTM C309, Type 1-chlorinated rubber.
- .8 Pre-moulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
- .9 Weep hole tubes: galvanized steel or plastic.

2.2 MIXES

- .1 Proportion normal density concrete in accordance with CAN/CSA-A23.1 to give following properties for all concrete:
 - .1 Cement:
 - .1 Type 10 Portland cement.
 - .2 Minimum compressive strength at 28 days: 30 MPa.
 - .3 Class of exposure: F2.
 - .4 Nominal size of coarse aggregate: 20 mm.
 - .5 Slump at time and point of discharge: 50 to 75 mm.
 - .6 Air content: 4 to 7 %.
- .2 Do not change concrete mix without prior approval of Engineer. Should change in material source be proposed, new mix design to be approved by Engineer.

CAST-IN-PLACE CONCRETE

- .3 Do not use calcium chloride.
- .4 When the Contractor wishes to mix concrete on site, he shall identify the source of aggregates and submit samples of fine and coarse aggregates to a testing laboratory for testing and trial mixes in order to determine a suitable mix design. The testing laboratory, at Contractor's cost, will test the trial mix for slump, air content, density and strength. The results of these tests will be submitted to the Engineer to be reviewed for compliance with the specification. This review must be completed before permission to place concrete is permitted.

Part 3 Execution**3.1 PREPARATION**

- .1 Obtain Engineer's approval before placing concrete. Provide 48 hours notice prior to placing of concrete.
- .2 Pumping of concrete is permitted only after approval of equipment and mix.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Engineer's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 Do not place load upon new concrete until authorized by Engineer.

3.2 CONSTRUCTION

- .1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1.
- .2 Anchor bolts.
 - .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
 - .2 With approval of Engineer, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be minimum 25 mm larger in diameter than bolts used to manufacturers' recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with shrinkage compensating grout.
- .3 Finishing.
 - .1 Finish concrete in accordance with CAN/CSA-A23.1.
 - .2 Use procedures acceptable to Engineer or those noted in CAN/CSA-A23.1 to remove excess bleed water. Ensure surface is not damaged.

CAST-IN-PLACE CONCRETE

- .3 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .4 Waterstops.
 - .1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.

3.3 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Engineer in accordance with CAN/CSA-A23.1 and Section 01 45 00 - Quality Control.
- .2 Engineer will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures: Testing Laboratory Services.
- .3 Engineer will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .4 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.
- .5 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .3 Section 01 56 00 - Temporary Barriers and Enclosures.
- .4 Section 01 35 43 - Environmental Procedures.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-[95], Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-[96a], Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-[98], Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-[00a], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557-[00], Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D4318-[00], Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A3000-[98]-A5-[98], Portland Cement.
 - .2 CAN/CSA-A23.1-[00], Concrete Materials and Methods of Concrete Construction.

1.3 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock : any solid material in excess of 0.25 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

EXCAVATING, TRENCHING AND BACKFILLING

- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Unsuitable materials:
 - .1 Weak and compressible materials under excavated areas.
 - .2 Frost susceptible materials under excavated areas.
 - .3 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 : Sieve sizes to CAN/CGSB-8.1.
 - .2 Table

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45
 - .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .7 Unshrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 SUBMITTALS

- .1 Samples:
 - .1 Inform Engineer at least 4 weeks prior to commencing Work, of proposed source of fill materials and provide access for sampling.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

1.6 PROTECTION OF EXISTING FEATURES

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Existing buried utilities and structures:

EXCAVATING, TRENCHING AND BACKFILLING

- .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to commencing excavation Work, notify applicable Owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .3 Confirm locations of buried utilities by careful test excavations.
 - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .5 Where utility lines or structures exist in area of excavation, obtain direction of Engineer before re-routing. Costs for such Work to be paid by Owner.
 - .6 Record location of maintained, re-routed and abandoned underground lines.
 - .7 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
- .1 Conduct, with Engineer, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair to approval of Owner.

Part 2 Products**2.1 MATERIALS**

- .1 Type 1 fill material around foundations and in trench, common: pit run natural or blended sand or gravel consisting of clean, hard, durable particles; free from clay lumps, cementation or organic material, having less than 10% by weight passing number (200) 0.075 mm sieve, capable of being compacted to degree as specified herein and meeting approval of Engineer. Backfill may consist of selected materials from excavations, suitable to Engineer for use intended, free from frozen materials, cinders, ashes, organic material, refuse, or other deleterious substances.
- .2 Type 2 fill material for cable trench bedding to be used as bedding and overlay for cable to be blended sand, free from unsuitable material.
- .3 Type 3 fill: selected material from excavation or other sources, approved by Engineer for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

Part 3 Execution**3.1 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 STRIPPING OF TOPSOIL

- .1 Commence topsoil stripping of areas as directed by Engineer after area has been cleared of brush, grasses and removed from site.
- .2 Strip topsoil to depths as directed by Engineer. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Engineer. Stockpile height not to exceed 2 m.
- .4 Dispose of unused topsoil as directed by Engineer.

3.3 STOCKPILING

- .1 Stockpile fill materials in areas designated by Engineer. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

3.4 SHORING, BRACING AND UNDERPINNING

- .1 Construct temporary Works to depths, heights and locations as required to carry out work.
- .2 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site and restore water courses as indicated and as directed by Engineer.

3.5 DEWATERING

- .1 Keep excavations free of water while Work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.

3.6 EXCAVATION

- .1 Advise Engineer at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 For trench excavation, unless otherwise authorized by Engineer in writing, do not fill in trench until cables have been inspected and tested.
- .5 Keep excavated and stockpiled materials a safe distance away from edge of trench as directed by Engineer.
- .6 Restrict vehicle operations directly adjacent to open trenches.
- .7 Dispose of surplus and unsuitable excavated material in approved location on site.

EXCAVATING, TRENCHING AND BACKFILLING

- .8 Do not obstruct flow of surface drainage or natural watercourses.
- .9 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .10 Notify Engineer when bottom of excavation is reached.
- .11 Obtain Engineers approval of completed excavation.
- .12 Remove unsuitable material from trench bottom to extent and depth as directed by Engineer.
- .13 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under other areas with Type 1 fill compacted to not less than 95 % of corrected maximum dry density.
- .14 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Engineer.
- .15 Where existing cables are located/encountered, excavate by hand 1 m each side of the cable(s).

3.7 FILL TYPES AND COMPACTION

- .1 Use fill of types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698.
 - .1 Under footings: provide 150 mm compacted thickness base course of Type 1 fill to underside of footing. Compact base course to 100 %.

3.8 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.

3.9 BACKFILLING

- .1 Do not proceed with backfilling operations until Engineer has inspected and approved installations.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

EXCAVATING, TRENCHING AND BACKFILLING

- .5 Backfilling around installations.
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 600 m.
- .6 Place unshrinkable fill in areas as indicated.
- .7 Consolidate and level unshrinkable fill with internal vibrators.

3.10 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 19 - Construction/Demolition Waste Management And Disposal, trim slopes, and correct defects as directed by Engineer.
- .2 Replace topsoil as directed by Engineer.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Clean and reinstate areas affected by Work as directed by Engineer.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A3000-98(April 2001), Cementitious Materials Compendium. Includes:
 - .1 CAN/CSA-A5-98, Portland Cement
 - .2 CSA A23.1/A23.2-00(June 2001), Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .3 CSA G30.3-M1983(R1998), Cold-Drawn Steel Wire for Concrete Reinforcement.
 - .4 CSA G30.5-M1983(R1998), Welded Steel Wire Fabric for Concrete Reinforcement.
 - .5 CAN/CSA-G30.18-92(R1998), Billet-Steel Bars for Concrete Reinforcement.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - 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 paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Consultant.
- .5 Divert unused and broken concrete materials from landfill to local quarry facility as approved by Consultant.
- .6 Divert unused aggregate materials from landfill to facility for reuse as approved by Consultant.
- .7 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products**2.1 PVC DUCT FITTINGS**

- .1 Rigid PVC conduits to CSA C22.2, 211.2 and CSA C22.2, 2.11.0 FT4 encased in reinforced concrete, opaque solvent welded type couplings, bell end fittings, plugs, caps, adaptors as required to make complete installation. Size as indicated on drawings. Type DB2 (thinwall) PVC ducts are unacceptable.
- .2 Expansion joints.
- .3 Rigid PVC 5 degree angle couplings.
- .4 Acceptable material:
 - .1 Ipex (Scepter Rigid PVC Conduit).

2.2 MARKERS

- .1 Provide 150 mm wide, 4 mil, polyethylene marker tape in all trenches. Use red colored tape. Install at depth as per drawings.

Part 3 Execution**3.1 INSTALLATION GENERAL**

- .1 Install underground duct banks including formwork.
- .2 Build duct bank on undisturbed soil or on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.
- .3 Open trench completely to be connected before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.
- .4 Prior to laying ducts, construct "mud slab" not less than 75 mm thick.
- .5 Install ducts at elevations and with slope as indicated and minimum slope of 1 to 400.
- .6 Install base spacers at maximum intervals of 1.5 m levelled to grades indicated for bottom layer of ducts.
- .7 Lay PVC ducts with configuration and reinforcing as indicated with preformed interlocking, rigid plastic intermediate spacers to maintain spacing between ducts at not less than 75 mm horizontally and vertically. Stagger joints in adjacent layers at least 150 mm and make joints

- watertight. Encase duct bank with concrete cover as per drawings. Use rigid galvanized steel epoxy coated conduit for sections extending above finished grade (underneath structure).
- .8 Make transpositions, offsets and changes in direction using 5 degree bend sections, do not exceed a total of 20 degree with duct offset.
 - .9 Use conduit to duct adapters when connecting to conduits.
 - .10 Cut, ream and taper end of ducts in field in accordance with manufacturer's recommendations, so that duct ends are fully equal to factory-made ends.
 - .11 Allow concrete to attain 50% of its specified strength before backfilling.
 - .12 Use anchors, ties and trench jacks as required to secure ducts and prevent moving during placing of concrete. Tie ducts to spacers with twine or other non-metallic material. Remove weights or wood braces before concrete has set and fill voids.
 - .13 Clean ducts before laying. Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.
 - .14 Immediately after placing of concrete, pull through each duct wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Avoid disturbing or damaging ducts where concrete has not set completely. Pull stiff bristle brush through each duct immediately before pulling-in cables.
 - .15 In spare duct and duct for telephone service install pull rope continuous throughout each duct run with 3 m spare rope at each end.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 211.1-M1984(R1999), Rigid Types EBI and DB2/ES2 PVC Conduit.
 - .2 CSA C22.2 No. 211.3-96(R2000), Reinforced Thermosetting Resin Conduit (RTRC) and Fittings (Bi-national standard, with UL 1684).

1.3 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Dispose of unused solvent cement at an official hazardous material collections sites as approved by Engineer. Do not dispose of unused solvent cement into sewer system, into streams, lakes, onto ground or in other location where they will pose health or environmental hazard.

Part 2 Products**2.1 PVC DUCTS AND FITTINGS**

- .1 Rigid PVC duct: to CSA C22.2 No. 211.1, Type DB2/ES2, with moulded fittings, for direct burial.
 - .1 Accepted Materials: Ipex (Scepter Rigid PVC Conduit).
- .2 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make complete installation.
- .3 Rigid PVC 90° and 45° bends.
- .4 Rigid PVC 5° angle couplings.
- .5 Expansion joints as indicated.

DIRECT BURIED UNDERGROUND CABLE DUCTS

2.2 CABLE PULLING EQUIPMENT

- .1 6 mm stranded nylon pull rope tensile strength 5 kN.

2.3 MARKERS

- .1 Provide 150 mm wide, 4 mil, polyethylene marker tape in all trenches. Use red colored tape. Install at depth as per drawings.

Part 3 Execution**3.1 INSTALLATION**

- .1 Install conduit as indicated and in accordance with manufacturer's instructions.
- .2 Clean inside of ducts before laying.
- .3 Ensure full, even support every 1.5m throughout duct length.
- .4 Slope ducts with 1 to 400 minimum slope.
- .5 During construction, cap ends of ducts to prevent entrance of foreign materials.
- .6 Pull through each duct a wooden mandrel, not less than 300mm long and of diameter 6mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth, and other foreign matter. Pull stiff bristle brush through each duct immediately before pulling in cables.
- .7 In each duct, install pull rope continuous throughout each duct run with 3m spare rope at each end.
- .8 Install markers as required.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Provision of rigid conduit - encased underground service ducts.

1.2 RELATED SECTIONS

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Section 33 65 76 - Direct Buried Underground Cable Ducts.
- .3 Section 26 05 01 - Common Work Results - Electrical.
- .4 Section 26 05 44 - Installation of Cables in Trenches and in Ducts.
- .5 Section 26 05 28 - Grounding - Secondary.
- .6 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA A23.1/A23.2-00(June 2001), Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

1.4 REGULATORY REQUIREMENTS

- .1 Co-ordinate and meet requirements of power supply authority. Ensure availability of power when required.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 MATERIALS**

- .1 Underground ducts: to Section 33 65 76 - Direct Buried Underground Cable Ducts, size as indicated.
- .2 Conductors: copper, type RW90, to Section 26 05 21 - Wires and Cables (0-1000V), size and number of conductors as indicated.
- .3 Meter socket: weatherproof, to requirement of the Utility.
- .4 Concrete: to CSA A23.1/A23.2.

UNDERGROUND ELECTRICAL SERVICE

- .5 Pole: Jack pine, red pine, or southern yellow pine, class 4, pressure or vacuum treated with pentachlorophenol preservatives.
- .6 Length as indicated on drawings.

Part 3 Execution**3.1 INSTALLATION**

- .1 Install cables in trenches and in conduit in accordance with Section 26 05 44 - Installation of Cables in Trenches and in Ducts.
- .2 Allow adequate conductor length for connection to supply by power supply authority.
- .3 Install meter socket and conduit.
- .4 Allow adequate conductor length for connection to service equipment.
- .5 Make grounding connections in accordance with Section 26 05 28 - Grounding - Secondary.
- .6 Provide concrete encasement in accordance with CSA A23.1, where indicated on drawings.

3.2 UTILITY POLES

- .1 Locate and dig pole hole as directed by Engineer. Make holes large enough to allow space for tamping backfill.
- .2 Set poles to depth as indicated.
- .3 Replace backfill in 150 mm layers. Tamp each layer and apply final layer to drain water from pole.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Perform additional tests if required by authority having jurisdiction.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Title and description of Mechanical Work.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.

1.3 GENERAL

- .1 This Section is intended to provide a general description of the mechanical work for this project. It is not intended to be a concise and exact scope of work. This is further defined on the drawings and in other sections of this specification.
- .2 This contractor is responsible for the total supply and installation of all equipment covered in these specifications and drawings.
- .3 Coordinate the installation of all mechanical equipment required for commissioning by others.
- .4 Be responsible for commissioning of all mechanical equipment supplied under this contract.
- .5 Coordinate the commissioning of the ventilation systems with the General Contractor and Electrical.

1.4 VENTILATION

- .1 This Contractor shall supply and install all ventilation equipment as required. The work generally consists of materials and labour to complete the system as outlined and shall include, but not necessarily be limited to, the following:
 - .1 Supply and install all fans, dampers and damper motors required to provide complete ventilation systems for the equipment shelter.

1.5 FIRE PROTECTION

- .1 Supply and install all fire extinguishers as indicated in the plans.

1.6 ENGINEER'S DRAWINGS & SPECIFICATIONS

- .1 The Engineer's drawings accompanying these specifications are not arranged to be entirely free from inaccuracies and no claim by this trade, based upon slight differences between the Engineer's drawings and the architectural drawings, or between the Engineer's drawings and the actual measurements of the building, will be entertained.
- .2 This trade will note that while the location of piping, fixtures, ductwork, etc., and any other equipment as shown on the Engineer's drawings, is essentially correct, such

SUMMARY OF MECHANICAL WORK

indicated location must be regarded as approximate in order to provide for a reasonable amount of flexibility to accommodate mechanical structural and architectural conditions prevailing at the time of installation.

- .3 This trade will be prepared to alter his installation, from those shown on the drawings to any other arrangement, as requested by the Owner or his representatives, without extra cost to the Owner, provided always, that this trade is not required to change anything already installed with approval or to add any equipment or materials that would not have been required in the original arrangement.
- .4 This trade will not make any changes to the work as shown on the drawings which require either more labour and/or materials or which constitute a major deviation from the drawings or specifications without first obtaining written approval from the Owner or his representatives.
- .5 On the drawings, figures dimensions will take preference over scaled dimensions. Where dimensions may be changed in other parts of the work, including his own work, this trade will establish new dimensions, where required, by taking measurements as applicable, notwithstanding any dimensions or measurements, either figured or scaled, indicated by the drawing.

1.7 REVISIONS

- .1 Revisions to the drawings and addenda to the contract may be made by the Owner or his representatives at any time during the progress of the work, and copies of such revisions and/or addenda will be furnished to this trade and will become part of the contract documents. After this trade has received revisions and/or addenda, he becomes fully responsible for the incorporation of these changes into the work and will thereafter bear all costs and expenses that might be incurred by using superseded drawings or specifications.

1.8 DISCREPANCIES OR ERRORS

- .1 This trade shall check all drawings for omissions, errors or discrepancies and shall, if any are discovered, report them immediately to the Owner or his representatives. This trade shall not continue any work that may be affected by such omissions, errors or discrepancies until corrections have been made or written instructions received from the Owner or his representatives. This trade will be held responsible for all errors which could have been avoided by reporting an obvious error, omission or discrepancy.

1.9 ORDERS AND INSTRUCTIONS

- .1 In the event of any dispute, no order or instructions given to this trade will be considered binding, except those given in writing. No order or instruction, of any kind, relating to the work, whether given in writing or not, will be considered binding, except those given by the Owner or his representatives.

1.10 APPROVAL

- .1 Wherever the term "approval" appears in these documents, it shall mean approval by the Owner or his representative. This trade will submit all required data, samples, etc.,

SUMMARY OF MECHANICAL WORK

pertaining to any material or equipment that is subject to approval, so that a decision may be made to accept or reject.

- .2 Acceptance of any material or equipment shall not constitute any obligation by, nor be binding upon the Owner, in the event of:
 - .1 Any misrepresentation by this trade or failure by this trade to provide complete information, relative to seeking acceptance for such material or equipment.
 - .2 Defective material, equipment or workmanship.
 - .3 Failure of the accepted material or equipment to integrate properly with the work in general, because of construction or installation difficulties.

1.11 LAYOUT OF WORK

- .1 This trade shall layout the work and will be responsible for the accuracy of such layout. The layout shall be as indicated on the drawings and/or directed by the Owner or his representatives. All piping shall be surface mounted on the walls and ceiling.
- .2 All equipment shall be located as shown on the plans. Before locating equipment, shop drawings and the equipment itself should be carefully examined to ensure proper space for maintenance and operation. Equipment located in such a manner that it is not easily accessible for proper maintenance shall be relocated without cost to the Owner.

1.12 CO-OPERATION WITH OTHER TRADES

- .1 The trades of this division shall familiarize themselves with the requirements of the work pertaining to other trades to ensure that their work shall proceed without hindrance to, or interference with, the work of other trades.

1.13 OPENINGS & PASSAGES

- .1 The trades of this division will be responsible for the location of all openings, holes, passages, sleeves, etc., to accommodate their work and shall advise the general contractor, or others as may be appropriate, so that all such openings can be provided at the proper time and in the proper location, consistent with the scheduling of the work, and the requirements of the contract documents. All openings to be fibreglass sealed to prevent water from entering the wall cavity.

1.14 WORK BY OTHERS

- .1 All wiring, high and low voltage, shall be by Electrical. Refer to the control diagrams on the drawings.

1.15 PROTECTION FROM LIENS

- .1 This trade shall identify and save harmless the Owner from and against all liens, claims, losses, costs, damages, court proceedings, or actions of any kind arising out of or relating to this trade's activities in the execution of this contract, other than those arising from a defect in the title to the site of the work or infringement of a patent arising from a design supplied by the Owner.

SUMMARY OF MECHANICAL WORK

1.16 CLAIMS AGAINST THIS TRADE

- .1 This trade shall ensure that all lawful claims against him arising out of the work are discharged and satisfied and he shall supply the Owner with a Statutory Declaration that all such obligations and claims have been met and discharged in full.
- .2 The Owner reserves the right to pay any outstanding obligations and/or claims arising out of or from the execution of the work, from this trade's payments and/or holdbacks.

1.17 TESTS

- .1 Perform all tests required by any law or ordinance or by any public authority or by these specifications. Tests shall be performed as called for in these specifications, in the manner outlined, or as may be directed by the Owner at no additional cost to the Owner. All tests and balancing of systems shall be done by competent Tradesmen or Engineers whose qualifications are approved by the Owner.

1.18 RESPONSIBILITY UNTIL ACCEPTANCE

- .1 All equipment and systems supplied under this division shall be maintained, operated and protected by this trade until the building is taken over by the Owner.
- .2 Equipment operators shall be acceptable to all authorities having jurisdiction.

1.19 PROTECTIVE DEVICES

- .1 Whether or not specifically called for in these specifications all rotating and moving equipment shall be provided with all accessories required for protection against injury from rotation and/or moving parts. This shall include guards for belt-driven equipment, fly wheels, etc.

1.20 IDENTIFICATION OF EQUIPMENT

- .1 Manufacturer's Nameplates:
 - .1 Provide on each piece of equipment. Include registration plates (eg. pressure vessel), Underwriter's Laboratories and CSA approved plates) as required by respective agency and as specified.
 - .2 Do not apply insulation or paint over plates.
 - .3 Indicate size, equipment model, manufacturer's name, serial number, voltage cycle, phase and power of motors, all factory supplied.
 - .4 Fasten to equipment according to code requirements.
 - .5 Locate nameplates so that they are easily read.
- .2 System Nameplates:
 - .1 Fasten nameplates securely in a conspicuous place.
 - .2 Electrically driven equipment shall be identified with Lamicoid labels similar to those provided at starting equipment and shall identify the system as well as the equipment.

SUMMARY OF MECHANICAL WORK

1.21 CODES AND BY-LAWS

- .1 All work and materials shall conform to Provincial codes and community bylaws where applicable. In the absence of Provincial codes, community bylaws, or other applicable standards enforceable by law, all work shall conform to the requirements of the National Building Code of Canada. Where there is conflict between the codes, or drawings, and specifications, the one with the highest standards will govern. This trade shall obtain and pay for all permits or other fees required by any authority having jurisdiction.

1.22 EXAMINATION

- .1 The bidder shall be thoroughly familiar with the details of the project, and with all other matters, contracts, etc., which can in any way affect his work, as covered by this division of the specification. No claim of any kind attributable to the bidder's lack of knowledge of the site, other contracts, or construction details, will be considered.

1.23 GUARANTEE

- .1 Unless longer guarantee periods have been provided elsewhere in the Contract Documents, this Trade shall guarantee all his work, materials and equipment for a period of one year after date of acceptance by the Owner. Any defects, of whatsoever kind, which appears during this period shall be corrected by this Trade at no expense to the Owner. Regardless of the date of acceptance, this equipment must operate a full year cycle of normal plant operation without defect or trouble. Should any defect or trouble be experienced, this Trade will correct same at its expense.

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 74 19 - Construction/Demolition Waste Management And Disposal.
- .3 Section 01 78 00 - Closeout Submittals.
- .4 Section 09 91 23 - Interior Painting.

1.2 EQUIPMENT LIST

- .1 Complete list of equipment and materials to be used on this project and forming part of tender documents by adding manufacturer's name, model number and details of materials, and submit for approval.
- .2 Submit for approval within 10 days after award of contract.

1.3 TRIAL USAGE

- .1 Engineer may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

1.4 PROTECTION OF OPENINGS

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

1.5 PAINTING

- .1 To Section 09 91 23 - Interior Painting.
- .2 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

1.6 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

- .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 Where specified elsewhere in Division 23, manufacturers to provide demonstrations and instructions.
- .3 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.

1.7 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual to be approved by, and final copies deposited with, Engineer before final inspection.
- .3 Operation data to include:
 - .1 Control schematics for each system including environmental controls.
 - .2 Description of each system and its controls.
 - .3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for each system and each component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
- .4 Maintenance data shall 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.
- .5 Performance data to include:
 - .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified elsewhere.
- .6 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Engineer for approval. Submission of individual data will not be accepted unless so directed by Engineer.
 - .2 Make changes as required and re-submit as directed by Engineer.
- .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

1.8 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings and product data shall show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances. eg. access door swing spaces.

- .3 Shop drawings and product data shall be accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify as to current model production.
 - .5 Certification of compliance to applicable codes.

1.9 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

1.10 AS-BUILT DRAWINGS

- .1 Site records:
 - .1 Engineer will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of the work. Mark there on all changes as work progresses and as changes occur. This shall include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection at all times.
- .2 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing (TAB), 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 Engineer for approval and make corrections as directed.
 - .4 TAB to be performed using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .3 Submit copies of as-built drawings for inclusion in final TAB report.

1.11 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Engineer.
- .3 Dispose of unused paint material at official hazardous material collections site approved by Engineer.

COMMON WORK RESULTS - MECHANICAL

- .4 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.
- .5 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .6 Dispose of packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

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 Materials and installation of low-pressure metallic ductwork, joints and accessories.
- .2 Related Sections:
 - .1 Section 01 33 00 - Submittal Procedures.
 - .2 Section 01 35 30 - Health and Safety Requirements.
 - .3 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
 - .4 Section 02 61 33 - Hazardous Materials.

1.2 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A480/A480M-[03c], Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A635/A635M-[02], Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
 - .3 ASTM A653/A653M-[03], Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33 .
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Fire Protection Association (NFPA).
 - .1 NFPA 90A-[02], Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-[02], Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
 - .3 NFPA 96-[01], Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition [1995] and Addendum No. 1, [1997].
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, [1985], 1st Edition.
 - .3 IAQ Guideline for Occupied Buildings Under Construction [1995], 1st Edition.

- .7 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 SUBMITTALS

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 61 33 - Hazardous Materials for the following:
 - .1 Sealants.
 - .2 Tape.
 - .3 Proprietary Joints.

1.4 QUALITY ASSURANCE

- .1 Certification of Ratings:
 - .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Protect on site stored or installed absorptive material from moisture damage.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 47 19 - Construction/Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal all packaging material for recycling in accordance with Waste Management Plan.
 - .4 Place materials defined as hazardous or toxic in designated containers.
 - .5 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
 - .6 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SEAL CLASSIFICATION

- .1 Classification as follows:

Maximum Pressure Pa

SMACNA Seal Class

□

Maximum Pressure Pa	SMACNA Seal Class
500	C
250	C
125	C
125	Unsealed

.2 Seal classification:

- .1 Class C: transverse joints and connections made air tight with sealant tape or combination thereof. Longitudinal seams unsealed.
- .2 Unsealed seams and joints.

2.2 SEALANT

- .1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.
 - .1 Acceptable material: Duro Dyne S-2.

2.3 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.
 - .1 Acceptable material: Duro Dyne FT-2.

2.4 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows.
 - .1 Rectangular: standard radius 1.5 times width of duct.
- .3 Mitred elbows, rectangular:
 - .1 To 400mm: with single thickness turning vanes.
 - .2 Over 400mm: with double thickness turning vanes.
- .4 Branches:
 - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct.
 - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.
- .6 Obstruction deflectors: maintain full cross-sectional area.

2.6 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA.
- .3 Joints: to SMACNA.

2.7 HANGERS AND SUPPORTS

- .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
 - .1 Maximum size duct supported by strap hanger: 500mm.
- .2 Hanger configuration: to ASHRAE and SMACNA.
- .3 Hangers: galvanized steel angle with [galvanized steel rods to following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

Part 3 Execution**3.1 GENERAL**

- .1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE and SMACNA.
- .2 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

3.2 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with SMACNA as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.3 SEALING AND TAPING

- .1 Apply sealant to outside of joint to manufacturer's recommendations.

- .2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

3.4 LEAKAGE TESTS

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 Section Includes:
 - .1 Materials and installation for duct accessories including flexible connections, access doors, vanes and collars.
- .2 Related Sections:
 - .1 Section 01 33 00 - Submittal Procedures.
 - .2 Section 01 35 30 - Health and Safety Requirements.
 - .3 Section 01 45 00 - Quality Control.
 - .4 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
 - .5 Section 01 78 00 - Closeout Submittals.
 - .6 Section 02 61 33 - Hazardous Materials.

1.2 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, [95].

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:
 - .1 Flexible connections.
 - .2 Turning vanes.
 - .2 Submit WHMIS MSDS in accordance with Section 02 61 33 - Hazardous Materials. Indicate VOC's for adhesive and solvents during application and curing.
- .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
 - .1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

AIR DUCT ACCESSORIES

- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturer's Field Reports: manufacturer's field reports specified.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section.
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Divert unused materials from landfill to recycling facility as approved by Engineer.

Part 2 Products**2.1 GENERAL**

- .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame 0.5 mm thick with fabric clenched by means of double locked seams.
- .2 Material:
 - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 30 degrees C to plus 260 degrees C, density of 0.5 kg/m².

2.3 TURNING VANES

- .1 Factory or shop fabricated double thickness without trailing edge, to recommendations of SMACNA and as indicated.

2.4 SPIN-IN COLLARS

- .1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.
- .2 Sheet metal thickness to co-responding round duct standards.

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 Flexible Connections:
 - .1 Install in following locations:
 - .1 Inlets and outlets to supply air units and fans.
 - .2 Inlets and outlets of exhaust and return air fans.
 - .3 As indicated.
 - .2 Length of connection: 100 mm.
 - .3 Minimum distance between metal parts when system in operation: 75 mm.
 - .4 Install in accordance with recommendations of SMACNA.
 - .5 When fan is running:
 - .1 Ducting on sides of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.
- .2 Turning vanes:
 - .1 Install in accordance with recommendations of SMACNA and as indicated.

3.3 CLEANING

- .1 Perform cleaning operations as specified in Section 01 74 11 Cleaning and in accordance with manufacturer's recommendations.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 23 33 00 - Air Duct Accessories.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate the following:
 - .1 Performance data.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 MULTI-LEAF DAMPERS**

- .1 Parallel blade type as indicated.
- .2 Extruded aluminum , interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, extruded aluminum frame.
- .3 Pressure fit self-lubricated bronze bearings.
- .4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.
- .5 Operator: Electric.
- .6 Performance:
 - .1 Leakage: in closed position to be less than 2% of rated air flow at 500 Pa differential across damper.

DAMPERS - OPERATING

- .2 Pressure drop: at full open position to be less than 50 Pa differential across damper at 5 m/s.
- .7 Insulated aluminum dampers:
 - .1 Frames: insulated with extruded polystyrene foam with R factor of 5.0.
 - .2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, R factor of 5.0.

Part 3 Execution**3.1 INSTALLATION**

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.
- .3 Seal multiple damper modules with silicon sealant.
- .4 Ensure dampers are observable and accessible.

END OF SECTION

Approved: 2005-03-31

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation of flexible ductwork, joints and accessories.
- .2 Sustainable requirements for construction and verification.
 - .1 [___].
- .3 Related Sections:
 - .1 Section [01 33 00 - Submittal Procedures].
 - .2 Section [01 35 30 - Health and Safety Requirements].
 - .3 Section [01 47 15 - Sustainable Requirements: Construction].
 - .4 Section [01 47 17 - Sustainable Requirements: Contractor's Verification].
 - .5 Section [01 74 19 - Construction/Demolition Waste Management and Disposal].
 - .6 Section [02 61 33 - Hazardous Materials].

1.2 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .2 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .2 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Fire Protection Association (NFPA).
 - .1 NFPA 90A-[02], Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-[02], Standard for Installation of Warm Air Heating and Air-Conditioning Systems.
- .5 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, [95] (Addendum No.1, November 1997).
 - .2 SMACNA IAQ Guideline for Occupied Buildings under Construction, 1st Edition [1995].
- .6 Underwriters' Laboratories Inc. (UL).
 - .1 UL 181-[96], Standard for Factory-Made Air Ducts and Air Connectors.

- .7 Underwriters' Laboratories of Canada (ULC).
 - .1 CAN/ULC-S110-[1986(R2001)], Fire Tests for Air Ducts.

1.3 SUBMITTALS

- .1 Make submittals in accordance with Section [01 33 00 - Submittal Procedures] [____].
- .2 Co-ordinate submittal requirements and provide submittals required by Section [01 47 15 - Sustainable Requirements: Construction] [____].
- .3 Submit Indoor Air Quality (IAR) Management Plan in accordance with Section [01 47 15 - Sustainable Requirements - Construction] [____].
- .4 Product Data: submit WHMIS MSDS in accordance with Section [01 47 15 - Sustainable Requirements: Construction] [____] and Section [02 61 33 - Hazardous Materials] [____] for the following:
 - .1 Thermal properties.
 - .2 Friction loss.
 - .3 Acoustical loss.
 - .4 Leakage.
 - .5 Fire rating.
 - .6 [____].
- .5 Samples: submit samples with product data of different types of flexible duct being used in accordance with Section [01 33 00 - Submittal Procedures] [____].

1.4 QUALITY ASSURANCE

- .1 Certification of Ratings:
 - .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section [01 35 30 - Health and Safety Requirements] [____].
- .3 Sustainable Requirements:
 - .1 Construction requirements: in accordance with Section [01 47 15 - Sustainable Requirements: Construction] [____].
 - .2 Verification: contractor's verification in accordance with Section [01 47 17 - Sustainable Requirements: Contractor's Verification] [____].

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Protect on site stored or installed absorptive material from moisture damage.
- .2 Store and manage hazardous materials in accordance with Section [01 47 15 - Sustainable Requirements: Construction] [____].

- .3 Waste Management and Disposal:
 - .1 Separate waste materials for [reuse] [and] [recycling] [____] in accordance with Section [01 74 19 - Construction/Demolition Waste Management and Disposal] [____].
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal [paper] [plastic] [polystyrene] [corrugated cardboard] [____] packaging material [in appropriate on-site bins] [____] for recycling in accordance with Waste Management Plan.
 - .4 Place materials defined as hazardous or toxic in designated containers.
 - .5 Handle and dispose of hazardous materials in accordance with [CEPA,] [TDGA,] [Regional and Municipal] [____] regulations.
 - .6 Ensure emptied containers are sealed and stored safely.
 - .7 Fold up [metal] [and] [plastic] banding, flatten and place in designated area for recycling.

1.6 INDOOR AIR QUALITY (IAQ) MANAGEMENT PLAN

- .1 Develop and implement an Indoor Air Quality (IAQ) Management Plan in accordance with Section [01 47 15 - Sustainable Requirements: Construction] [____] for construction and preoccupancy phases of building.
- .2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

- .1 Materials and products in accordance with Section [01 47 15 - Sustainable Requirements: Construction] [____].

2.2 GENERAL

- .1 Factory fabricated to CAN/ULC-S110.
- .2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.
- .3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

2.3 METALLIC - UNINSULATED

- .1 [Type 1] [____]: spiral wound flexible [aluminum] [stainless steel] [____], as indicated.
- .2 Performance:
 - .1 Factory tested to [2.5] [____] kPa without leakage.
 - .2 Maximum relative pressure drop coefficient: [3] [____].

.3 [____].

2.4 METALLIC - INSULATED

.1 [Type 2] [____]: spiral wound flexible aluminum with factory applied, [37] [____] mm thick flexible glass fibre thermal insulation with vapour barrier and [vinyl] [reinforced mylar/neoprene laminate] [aluminum] [____] jacket, as indicated.

.2 Performance:

- .1 Factory tested to [2.5] [____] kPa without leakage.
- .2 Maximum relative pressure drop coefficient: [3] [____].
- .3 Thermal loss/gain: [____] W/m². degrees C mean.

.3 [____].

2.5 NON-METALLIC - UNINSULATED

.1 [Type 3] [____]: non-collapsible, coated [mineral base fabric] [aluminum foil mylar] [____] type, mechanically bonded to, and helically supported by, external [steel] [____] wire, as indicated.

.2 Performance:

- .1 Factory tested to [2.5] [____] kPa without leakage.
- .2 Maximum relative pressure drop coefficient: [3] [____].

.3 [____].

2.6 NON-METALLIC - INSULATED

.1 [Type 4] [____]: non-collapsible, coated [mineral base fabric] [aluminum foil/mylar] [____] type mechanically bonded to, and helically supported by, external [steel] [____] wire with factory applied, [37] [____] mm thick flexible mineral fibre thermal insulation with vapour barrier and [vinyl] [reinforced mylar/neoprene laminate] [____] jacket, as indicated.

.2 Performance:

- .1 Factory tested to [2.5] [____] kPa without leakage.
- .2 Maximum relative pressure drop coefficient: [3] [____].
- .3 Thermal loss/gain: [____] W/m². degrees C mean.

.3 [____].

2.7 METALLIC ACOUSTIC INSULATED - MEDIUM PRESSURE

.1 [Type 5] [____]: Spiral wound, flexible perforated [aluminum] [____] with factory applied [37] [____] mm thick flexible mineral fibre thermal insulation and sleeved by [aluminum foil/mylar laminate] [Type M] [____] vapour barrier, as indicated.

.2 Performance:

- .1 Factory tested to [2.5] [____] kPa without leakage.

- .2 Maximum relative pressure drop coefficient: [3] [____].
- .3 Acoustical performance: Minimum attenuation (dB/m) to following table:

Duct Diam:	Frequency (Hz)				
	125	250	500	1000	2000
[100]	[0.6]	[3]	[12]	[27]	[0]
[150]	[1.2]	[3]	[12]	[22]	[27]
[200]	[2.0]	[5]	[12]	[19]	[20]
[300]	[2.4]	[5]	[12]	[16]	[15]

- .3 [____].

2.8 METALLIC - ACOUSTIC INSULATED - HIGH PRESSURE

- .1 [Type 6] [____]: Spiral wound, flexible perforated aluminum [with factory applied [37] [____]] [____] mm thick flexible mineral fibre thermal insulation and encased in spiral wound flexible aluminum jacket, as indicated.

- .2 Performance:

- .1 Factory tested to [2.5] [____] kPa without leakage.
- .2 Maximum relative pressure drop coefficient: [3] [____].
- .3 Acoustical performance: minimum attenuation (dB/m) to following table:

Duct Diam:	Frequency (Hz)				
	125	250	500	1000	2000
[100]	[0.6]	[3]	[12]	[27]	[0]
[150]	[1.2]	[3]	[12]	[22]	[27]
[200]	[2.0]	[5]	[12]	[19]	[20]
[300]	[2.4]	[5]	[12]	[16]	[15]

- .3 [____].

2.9 NON-METALLIC - ACOUSTIC INSULATED

- .1 [Type 7] [____]: non-collapsible, coated mineral base perforated fabric type helically supported by and mechanically bonded to [steel] [____] wire with factory applied flexible mineral fibre acoustic insulation and encased in [aluminum foil/mylar laminate] [Type M] [____] vapour barrier[, as indicated] [____].

- .2 Performance:

- .1 Factory tested to [2.5] [____] kPa without leakage.
- .2 Maximum relative pressure drop coefficient: [3] [____].
- .3 Acoustical performance: Minimum attenuation (dB/m) to following table:

Duct Diam:	Frequency (Hz)				
	125	250	500	1000	2000
[100]	[0.6]	[3]	[12]	[27]	[0]
[150]	[1.2]	[3]	[12]	[22]	[27]
[200]	[2.0]	[5]	[12]	[19]	[20]
[300]	[2.4]	[5]	[12]	[16]	[15]

- .3 [____].

Part 3 Execution

3.1 DUCT INSTALLATION

- .1 Install in accordance with: [CAN/ULC-S110] [UL-181] [NFPA 90A] [NFPA 90B] [SMACNA] [____].

3.2 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section [01 47 17 - Sustainable Requirements: Contractor's Verification] [____], include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Low-emitting materials.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 AMCA 99-1986, Standards Handbook.
- .2 ANSI/AMCA 210-1985, Laboratory Methods of Testing Fans for Rating.
- .3 AMCA 300-1985 Revised 1987, Reverberant Room Method for Sound Testing of Fans.
- .4 AMCA 301-1990, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- .5 ANSI/ASHRAE 51- 1985, Laboratory Methods of Testing Fans for Rating.
- .6 CGSB 1-GP-181M-77, Coating, Zinc Rich, Organic, Ready Mixed.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide :
 - .1 Fan performance curves showing point of operation, kW and efficiency.
 - .2 Sound rating data at point of operation.
- .3 Indicate:
 - .1 Motors, sheaves, bearings, shaft details.
 - .2 Minimum performance achievable with variable inlet vanes as appropriate.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 EXTRA MATERIALS

- .1 Furnish list of individual manufacturer's recommended spare parts for equipment such as bearings and seals, and addresses of suppliers, together with list of specialized tools necessary for adjusting, repairing or replacing, for placement into operating manual.

1.5 MANUFACTURED ITEMS

- .1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

Part 2 Products**2.1 FANS GENERAL**

- .1 Capacity: flow rate, static pressure, W , efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
- .2 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.
- .3 Sound ratings: comply with AMCA 301, tested to AMCA 300. Unit shall bear AMCA certified sound rating seal.
- .4 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210, and ANSI/ASHRAE 51. Unit shall bear AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.
- .5 Motors:
 - .1 For use with variable speed controllers.
 - .2 Sizes as indicated.
- .6 Accessories and hardware: adjustable motor bases, coupling guards fan inlet safety screens as indicated and outlet dampers and vanes as indicated.
- .7 Factory primed before assembly in colour standard to manufacturer.
- .8 Scroll casing drains: as indicated.
- .9 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.
- .10 Vibration isolation: as required.

2.2 AXIAL FLOW FANS (TUBE-AXIAL OR VANE-AXIAL)

- .1 Blade material: aluminium. Hub material: aluminium.
- .2 Bearings: ball or roller with extension tubes to outside of casing.
- .3 Direct drive:
 - .1 Fixed blade wheels: totally-enclosed, air over motors.
 - .2 Diameter of wheel hub: at least equal to that of motor frame.
- .4 Acceptable material: as indicated.

Part 3 Execution**3.1 FAN INSTALLATION**

- .1 Install fans as indicated, complete with resilient mountings, flexible electrical leads and flexible connections as required.

□

HVAC FANS

- .2 Bearings and extension tubes to be easily accessible.
- .3 Access doors and access panels to be easily accessible.

3.2 ANCHOR BOLTS AND TEMPLATES

- .1 Size anchor bolts to withstand seismic acceleration and velocity forces.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/ National Fire Protection Association (NFPA)
 - .1 ANSI/NFPA 96-[01], Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
 - .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM E90-[99], Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .4 Society of Automotive Engineers (SAE)

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate the following:
 - .1 Pressure drop.
 - .2 Face area.
 - .3 Free area.

1.4 CERTIFICATION OF RATINGS

- .1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 FIXED LOUVRES - ALUMINUM**

- .1 Construction: welded with exposed joints ground flush and smooth.

□

LOUVRES, INTAKES AND VENTS

- .2 Material: extruded aluminum alloy 6063-T5.
- .3 Blade: [stormproof pattern with centre watershed in blade], reinforcing bosses and maximum blade length of [1500] mm.
- .4 Frame, head, sill and jamb: [100] [150] mm deep one piece extruded aluminum, minimum [3] mm thick [with approved caulking slot, integral to unit].
- .5 Mullions: at [1500] mm maximum centres.
- .6 Fastenings: stainless steel (Society of Automotive Engineers) SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.
- .7 Screen: [[12] mm exhaust] [[19] mm intake] mesh, [2] mm diam wire aluminum birdscreen on [inside] face of louvres in formed U-frame.
- .8 Finish: [factory applied enamel], [prime coated] [anodized]. Colour: to [Engineer's] [Consultant's] approval.
- .9 Acceptable material: [____].

2.2 FIXED LOUVRES

- .1 General: copper in welded steel frame, complete with anchors.
- .2 Blades:
 - .1 [24] ounce cold rolled copper set at 45°, Z-shaped with drip lips.
 - .2 Stormproof design for outside air intakes.
 - .3 Braced against wind pressures of [____].
 - .4 Maximum length without mullions of same material: [1250] mm.
- .3 Frame: galvanized structural steel, welded construction. All welds painted after construction to Section [09 91 13 - Exterior Painting].
- .4 Screen: [[12] mm exhaust] [[19] mm intake] mesh, [2] mm diam wire aluminum birdscreen on [inside] face of louvres in formed U-frame.
- .5 Finish: [factory applied enamel], [prime coated]. Colour: to [Engineer's] [Consultant's] approval.
- .6 Acceptable material: [____].

2.3 ADJUSTABLE LOUVRES

- .1 Construction: welded with exposed joints ground flush and smooth.
- .2 Material: extruded aluminum alloy [6063-T5].
- .3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of [1500] mm.

LOUVRES, INTAKES AND VENTS

- .4 Frame, head, sill and jamb: [100] [150] mm deep one piece extruded aluminum, minimum [3] mm thick [with approved caulking slot, integral to unit].
- .5 Mullions: at [1500] mm maximum centres.
- .6 Fastenings: stainless steel (Society of Automotive Engineers) SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.
- .7 Screen: [[12] mm exhaust] [[19] mm intake] mesh, [2] mm diam wire aluminum birdscreen on [inside] face of louvres in formed U-frame.
- .8 Finish: [factory applied enamel], [prime coated] [anodized]. Colour: to [Engineer's] [Consultant's] approval.
- .9 Operator: [___].
- .10 Acceptable material: [___].

Part 3 Execution**3.1 INSTALLATION**

- .1 In accordance with manufacturer's and SMACNA recommendations.
- .2 Reinforce and brace as indicated.
- .3 Anchor securely into opening. Seal with caulking around to ensure weather tightness.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .3 Section 01 78 00 - Closeout Submittals.
- .4 Section 26 05 01 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.46-M1988, Electric Air-Heaters.
- .2 Underwriters' Laboratories (UL) Inc.
 - .1 UL 1042-1994, Electric Baseboard Heating Equipment.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data sheets for baseboard convectors. Include:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Mounting methods.
 - .4 Physical size.
 - .5 kW rating, voltage, phase.
 - .6 Cabinet material thicknesses.
 - .7 Limitations.
 - .8 Colour and finish.
- .3 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, and cleaning procedures.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit operation and maintenance data for baseboard convectors in accordance with Section 01 78 00 - Submittal Procedures.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

RESIDENTIAL CONVECTORS

Part 2 Products**2.1 MANUFACTURERS**

- .1 Acceptable material:
 - .1 Stelpro.

2.2 BASEBOARD CONVECTORS

- .1 Heaters: to CSA C22.2 No.46, standard wattage density with connection box both ends.
 - .1 Element through-type fitted with aluminum convector vanes and resistor wire enclosed in mineral insulation in stainless steel sheath.
 - .2 Element locked to cabinet and supported with non metallic supports to allow for expansion.
 - .3 Cabinet: steel finished in baked enamel, colour almond with integral air deflector for diffusion.
 - .4 Approved wiring channel for interconnection of heaters and components.
 - .5 Knock-outs for 12 mm dia. conduit connection.

2.3 CONTROLS

- .1 Relays and transformers to switch loads in excess of thermostat rating. Refer to drawings.

Part 3 Execution**3.1 INSTALLATION**

- .1 Attach baseboard heaters to wall with toggle bolts wood-screws.
- .2 For corner extension use inside and outside corners as required.
- .3 Install thermostats in locations indicated.
- .4 Make power and control connections as indicated.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Ensure that heaters and controls operate correctly.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .3 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.46-M1988, Electric Air-Heaters.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data sheets for unit heaters. Include:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Mounting methods.
 - .4 Physical size.
 - .5 kW rating, voltage, phase.
 - .6 Cabinet material thicknesses.
 - .7 Limitations.
 - .8 Colour and finish.
- .3 Submit product data sheets for unit heaters.
 - .1 Include product characteristics, performance criteria, physical size, limitations and finish.
- .4 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, and cleaning procedures.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for unit heaters for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

Part 2 Products**2.1 MANUFACTURERS**

- .1 Acceptable manufacturers:

□

Approved: 2003-12-31

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials, components and installation for electric power generating equipment and system start-up.

1.2 RELATED SECTIONS

- .1 Section [01 29 83 - Payment Procedures - Testing Laboratory Services].
- .2 Section [01 74 19 - Construction/Demolition Waste Management And Disposal].
- .3 Section [01 91 00 - Commissioning].
- .4 Section [01 79 00 - Demonstration and Training].

1.3 PAYMENT PROCEDURES

- .1 Provide payment for services of qualified diesel electric technician in accordance with Section [01 29 83 - Payment Procedures - Testing Laboratory Services].

1.4 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B139-[00(October 2001)], Installation Code for Oil-Burning Equipment.
- .2 Transport Canada - Marine Safety (TCMS)
 - .1 Approved Products Catalogue Index (APCI) - Structural Fire Prevention Item.
 - .1 Non-Combustible Material - Cloth and Paper.
- .3 Underwriters' Laboratories of Canada (ULC)
- .4 U.S. Coast Guard Equipment List (USCG)
 - .1 164.009-[May 2002], Non-Combustible Materials.

1.5 QUALIFICATIONS

- .1 Provide proof of diesel electric technician qualification to [Engineer] [Consultant].

1.6 DELIVERY, STORAGE AND HANDLING

- .1 [____].

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section [01 74 19 - 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 [paper] [plastic] [polystyrene] [corrugated cardboard] packaging material [in appropriate on-site bins] for recycling in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by [Engineer] [Consultant].
- .6 Divert unused batteries from landfill to battery recycling facility approved by [Engineer] [Consultant].
- .7 Divert unused antifreeze from landfill to antifreeze recycling facility approved by [Engineer] [Consultant].
- .8 Fold up metal banding, flatten and place in designated area for recycling.

1.8 SYSTEM START-UP

- .1 Preparation: before starting unit, carry out thorough mechanical and electrical inspection of equipment, and perform following checks and adjustments:
 - .1 Disconnect battery cables from batteries to prevent accidental starting.
 - .2 Turn engine several revolutions by means of hand-barring devices to ensure parts are free and there are no obstructions to its running.
 - .3 Check engine/generator alignment readings to ensure they match readings attained at time of manufacture.
 - .4 Check fluid levels and top up as necessary. Pre-lubricate engine and turbochargers as recommended by engine manufacturer. Install drip pan beneath engine.
 - .5 Ensure cooling system antifreeze is effective to at least minus 40 degrees C.
 - .6 Check belts for correct tension and adjust as necessary.
 - .7 Check and grease grease points.
 - .8 Check and tighten properly nuts, bolts, etc.
 - .9 Ensure safety guards are in place and properly secured.
 - .10 Check linkages for damage and freedom of movement.
 - .11 Check fuel supply system for leakage.
 - .12 Ensure fuel supply and fuel injection systems are properly primed.
 - .13 Check and tighten properly electrical connections.
 - .14 Check starting battery electrolyte level specific gravity and for proper installation.
 - .15 Check battery charger for proper operation and adjust as necessary.

- .16 Carry out generator winding insulation resistance test. If reading is unacceptable, carry out recognized drying procedure. Do not start unit until satisfactory reading has been achieved.
- .17 Check jacket coolant heater for proper operation.
- .18 Complete additional preparations deemed necessary.
- .2 Performance verification: on completion of start-up preparations, take following action:
 - .1 Have at hand, during initial start-up, means for choking off air supply to engine air induction manifold in event of engine run away or other emergency.
 - .2 Reconnect starting battery cables to starting battery.
 - .3 Start unit only in presence of [Engineer] [Consultant] and allow to warm up. Stop unit if abnormal conditions are encountered.
 - .4 Check for and correct leakage from exhaust system, fuel system, cooling system, and lubricating oil system.
 - .5 Adjust vibration isolators.
 - .6 Observe and ensure that lubricating oil pressure and coolant temperature are within limits and no harmful vibration or sounds are evident.
 - .7 Ensure voltage is within operating parameters and automatic voltage regulator is operating correctly.
 - .8 Ensure manual voltage control is operating correctly.
 - .9 Ensure frequency is within operating parameters and electronic governor is operating correctly.
 - .10 Check engine air ventilation system for proper operation.
 - .11 Check operation of engine-mounted protective sensing devices and adjust as necessary.
 - .12 Check phase sequence of normal power supply and ensure emergency power supply are in same sequence.
 - .13 Check operation of electronic controller protection, transfer, timing, metering, and annunciator functions and adjust as necessary.
 - .14 Check operation and calibration of analog metering and adjust as necessary.
 - .15 Apply electrical load, read the metres, and correlate these readings.
 - .16 Demonstrate:
 - .1 Unit start, transfer to load, retransfer to normal power, unit shutdown, on "automatic" control.
 - .2 Unit start, transfer to load, retransfer to normal power, unit shutdown, on "full load test" control. Unit start and shutdown, on "no load test" control.
 - .3 Unit cranking, start, and shutdown by means of engine-mounted key switch.
 - .4 Run unit on load for minimum period of [8] hours to show load-carrying capability, stability of voltage and frequency, and satisfactory performance of engine ventilating system to provide adequate cooling.
 - .5 Every 1/2 hour carry out and record readings on Test Chart.
 - .17 Perform additional tests as required by [Engineer] [Consultant] to ensure unit is operating satisfactorily.

1.9 OWNER'S INSTRUCTION

- .1 Provide instruction to site operation and maintenance staff for proper care, operation, and maintenance of equipment.

1.10 COMMISSIONING

- .1 Do site commissioning of the diesel electric generator unit by qualified diesel electric technician in accordance with Section [01 91 00 - Commissioning].
- .2 Provide commissioning report included time delay settings, operational set points and adjustment ranges.

Part 2 Products

2.1 MATERIALS

- .1 Provide following materials:
 - .1 Conduits and boxes as required.
 - .2 Copper fuel lines and fittings as required.
 - .3 ULC automatic fire shut-off valve.
 - .4 Primary fuel filter/water separator.
 - .5 Insulation for exhaust system.
 - .6 Electrical components as indicated.
 - .7 Wiring material.
 - .8 Antifreeze, ethylene glycol.
 - .9 Diesel fuel; storage [and day] tank initial fill, plus top-up after testing.
 - .10 Manual IPU bypass switch.
 - .11 All wiring and materials, including necessary [rigid] steel conduits and fittings for making connections.
 - .12 The power circuit cables will be [size of conductor], RW90 (-40 degrees C) cross link polyethylene, [single] [multiple] conductor[s], [shielded] [unshielded] [PVC jacketed].
 - .13 The control circuit cables will not be less than No. 14, RW90, [single] [multiple] conductor[s], colour or number coded.
 - .14 Electronic governor control cable shall be minimum size No. [18] stranded copper conductor, shielded complete with drain wire and overall PVC jacket.
 - .15 Battery cable shall be welding cable type, extra flexible, rope stranded copper conductor with neoprene oil-resistant insulation, sized to limit voltage drop to 5% at time of peak load.

Part 3 Execution

3.1 LOCATING AND MOUNTING

- .1 Locate unit as indicated.
- .2 Fit and adjust isolators in accordance with manufacturer's installation and adjustment instruction bulletin contained in unit manual.
- .3 Do not bolt housings to foundation if isolator housing feet are equipped with 6 mm rubber sound pads.

3.2 ALIGNMENT CHECK

- .1 Since Engine-generator shaft alignment is adjusted at factory, check to ensure that no change has occurred due to shipment and handling.
- .2 Where engine and generator housings are close coupled and instruments at hand are not suitable for measuring alignment within confines of housings, just loosen engine and generator hold down bolts and ensure that each foot is carrying proportionate amount of weight and feet are level on base plate.

3.3 FUEL SUPPLY SYSTEM

- .1 Install fuel tanks in accordance with CAN/CSA-B139.
- .2 Inspect thoroughly fuel tank and lines to ensure they are clean and free of foreign material before connecting fuel system.
- .3 Install primary fuel filter/water separator and servicing shut-off valves as indicated. Provide [3] spare filter elements.
- .4 Install ULC automatic fire shut-off valve. Locate upstream of any combustible fuel system component.
- .5 Install supply and return fuel lines between engine and fuel day tank. Install flexible sections between the engine and fixed end of fuel lines from fuel tank, [using materials supplied with unit].
- .6 Hard drawn copper pipe joints to be brazed or silver soldered.
- .7 Brazing or soldering alloys to have minimum melting point of 450 degrees C.
- .8 Neatly install fuel lines parallel or perpendicular to building lines with no kinks or dents.
- .9 Install soft drawn copper fuel lines using brass 45 degrees flare and pipe fittings as required and bend with correct size lever type bending tool. Entirely replace leaking fuel lines.
- .10 Protect fuel lines from mechanical damage.

3.4 BATTERIES AND CHARGER

- .1 For dry charged batteries, activate in accordance with manufacturer's instructions in the unit manual prior to installation.
- .2 For wet batteries, inspect individually each battery cell and check electrolyte level. Check charge condition by measuring temperature and specific gravity of electrolyte. Consult manufacturer's instructions for recommended readings. If readings are lower, give batteries freshening charge until reading are reached.
- .3 Locate batteries as indicated and ensure that batteries are accessible for service. Run and protect cables to starting motor using cables supplied with unit.
- .4 Install battery charger on wall, adjacent to batteries and make connection to batteries.
- .5 Clean connections and tighten securely.
- .6 Install removable plexiglass cover on batteries.

3.5 EXHAUST SYSTEM

- .1 Install exhaust pipe and silencer using material supplied with unit.
- .2 Arrange silencer above and approximately in line with engine exhaust manifold with exhaust tail pipe protruding through thimble in wall.
- .3 Extend tail pipe not less than one metre beyond outside wall.
- .4 Support silencer with hangers so no weight or stress is applied to engine exhaust manifold or turbocharger.
- .5 Install flexible exhaust pipe between silencer and manifold.
- .6 Install exhaust system fireproof insulative material, after test run.
 - .1 Removable fibreglass jacket insulation rated for [650] degrees C with stainless lacing hooks and wires.
 - .1 Jacket to be enclosed on inside by stainless steel mesh with outside cover silicone coated or aluminized fibreglass cloth: to USCG approved Non-Combustible Materials No. [164.009] and TCMS Non-Combustible Materials - Certificate No. F3-[Series].
 - .2 Acceptable products: [____].
 - .2 Calcium Silicate removable insulation rated for [650] degrees C with exterior stainless steel protective cover and fastenings.
 - .1 Acceptable products: [____].

3.6 COOLING AND VENTILATION

- .1 Install air outlet and inlet louvres and hoods in their respective openings.

- .2 Install louvre motors and linkages, adjust to ensure louvres are tight in closed position and give free damper movements from fully closed to fully open.
- .3 Where canvas boot is not provided, maintain [13] mm clearance between radiator and air outlet duct.
- .4 Mount thermostat [in strategic position, away from inlet louvre] [as indicated].
- .5 Install conduits and junction boxes and make connections from louvre motors to thermostat and to 120/24 V AC transformer [in panel].
- .6 Fill engine radiator with water/ethylene glycol antifreeze mix good for [-40 degrees C].
- .7 Install remote radiator including piping, valves, fittings and pumps as indicated.

3.7 CONTROL AND TRANSFER PANEL

- .1 Locate panels as indicated.
- .2 Make control and power circuit connections as indicated.
- .3 Identify cables at both ends.
- .4 Tag with slip-on wire maker, each wire end with number corresponding to number in panel.
- .5 Make terminations with self-insulated terminals of flanged fork or ring type.

3.8 ADDITIONAL WORKS

- .1 Complete any additional work as instructed by [Engineer] [Consultant] to:
 - .1 Ensure equipment is safe to operate.
 - .2 Provide complete and operating system.

3.9 FIELD QUALITY CONTROL

- .1 Qualified diesel electric technician to: inspect and verify that installation of interruptible power unit is acceptable and complete. Provide inspection report to the [Engineer] [Consultant].

3.10 DEMONSTRATION AND TRAINING

- .1 As directed by [Engineer] [Consultant] and in accordance with Section [01 79 00 - Demonstration and Training] carry out demonstrations of complete interruptible power unit for Project Acceptance Board.
- .2 Provide familiarization training of operating and maintenance staff.

- .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.
- .4 Provide fuel required for performing diesel-generator site test and top-up after acceptance test completion.

END OF SECTION

SUMMARY OF ELECTRICAL WORK

Part 1 General**1.1 SECTION INCLUDES**

- .1 Title and description of Electrical Work.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- .1 The following is a brief outline of the electrical work. A detailed scope of work can only be determined by examination of the drawings and specifications.
- .2 The project generally consists of supply and installation of the following:
 - .1 Main 200 Amp, 120/240 volt, single phase service entrance.
 - .2 Lighting system.
 - .3 General power and branch circuits for receptacles.
 - .4 Panelboards and associated feeders.
 - .5 Electric heating.
 - .6 Telephone service entrance and provision for telephone system.
 - .7 Ground buses and grounding system.
 - .8 All wiring associated with mechanical systems, ventilation, and any other equipment indicated, and mounting of electrical devices supplied by Mechanical trades for these systems as per drawings. Supply and installation of disconnect switches for mechanical equipment.
 - .9 All other controls, fuses, devices, contactors, switches, breakers, fittings, etc., required or indicated.

Part 2 Products**2.1 NOT USED**

- .1 Not Used.

Part 3 Execution**3.1 GENERAL**

- .1 In general, wiring method shall be EMT conduit except as indicated on drawings.
- .2 Wireway shall be used on interior perimeter of Equipment Room to minimize wall space taken up by conduits.
- .3 All wireways, conduits, wiring, etc. shall be run exposed.

END OF SECTION

Part 1 General**1.1 GENERAL**

- .1 This Section covers items common to Sections of Division 26. This section supplements requirements of Division 1.
- .2 Work included: This contract includes all work related to the supply and installation of equipment. Work included is described on the drawings and in Section 26 05 00.

1.2 CODES AND STANDARDS

- .1 Do complete installation in accordance with CSA C22.1-1998 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1-M1987 except where specified otherwise.

1.3 CARE, OPERATION AND START-UP

- .1 Instruct Engineer and operating personnel in the 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 all aspects of its care and operation.

1.4 VOLTAGE RATINGS

- .1 Operating voltages: to CAN3-C235-83.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 PERMITS, FEES AND INSPECTION

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Engineer will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.

COMMON WORK RESULTS - ELECTRICAL

- .4 Notify Engineer of changes required by Electrical Inspection Department prior to making changes.
- .5 Furnish Certificates of Acceptance from Electrical Inspection Department on completion of work to Engineer.

1.6 MATERIALS AND EQUIPMENT

- .1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.
- .3 Factory assemble control panels and component assemblies.
- .4 Use new equipment and materials unless otherwise specified.

1.7 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
- .2 Control wiring and conduit is specified in Electrical Sections except for conduit, wiring and connections below 50V which are related to control systems specified in Mechanical (All control wiring to be supplied and installed by Electrical except as indicated on drawings).
- .3 Starters, motor protection, and manual control devices form part of this division unless otherwise indicated. Starters noted as supplied under Mechanical are to be installed and wired under this Division unless otherwise indicated.
- .4 Check approved shop drawings and co-ordinate rating, characteristics and location of each motor with trade responsible before ordering of starting equipment and in advance of roughing in. Where equipment submitted by other divisions requires power of controls other than specified, advise engineer.
- .5 Submit shop drawings for all control and protective devices as indicated in related sections.
- .6 Before placing motor on load:
 - .1 Ensure that overload relays are properly sized and wired into circuit.
 - .2 Check all circuit protective devices.
 - .3 Ensure that external control wiring has been verified. Record any changes on control diagrams.

- .7 Perform the following tasks after energizing motors:
 - .1 Verify voltage and current on each phase of supply circuit on starting and running.
 - .2 Perform motor rotation test.

1.8 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1-1955.
 - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.9 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with [nameplates] [and] [labels] as follows:
- .2 Nameplates:
 - .1 Lamicoïd 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES

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

- .3 Labels:
 - .1 Embossed plastic labels with 6 mm high letters unless specified otherwise.
- .4 Wording on nameplates and labels to be approved by Engineer prior to manufacture.
- .5 Allow for average of twenty-five (25) letters per nameplate and label.
- .6 Identification to be English.
- .7 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .8 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .9 Terminal cabinets and pull boxes: indicate system and voltage.

- .10 Transformers: indicate capacity, primary and secondary voltages.

1.10 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 code: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

1.11 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 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

1.12 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.13 MANUFACTURERS AND CSA LABELS

- .1 Visible and legible, after equipment is installed.
- .2 Ensure that manufacturer's registration plates are properly affixed to all apparatus showing the size, name of equipment, serial number and all information usually provided, including voltage, cycle, phase and the name and address of the manufacturer.
- .3 Do not paint over registration plates or approval labels. Leave openings through insulation for viewing the plates. Contractors or sub-contractors nameplate not acceptable.

1.14 WARNING SIGNS

- .1 As specified and to meet requirements of Electrical Inspection Department and Engineer

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- .2 Decal signs, minimum size 175 x 250 mm.

1.15 SINGLE LINE ELECTRICAL DIAGRAMS

- .1 Provide single line electrical diagrams under plexiglass as follows:
 - .1 Electrical distribution system: locate in main electrical room.
 - .2 Electrical power generation and distribution systems: locate in power plant rooms.

1.16 LOCATION OF OUTLETS

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

1.17 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: 1200 mm.
 - .2 Wall receptacles:
 - .1 General: 300 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 1200 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 300 mm.
 - .5 Wall mounted telephone and interphone outlets: 1500 mm.
 - .6 Fire alarm stations: 1500 mm.
 - .7 Thermostats: 1200mm

1.18 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 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.19 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.
- .4 Where conduit routes are shown on drawings, contractor must follow as closely as possible to the routing shown. Before running conduit in locations other than as shown, coordinate with Engineer and other trades on site.

1.20 FIELD QUALITY CONTROL

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- .2 The work of this division to be carried out by a contractor who holds a valid Master Electrical contractor license as issued by the Province that the work is being constructed.
- .3 Conduct and pay for following tests:
 - .1 Power distribution system including phasing, 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: Smoke alarms and carbon monoxide alarms.
- .4 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .5 Insulation resistance testing.
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .6 Carry out tests in presence of Consultant.

- .7 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .8 Submit test results for Consultant's review.

1.21 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.
- .2 Fault current ratings noted on panel schedules are for fully rated equipment. Integrated rating equipment is not acceptable.

1.22 FIREPROOFING

- .1 Where cables or conduits pass through fire rated walls or ceilings, sleeve and steel conduit and install fire and smoke seal to the requirements of the National Building Code of Canada – 2005.
- .2 Standard of Acceptance: Nelson CLK self-leveling firsetop sealant or approved equal.
- .3 Fire/Smoke seal system shall be installed in accordance with manufacturer's recommended practice by a licensed installation technician.

1.23 ELECTRICAL DRAWINGS

- .1 The design drawings are partly diagrammatic and intended to convey the scope of work and indicate the general arrangement of systems and components. They should not be construed as, or otherwise understood, to be fabrication drawings.
- .2 The drawings are not intended to show structural details or architectural features.
- .3 Do not determine locations of equipment and materials by measurement from drawings.

1.24 TRIAL USAGE

- .1 The Owner may use equipment and systems for test purposes prior to acceptance. Supply labour and material and instruments required for testing.

1.25 TESTS

- .1 Give 24 hour written notice of date for tests. Conceal work only after testing and approve by Engineer. Bear costs of retesting.
- .2 Equipment: refer to relevant sections.
- .3 Prior to tests, isolate all equipment as required.

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 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2No.18- 98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2No.65-93 (R1999), Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 MATERIALS**

- .1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Clamps or connectors for armoured cable, flexible conduit, as required to: CAN/CSA-C22.2No.18.
- .4 Standard of acceptance:
 - .1 3M Scotchblock 2
 - .2 Ideal Wirenut #451, 452, 453.
 - .3 Marrette #733, 735, 739.

Part 3 Execution

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.
 - .3 Install fixture type connectors and tighten. Replace insulating cap.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

1.2 REFERENCES

- .1 CSA C22.2 No .0.3-[96], Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No. 131-[M89(R1994)], Type TECK 90 Cable.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 BUILDING WIRES**

- .1 Conductors: stranded for #8 AWG and larger. Minimum size: #12 AWG.
- .2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.
- .3 Copper conductors: size as indicated, with thermoplastic insulation type TW rated at 300V for use as grounding or bonding conductor only.

2.2 CONTROL CABLES

- .1 Type LVT: 2 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of cotton braid thermoplastic jacket.
- .2 Special control cables as per drawings.

2.3 COLOR CODING

- .1 Insulated neutral and grounding conductors smaller than #2 AWG shall be continuously identified in accordance with the requirements of Section 4 of the Canadian Electrical Code C22.1(latest edition).
- .2 Phase conductors shall be color coded in accordance with Section 4 of the Canadian Electrical Code C22.1(latest edition).

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34.
 - .2 In underground conduits as per Section 33 65 73.
 - .3 Use RW90 wire for all applications. Type TW wire may be used only for bonding wires.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Materials and installation for connectors and terminations.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.41-[M1987(R1999)], Grounding and Bonding Equipment.

1.4 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

1.5 CERTIFICATES

- .1 Obtain inspection certificate of compliance covering high voltage stress coning from inspection authority and include it with maintenance manuals.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 CONNECTORS AND TERMINATIONS**

- .1 [Copper] [Aluminum] [long barrel] [short barrel] compression connectors to CSA C22.2No.[___] as required sized for conductors.
- .2 Contact aid for aluminum cables where applicable.
- .3 [2] [3] [4] way joint boxes [submarine] [dry location] type in accordance with Section [26 05 33 - Raceway and Boxes for Electrical Systems].
- .4 [2] [3] [4] way junction boxes with respective pothead for [2] [3] [4] conductor cables [for enclosing stress - cone within] [with allowance for stress - cone beyond] for [paper-insulated lead-sheathed] [X - linked polyethylene] [polyethylene] [butyl rubber] cable [with] [without] [copper] [aluminum] sheath, [and overall jacket] in accordance with Section [26 05 33 - Raceway and Boxes for Electrical Systems].

Part 3 Execution

3.1 INSTALLATION

- .1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required [to CSA C22.2No.41].

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Section 26 05 01 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
 - .1 ANSI/IEEE 837-[1989(R1996)], Qualifying Permanent Connections Used in Substation Grounding.
- .2 Canadian Standards Association, (CSA International)
- .3 CAN/CSA Z32-[1999], Electrical Safety and Essential Electrical Systems in Health Care Facilities.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 EQUIPMENT**

- .1 Clamps for grounding of conductor: size as indicated to exterior ground loop.
- .2 Rod electrodes: galvanized steel 19 mm diameter by 3 m long.
- .3 Rod electrodes: copper clad steel 19mm dia. by 3m long. Equal to Erico Type 61 Copperbound ground rods.
- .4 Insulated grounding conductors: green, type TW.
- .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.

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5 Soldered joints not permitted.
- .6 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .7 Connect building structural steel and metal siding to ground by welding copper to steel.
- .8 Make grounding connections in radial configuration only, with connections terminating at single grounding point street side of water pipe. Avoid loop connections.
- .9 Ground secondary service pedestals.

3.2 SYSTEM AND CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral of 240 V systems.

3.3 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to, the following list: service equipment, switchgear, starters, control panels, frames of motors, building steel work.

3.4 GROUNDING BUS

- .1 Install copper grounding bus mounted on insulated supports on wall of electrical room.
- .2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections sized as per drawings.

3.5 COMMUNICATION SYSTEMS

- .1 Install grounding connections for telephone and other systems as per drawings.

3.6 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 SUPPORT CHANNELS**

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended.
- .2 Standard of acceptance:
 - .1 Thomas and Betts Superstrut
 - .2 B-Line
 - .3 Unistrut

Part 3 Execution**3.1 INSTALLATION**

- .1 Secure equipment to solid 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 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole 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.
- .6 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.
- .7 For surface mounting of two or more conduits use channels at 2.0 m on centre spacing.

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .10 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.
- .12 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 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 - Submittal Procedures.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 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.
- .3 Type D: Standard of Acceptance: Bel Type DUKO.

2.2 CABINETS

- .1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, and catch, for surface mounting.

Part 3 Execution**3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor.
- .3 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.2 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

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Part 1 General**1.1 REFERENCES**

- .1 CSA C22.1- 1998, Canadian Electrical Code, Part 1.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

Part 2 Products**2.1 OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.

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 or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .3 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster walls.

2.3 CONDUIT BOXES

- .1 Cast FS or FD ferrous alloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.
- .2 Utility boxes are not acceptable.

2.4 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

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OUTLET BOXES, CONDUIT BOXES AND FITTINGS

- .5 Water tight fitting on conduits in wet or damp locations.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No. 18-[98], Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
 - .2 CSA C22.2 No. 45-[M1981(R1992)], Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-[1977(R1999)], Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-[M1985(R1999)], Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-[M1984(R1999)], Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-[M91(R1999)], Flexible Nonmetallic Tubing.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with set-screw couplings.
- .3 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .4 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .5 Wireway auxiliary gutters and fittings: CSA C22.2-02.
- .6 Fittings for raceways: To CSA C22.2-02.
- .7 Low voltage wiring shall not pass through compartment reserved for line voltage wiring (or vice-versa). Provide manufacturer's approved fittings to enable wiring to pass into appropriate channel without crossing wiring of different voltages.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 2.0 m oc.

- .4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.
- .3 Steel set-screws and couplings for EMT. Die-cast couplings are not acceptable.

2.4 SURFACE RACEWAY SYSTEM

- .1 Plastic raceway: rigid extruded polyvinyl chloride reinforced thermosetting plastic.
- .2 Two channel: with solid snap-on covers throughout entire length.
- .3 Two piece, plastic assembly. Size 133 mm wide x 43 mm deep.
- .4 Finish: white.
- .5 Provide all dividers, covers, entrance ends, wall box connectors, elbows, blank ends and all other hardware required for complete installation as per manufacturer's recommendations.
- .6 Standard of Acceptance:
 - .1 Wiremold 5400 Series.
- .7 Acceptable Alternates:
 - .1 Panduit.
 - .2 Hubbell.

2.5 FISH CORD

- .1 Polypropylene.

Part 3 Execution

3.1 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Wiring method:
 - .1 Use EMT conduit for all work, except where specified elsewhere.
 - .2 Use flexible metal conduit for connection to motors in dry areas.
 - .3 Use liquid tight, flexible metal conduit for connection to motors in damp, wet or corrosive locations.
 - .4 Use epoxy coated rigid galvanized conduit for all exterior uses.

- .5 Use rigid PVC conduit underground.
- .6 Use wireways where possible. Install wall mounted wireway around perimeter of equipment room at ceiling/wall intersection.
- .3 Use rigid galvanized steel threaded conduit for wiring from control panel to generator and where indicated.
- .4 Use rigid pvc conduit on exterior and where indicated.
- .5 Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without a prewired outlet box and connection to surface or recessed fluorescent fixtures.
- .6 Use liquid tight flexible metal conduit for final connection to generator set.
- .7 Minimum conduit size for lighting and power circuits: 12 mm.
- .8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Mechanically bend steel conduit over 19 mm dia.
- .10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .11 Install fish cord in empty conduits.
- .12 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .13 Dry conduits out before installing wire.
- .14 Conduits shall not pass through structural members, except as indicated.
- .15 Wiring for emergency lighting circuits shall be run in separate conduits from other systems.

3.2 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Section 31 23 10 - Excavating, Trenching and Backfilling.
- .3 Section 26 05 01 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association, (CSA International)
- .2 Insulated Cable Engineers Association, Inc. (ICEA)

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 MARKERS**

- .1 Provide 150 mm wide, 4 mil, polyethylene marker tape in all trenches. Use red colored tape. Install at depth as per drawings

Part 3 Execution**3.1 CABLE INSTALLATION IN DUCTS**

- .1 Install cables as indicated in ducts.
 - .1 Do not pull spliced cables inside ducts.
- .2 Install multiple cables in duct simultaneously.
- .3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .4 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .5 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .6 After installation of cables, seal duct ends with duct sealing compound.

- .7 Install cable markers in trenches as indicated on drawings.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests.
 - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
 - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Provide Engineer with list of test results showing location at which each test was made, circuit tested and result of each test.
- .7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 Electrical and Electronic Manufacturers= Association of Canada (EEMAC)
 - .1 EEMAC M1-7, [1992] , Motors and Generators.
 - .2 EEMAC M2-1, [1966] , Lead Marking and Connections for Polyphase Induction Motors.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, and cleaning procedures.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate:
 - .1 Mounting method and dimensions.
 - .2 Starter size and type.
 - .3 Layout of identified internal and front panel components.
 - .4 Enclosure types.
 - .5 Wiring diagram for each type of starter.
 - .6 Interconnection diagrams.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for motors for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Data necessary for maintenance of motors.
- .3 Manufacturer's recommended list of spare parts.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management and.

1.6 EXTRA MATERIALS

- .1 Provide maintenance materials and spare parts in accordance with Section 01 78 00 - Closeout Submittals.

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Part 2 Products**2.1 MATERIALS**

- .1 Motors: to EEMAC M1-7.
- .2 Lead markings: to EEMAC M2-1.

2.2 RATING

- .1 Motor:
 - .1 Single speed: horsepower and speed as per mechanical drawings.
 - .2 120 V, 1 phase, 60 Hz.
 - .3 Frame size: As indicated on drawings.
 - .4 Enclosure: As indicated on drawings.
 - .5 Operation: full speed, full load.
 - .6 Motors to be supplied and installed by Mechanical Division.

2.3 MANUAL MOTOR STARTERS

- .1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
 - .1 Switching mechanism, quick make and break.
 - .2 Overload heaters, manual reset, trip indicating handle.
- .2 Accessories:
 - .1 Toggle switch or as indicated.
 - .2 Indicating light: standard type and color as indicated.
 - .3 Locking tab to permit padlocking in "ON" or "OFF" position.
- .3 Standard of acceptance: Allen Bradley Bulletin 600 TAX 216.

2.4 FINISHES

- .1 Apply finishes to enclosure in accordance with Section 26 05 01 - Common Work Results - Electrical.

2.5 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Magnetic starter designation label, white plate, black letters, size as indicated.

Part 3 Execution**3.1 INSTALLATION**

- .1 Dry out motor if dampness present in accordance with manufacturer's instructions.
- .2 Install motor on structure rigid plumb and square.
- .3 Make wiring connections. Use liquid tight pvc jacketed flexible conduit between rigid conduit and motor.
- .4 Make flexible conduit long enough to permit movement of motor over entire length of slide rails.
- .5 Check for correct direction of rotation, with motor uncoupled from driven equipment.
- .6 Align and couple motor to driven machinery to manufacturer's instructions, using only correct parts such as couplings, belts, sheaves, as provided by manufacturer.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical .

END OF SECTION

SERVICE EQUIPMENT

Part 1 General**1.1 SECTION INCLUDES**

- .1 Service equipment and installation.

1.2 RELATED SECTIONS

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Section 26 05 28 - Grounding - Secondary.
- .3 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.
- .4 Section 26 28 21 - Moulded Case Circuit Breakers.
- .5 Section 26 28 23 - Disconnect Switches - Fused and Non-Fused.
- .6 Section 26 24 17 - Panelboards Breaker Type.

Part 2 Products**2.1 EQUIPMENT**

- .1 Fused disconnect switch: in accordance with Section 26 28 23 - Disconnect Switches - Fused and Non-Fused, up to 1000V, rating as indicated.
- .2 Meter Socket: exterior, weatherproof to Utility Company requirements.

Part 3 Execution**3.1 INSTALLATION**

- .1 Install service equipment.
- .2 Connect to incoming service.
- .3 Connect to outgoing load circuits.
- .4 Make grounding connections in accordance with Section 26 05 28 - Grounding - Secondary.
- .5 Make provision for power supply authority's metering.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .3 Section 06 10 11 - Rough Carpentry - Short Form: Plywood Backboard.
- .4 Section 26 05 01 - Common Work Results - Electrical.
- .5 Section 26 28 21 - Moulded Case Circuit Breakers.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2No.29-[M1989(R2000)], Panelboards and enclosed Panelboards.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

Part 2 Products**2.1 PANELBOARDS**

- .1 Panelboards: to CSA C22.2No.29 and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250 V panelboards: bus and breakers rated as indicated.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboard and key panelboards alike.

PANELBOARDS BREAKER TYPE

- .6 Copper bus with neutral of same ampere rating as mains.
- .7 Mains: suitable for bolt-on breakers.
- .8 Trim with concealed front bolts and hinges.
- .9 Trim and door finish: baked grey enamel.
- .10 Acceptable Manufacturers: Cutler Hammer, Square D, Siemens.
- .11 All panelboards shall be commercial grade. Residential grade is unacceptable.

2.2 BREAKERS

- .1 Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .4 Lock-on devices for 10% of 15 to 30A breakers installed as indicated. Turn over unused lock-on devices to Engineer.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results – Electrical.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

Part 3 Execution**3.1 INSTALLATION**

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 10 - Rough Carpentry. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 01 - Common Work Results - Electrical or as indicated.
- .4 Connect loads to circuits.

- .5 Connect neutral conductors to common neutral bus.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .3 Section 26 05 01 - Common Work Results - Electrical.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No.42-[99(R2002)], General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CSA-C22.2 No.42.1-[00], Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA-C22.2 No.55-[M1986(July 2001)], Special Use Switches.
 - .4 CSA-C22.2 No.111-[00], General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 SWITCHES**

- .1 15 A, 120 V, single pole switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.
- .2 Manually-operated general purpose ac switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Ivory toggle.

□

WIRING DEVICES

- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.
- .5 Acceptable materials: Hubbell HBL1200 Series.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.
- .5 Acceptable materials: Hubbell HBL5252 Series

2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type cabinet boxes.
- .4 Stainless steel, cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

Part 3 Execution**3.1 INSTALLATION**

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.

WIRING DEVICES

- .3 Mount toggle switches at height in accordance with Section 26 05 01 - Common Work Results – Electrical as indicated.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 01 - Common Work Results – Electrical as indicated.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .3 Cover plates:
 - .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 26 05 01 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2No.248.12-[94] , Low Voltage Fuses Part 12: Class R (Bi-National Standard with, UL 248-12 (1st Edition).

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
 - .1 Place materials defined as hazardous or toxic waste in designated containers.
 - .2 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.5 DELIVERY AND STORAGE

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed in switchboard.
- .3 Store fuses in original containers in moisture free location.

1.6 MAINTENANCE MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Six spare fuses of each type and size installed up to and including 600 A.

Part 2 Products**2.1 FUSES GENERAL**

- .1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.
- .2 Fuses: product of one manufacturer for entire project.

2.2 FUSE TYPES

- .1 Class J fuses (formerly HRCI- J).
 - .1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

Part 3 Execution

3.1 INSTALLATION

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically matched mounting devices.
- .3 Ensure correct fuses fitted to assigned electrical circuit.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Materials for moulded-case circuit breakers.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 5-[02], Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

Part 2 Products**2.1 BREAKERS GENERAL**

- .1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .2 Common-trip breakers: with single handle for multi-pole applications.
- .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .4 Circuit breakers to have minimum 10,000 symmetrical rms interrupting capacity rating. See drawings for ratings required.

Part 3 Execution**3.1 INSTALLATION**

- .1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 30 - Health and Safety Requirements.
- .3 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .4 Section 26 05 01 - Common Work Results - Electrical.
- .5 Section 26 28 14 - Fuses - Low Voltage.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches.
 - .2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 HEALTH AND SAFETY

- .1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

Part 2 Products**2.1 DISCONNECT SWITCHES**

- .1 Fusible, disconnect switch in CSA Enclosure 1, size as indicated.
- .2 Provision for padlocking in off switch position by three locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Fuses: size as indicated, HRC Class J.
- .5 Fuseholders: relocatable and suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.
- .8 Industrial grade switches required.

.9 Standard of acceptance: FPE Switchmatic or approved equal.

.10 Acceptable Manufacturers:

.1 Square D

.2 Siemens

.3 Cutler Hammer

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1-[97], Electric Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
 - .2 ANSI C82.4-[92], Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-[1991], Surge Voltages in Low-Voltage AC Power Circuits.
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM F1137-[88(1993)], Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 United States of America, Federal Communications Commission (FCC)
 - .1 FCC (CFR47) EM and RF Interference Suppression.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .3 Section 01 45 00 - Quality Control.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 LAMPS**

- .1 Fluorescent lamps.

Lamp Design Wattage	Bulb shape	Base	Type	Initial Lumens	Life h	Description
F032/835	T8	md.bip	EB8	2900	20000	Octron 35K

- .2 High pressure sodium lamps.

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Lamp Design Wattage	Bulb shape	Base	Initial Lumens	Life h	Description
ED-17	70	mogul	5400	24000	Coated

2.2 BALLASTS

- .1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic.
 - .1 Rating: 120 V, 60 Hz, for use with lamps identified in fixture schedule.
 - .2 RFI/EMI suppression circuit to: FCC (CFR47) Part 18, sub-part C, Class A and Part 15, sub-part B, Class B.
 - .3 Totally encased and designed for 40 deg C ambient temperature.
 - .4 Power factor: minimum 95% with 95% of rated lamp lumens.
 - .5 Crest factor: 1.5 maximum current, 2.0 maximum voltage.
 - .6 Capacitor: thermally protected.
 - .7 Thermal protection: non-reset able on coil.
 - .8 Harmonics: 10 % maximum THD, including 49th for electronic discrete and hybrid ballasts, 25 % maximum THD including 49th for electromagnetic ballasts.
 - .9 Operating frequency of electronic ballast: 21 khz minimum.
 - .10 Total Circuit Power: 62 Watts for 2-32 Watt ballast.
 - .11 Ballast Factor: greater than 0.90.
 - .12 Sound rated: Class A.
 - .13 Mounting: integral with luminaire.
 - .14 CSA approved.
 - .15 Acceptable materials:
 - .1 Osram Sylvania
 - .2 Standard
 - .3 Advance
 - .4 Magnatek
- .2 High pressure sodium ballast: to ANSI C82.4 design.
 - .1 Rating: 120 V, 60Hz, for use with high pressure sodium lamp as indicated.
 - .2 Totally encased and designed for 40 deg C ambient temperature.
 - .3 Power factor: minimum 95% with 95% of rated lamp lumens.
 - .4 Type: reactor with matching igniter as recommended by manufacturer.
 - .5 Input voltage range: plus 10% to minus 10% of nominal.
 - .6 Minimum starting temperature: minus 34 deg C at 90% line voltage.
 - .7 Mounting: integral with luminaire.
 - .8 Crest factor: 1.8 maximum current, 2.0 maximum voltage.

2.3 FINISHES

- .1 Baked enamel finish:
 - .1 Conditioning of metal before painting:
 - .1 For corrosion resistance conversion coating to ASTM F1137.

□

LIGHTING

- .2 For paint base, conversion coating to ASTM F1137.
- .2 Metal surfaces of luminaire housing and reflectors finished with high gloss baked enamel to give smooth, uniform appearance, free from pinholes or defects.
- .3 Reflector and other inside surfaces finished as follows:
 - .1 White, minimum reflection factor 85%.
 - .2 Colour fastness: yellowness factor not above 0.02 and after 250 hours exposure in Atlas fade-ometer not to exceed 0.05.
 - .3 Film thickness, not less than 0.03 mm average and in no areas less than 0.025 mm.
 - .4 Gloss not less than 80 units as measured with Gardner 60E gloss meter.
 - .5 Flexibility: withstand bending over 12 mm mandrel without showing signs of cracking or flaking under 10 times magnification.
 - .6 Adhesion: 24 mm square lattice made of 3 mm squares cut through film to metal with sharp razor blade. Adhesive cellulose tape applied over lattice and pulled. Adhesion satisfactory if no coating removed.

2.4 LUMINAIRES

- .1 Refer to drawings.

2.5 SPARE LAMPS

- .1 In addition to providing lamps for all luminaries supplied under this contract, provide the following complement of spare lamps:
 - .1 Six (6) of each type of fluorescent lamp used.
 - .2 Two (2) of each type of HPS lamp used.

2.6 APPROVED ALTERNATES

- .1 Canlyte
- .2 Cooper
- .3 Lithonia

Part 3 Execution**3.1 INSTALLATION**

- .1 Locate and install luminaires as indicated.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Directly for luminaire on gyproc ceilings.

LIGHTING

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations, support luminaires from ceiling grid in accordance with local inspection requirements.

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

END OF SECTION

Part 1 General**1.1 SECTION INCLUDES**

- .1 Materials and installation for emergency lighting systems.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .3 Section 26 05 21 - Wires and Cables (0-1000 V).
- .4 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.141-[M1985(R1999)], Unit Equipment fo Emergency Lighting.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data to indicate system components, mounting method, source of power and special attachments.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

Part 2 Products**2.1 EQUIPMENT**

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: 120 V, ac.
- .3 Output voltage: 12 V dc.
- .4 Operating time: 144 W for 30 min or as indicated.
- .5 Battery: sealed, maintenance free, 10 year life.

UNIT EQUIPMENT FOR EMERGENCY LIGHTING

- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Signal lights: solid state, life expectancy 100,000 hours, for 'AC Power ON' and 'High Charge'.
- .10 Lamp heads: integral on unit or remote as indicated. Lamp heads equal to MR16, 12V, 12W, 100hr, 12 WG.
- .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .12 Finish: white baked on enamel.
- .13 Auxiliary equipment:
 - .1 Lamp disconnect Switch.
 - .2 Test switch.
 - .3 Battery disconnect device.
 - .4 AC input and DC output terminal blocks inside cabinet.
 - .5 Mounting bracket.
 - .6 Cord and plug connection for AC.
 - .7 Auto test feature.
 - .8 Cord and L5-15R plug for connection to dc.
- .14 Approved Materials:
 - .1 Emergi-Lite
 - .2 Dual-Lite
 - .3 Ready Lite
 - .4 Lumacell

Part 3 Execution**3.1 INSTALLATION**

- .1 Install unit equipment and remote mounted fixtures.
- .2 Direct heads.
- .3 Connect exit lights to unit equipment.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 Atomic Energy Control Board Regulations
- .2 Canadian Code for Preferred Packaging
- .3 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.141- [M1985(R1992)] , Unit Equipment for Emergency Lighting.
 - .2 CSA C860- [96] , Performance of Internally-Lighted Exit Signs.
- .4 National Fire Protection Association (NFPA) requirements

1.2 SUBMITTALS

- .1 Submit product data in accordance with Section [01 33 00 - Submittals] .
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section [02 61 33 - Hazardous Materials]. WHMIS acceptable to Labour Canada, and Health and Welfare Canada for [____].
- .3 Submit product data sheets for exit lights. Include product characteristics, performance criteria, physical size, limitations and finish.
- .4 Manufacturer=s Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures and [____] .

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section [01 74 19 - Construction/Demolition Waste Management And Disposal] , and with Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products**2.1 STANDARD UNITS**

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.

□

EXIT SIGNS

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- .2 Housing: [cold rolled steel minimum [1.0] mm thick, satin aluminum enamel finish] [[cast anodized] extruded aluminum housing, brush aluminum finish] .
- .3 [Face] and [back] plates: [cast aluminum alloy] [die formed cold rolled steel] [Lexan] [extruded aluminum] .
- .4 Lamps: [One] [two] [multiple] - [A19-25W] [T6-9W] [T6-13W] [T6-15W] [PL5-12W] [PL7-16W] [PL9-20W] , [LED-12W] [EL-5W] [120] [130] [145] [347] V, [1000] [10,000] [50,000] [75,000] [100,000] [over 500,000] hours.
- .5 Operation: designed for [10,000] hours, fluorescent lamps only, [50,000] [75,000] [100,000] [over 100,000] hours of continuous operation without relamping.
- .6 Letters: [150] mm high x [19] mm, with [13 mm] thick stroke, [white on red glass] [red on white glass] [red on die-cast aluminum face] , reading [EXIT] [and] [SORTIE] .
- .7 [Downlight: [white glass] [translucent acrylic] in bottom of unit.]
- .8 Third lamp socket for emergency lamp lighting circuit. Third lamp: [___] W, [___] V [dc] [ac] .
- .9 Face plate to remain captive for relamping.

2.2 SELF-POWERED UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.
- .2 Housing: [cold rolled steel minimum [1.0] mm thick, satin aluminum enamel finish] [[cast anodized] extruded aluminum housing, brush aluminum finish] .
- .3 [Face] and [back] plates: [cast aluminum alloy] [die formed cold rolled steel] [Lexan] [extruded aluminum] .
- .4 Lamps: [One] [two] [multiple] - [A19-25W] [T6-25W] [T6-9W] [T6-13W] [T6-15W] [PL5-12W] [PL7-16W] [PL9-20W] , [LED-12W] [EL-5W] [120] [130] [145] [347] V, [1000] [10,000] [50,000] [75,000] [100,000] [over 500,000] hours.
- .5 Operation: designed for [10,000] hours fluorescent lamps only, [50,000] [75,000] [100,000] [over 100,000] hours of continuous operation without relamping.
- .6 Letters: [150] mm high x [19] mm wide, with [13] mm thick stroke, [white on red glass] [red on white glass] [red on die-cast aluminum face] , reading [EXIT] [and] [SORTIE] .
- .7 [Downlight: [white glass] [translucent acrylic] in bottom of unit.]
- .8 Third lamp socket for emergency lamp lighting circuit. Third lamp: [___] W, [___] V [dc] [ac] .
- .9 Face plate to remain captive for relamping.
- .10 Supply voltage: [120] V, ac.

□

EXIT SIGNS

- .11 Output voltage: [12] [24] V dc.
- .12 Operating time: [30] [60] min.
- .13 Recharge time: [12] [24] hours
- .14 Battery: sealed, maintenance free.
- .15 Charger: solid state, voltage/current regulated, inverse temperature compensated, short circuit protected, with regulated output of plus or minus 0.01 V for plus or minus 10% V input variation.
- .16 Solid state transfer circuit.
- .17 Signal lights: solid state, for ['AC Power ON'] and ['High Charge'] condition.
- .18 Lamp heads: integral on unit, 345E horizontal and 180E vertical adjustment. Lamp type: [tungsten] [quartz] , [___] W, minimum [___] lumen output.
- .19 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .20 Cabinet: finish: [___] .
- .21 Auxiliary equipment:
 - .1 Ammeter.
 - .2 Voltmeter.
 - .3 Lamp disconnect switch.
 - .4 Test switch.
 - .5 AC/DC output terminal blocks inside cabinet.
 - .6 RFI suppressor.
 - .7 Cord and [single twist-lock] plug connection for AC power supply.

2.3 SELF-LUMINOUS SIGNS

- .1 Exit lights: packaged in accordance with the Canadian Code for Preferred Packaging guidelines.
 - .1 No power source or wiring required, spark free.
 - .2 Constructed: metal and plastic.
 - .3 Source of energy: Tritium gas emits constant low energy beta particles to excite phosphor coating on inside of tube.
 - .4 Viewing distance: to requirements of the National Fire Protection Association.
 - .5 Dispose of lights at end of lifespan as Hazardous Waste in accordance with Atomic Energy Control Board Regulation. Disposal by manufacturer or authorized agent.

2.4 DESIGN [X1]

- .1 [Recessed] [wall] [end to wall] [ceiling] mounting.

□

EXIT SIGNS

- .2 [Single] [Double] face [with die-cast face plate to remain captive for relamping] .
- .3 Arrow: [right] [left] [both directions] [knock-outs] .
- .4 Wireguard.

Part 3 Execution

3.1 INSTALLATION

- .1 Install exit lights.
- .2 Connect fixtures to exit light circuits.
- .3 Connect emergency lamp sockets to emergency circuits.
- .4 Ensure that exit light circuit breaker is locked in on position.

END OF SECTION