



Public Works and  
Government Services Canada

Requisition No. EZ899-152418

MERX I.D. No. \_\_\_\_\_

**SPECIFICATIONS**

for

**Palace Grand Theatre Foundation Replacement**

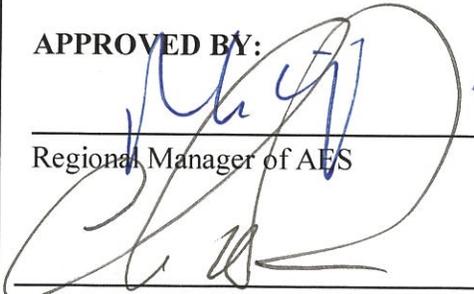
at

Dawson City, Yukon Territory

Project No. R.068835.001

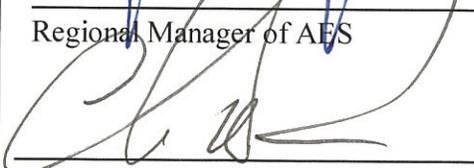
May 2015

**APPROVED BY:**

  
\_\_\_\_\_  
Regional Manager of AFS

2015-05-14

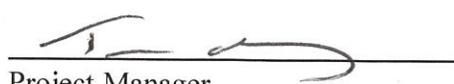
Date

  
\_\_\_\_\_  
Regional Construction Safety Coordinator

2015.05.12

Date

**TENDER:**

  
\_\_\_\_\_  
Project Manager

15/05/14

Date

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	- Structural		
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**STRUCTURAL**

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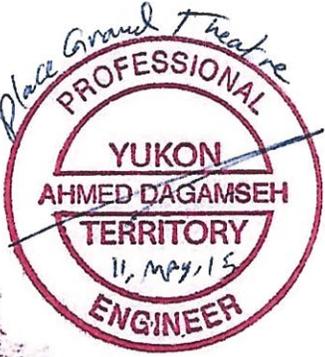
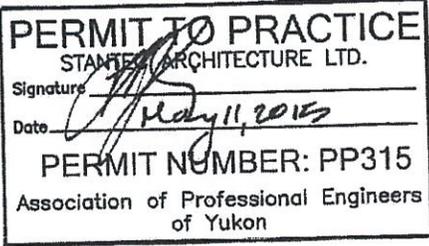
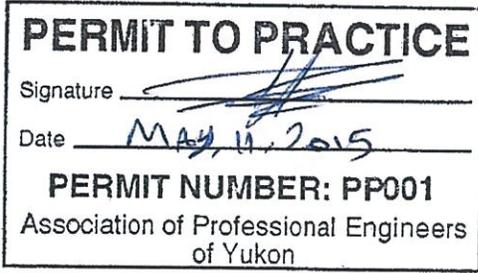
**MECHANICAL**

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E1	ELECTRICAL DEMOLISHING AND RE-INSTALLATION PLAN
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**ARCHITECT AND ENGINEERS – SEAL & SIGNATURE**

Seal / Signature / Date	Seal / Signature / Date
 <p>PROFESSIONAL              YUKON              Y.W. PATRICK LAM              TERRITORY              ENGINEER              May 11, 2015</p>	 <p>PROFESSIONAL              YUKON              SANDY BIRRELL              TERRITORY              May 11, 2015              ENGINEER              Palace Grand 144902432</p>
 <p>Palace Grand Theatre              PROFESSIONAL              YUKON              AHMED DAGAMSEH              TERRITORY              11, May, 15              ENGINEER</p>	 <p>PERMIT TO PRACTICE              STANTEC ARCHITECTURE LTD.              Signature _____              Date <u>May 11, 2015</u>              PERMIT NUMBER: PP315              Association of Professional Engineers              of Yukon</p>
 <p>PERMIT TO PRACTICE              Signature _____              Date <u>MAY 11, 2015</u>              PERMIT NUMBER: PP001              Association of Professional Engineers              of Yukon</p>	 <p>REGISTERED ARCHITECT              BARRY RAYMOND              COSE              BRITISH COLUMBIA              MAY 11 2015</p>

END

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1.0 GENERAL

1.1 CODES

- .1 Perform work in accordance with National Building Code for Canada 2010, Yukon Workers' Compensation Health and Safety Board, and any other code of territory or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Meet or exceed requirements of specified standards, codes and referenced documents.

1.2 DESCRIPTION OF WORK

- .1 Work under this Contract is to take place at Palace Grand Theatre in Dawson City at Yukon Territory as shown on location plan on drawing S0. The existing Palace Grand Theatre is a heritage building.
- .2 Work under this Contract comprises, but is not limited to, the provision of all labour, materials, services and equipment necessary for the followings:
  - (1) The foundation replacement of the existing Theatre Building as fully described in the Tender Documents.
  - (2) Remove and re-instate existing mechanical and electrical service as required to allow for the foundation replacement.
  - (3) Demolish existing skirting walls and construct new skirting walls as shown on the drawings.
  - (4) Prepare crawlspace floor and Install drainage, insulation, etc. as shown on the drawings.
- .3 "Green" requirements:
  - (1) Use materials/products containing highest percentage of recycled and recovered materials practicable \_ consistent with maintaining cost effective satisfactory levels of competition.
  - (2) Adhere to waste reduction requirement for reuse or recycling of waste materials, thus diverting materials from landfill.

1.3 CONTRACT DOCUMENTS

- .1 The Contract documents, drawings and specifications are intended to complement each other and to provide for and include everything necessary for the completion of the work.
- .2 Drawings are, in general, diagrammatic and are intended to indicate the scope and general arrangement of the work.

1.4 DIVISION OF SPECIFICATIONS

- .1 The specifications are subdivided in accordance with the current 6\_digit National Master Specifications System.
- .2 A division may consist of the work of more than 1 subcontractor. Responsibility for determining which subcontractor provides the labour, material, equipment and services required to complete the work rests solely with the Contractor.
- .3 In the event of discrepancies or conflicts when interpreting the drawings and specifications, the specifications govern

1.5 TIME OF COMPLETION

- .1 Commence work immediately upon official notification of acceptance of offer and complete the project within twenty-two (22) weeks after contract award with the milestone completion date as follows:

- a) No pile installation work is to be commenced prior to Aug 1, 2015 and all pile installation shall be completed prior to Oct 15, 2015
- b) Allow minimum 2 months for development of pile adfreeze capacity prior to loading new piles to carry the theatre building unless approval from the Departmental Representative based on the pile loading test.

The Building is in function until August 1, 2015. No construction work to the Building including the crawl space and perimeter skirting shall allow to be commenced prior to August 1, 2015. Any on-site construction activities outside the Building prior to August 1, 2015 shall not be interfered with the Building operation.

#### 1.6 HOURS OF WORK

- .1 Hours of work:
  - .1 The Work shall be carried out during the normal working hours in accordance with the municipal bylaw, Monday to Friday.
  - .2 Work may be performed on Saturdays, Sundays, and holidays, with the prior approval of the Departmental Representative.
  - .3 Contractor must notify the Departmental Representative in writing at least 2 working days in advance of working on Saturdays, Sundays, and holidays. Contractor notification to Departmental Representative to work on Saturdays, Sundays, and holidays does not mean that it will automatically be granted.
  - .4 Hours of work for Saturdays, Sundays, and holidays will be determined by the Departmental Representative.

#### 1.7 WORK SCHEDULE

- .1 Carry out work as follows:
  - .1 Within 10 working days after Contract award, provide a "phasing bar chart" , "adopted construction methodology and its associated protection plan to all heritage fixtures & finishing for approval and a schedule showing anticipated progress stages and final completion of the work within the time period required by the Contract documents. Indicate the following:
    - .1 Submission of shop drawings, product data, MSDS sheets and samples.
    - .2 Commencement and completion of work of each section of the specifications or trades for each phase as outlined.
    - .3 Final completion date within the time period required by the Contract documents.
  - .2 Do not change approved Schedule without notifying Departmental Representative.
  - .3 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative and schedule updated by Contractor in conjunction with and to approval of Departmental Representative.

#### 1.8 COST BREAKDOWN

- .1 Before submitting the first progress claim, submit a breakdown of the Contract lump sum prices in detail as directed by the Departmental Representative and aggregating Contract price. After approval by Departmental Representative cost breakdown will be used as basis for progress payments.
- .2 Within 2 weeks after award of contract, provide a monthly cash flow projection for the whole contract period in detail as directed by Departmental Representative. Contractor should provide a monthly update of the cash flow projection according to the actual work schedule

**1.9 CODE, BYLAWS, STANDARDS**

- .1 Perform work in accordance with the National Building Code of Canada (NBC) 2010, and other indicated Codes, Construction Standards and/or any other Code or Bylaw of local application.
- .2 Comply with applicable local bylaws, rules and regulations enforced at the location concerned.
- .3 Meet or exceed requirements of Contract documents, specified standards, codes and referenced documents.
- .4 In any case of conflict or discrepancy, the most stringent requirements shall apply.

**1.10 DOCUMENTS REQUIRED**

- .1 Maintain one copy each of the following at the job site:
  - .1 Contract drawings.
  - .2 Contract specifications.
  - .3 Addenda to Contract documents.
  - .4 Copy of approved work schedule.
  - .5 Reviewed/approved shop drawings.
  - .6 Change orders.
  - .7 Other modifications to Contract.
  - .8 Field test reports.
  - .9 Reviewed/approved samples.
  - .10 Manufacturer's installation and application instructions.
  - .11 One set of record drawings and specifications for "as-built" purposes.
  - .12 National Building Code of Canada 2010.
  - .13 Current construction standards of workmanship listed in technical Sections.
  - .14 Building Safety Plan.
  - .15 Request for Information (RFI)
  - .16 Contemplated Change Notices
  - .17 WHMIS Documents
  - .18 Site Instructions
  - .19 Contractor's Health and Safety Plan, including map to nearest hospital.

**1.11 REGULATORY REQUIREMENTS**

- .1 Building Permit
  - .1 Obtain and pay for Building Permit, Occupancy Permit, Certificates, Licenses and other permits through the Government of Yukon as required by regulatory municipal, territory or federal authorities to complete the work.
- .2 Provide inspection authorities with plans and information required for issue of acceptance certificates.
- .3 Furnish inspection certificates in evidence that the work installed conforms with the requirements of the authority having jurisdiction.
- .4 Comply with conditions as stated in Standard Acquisition Clauses and Conditions (SACC) Manual.

**1.12 CONTRACTOR'S USE OF SITE**

- .1 Use of site:
  - .1 Contractor can only perform the Work of foundation placement to the Building starting August 01, 2015.

- .2 Use temporary construction storage areas as shown on drawings.
  - .3 Use of existing toilet facilities inside the building is not allowed.
  - .4 Exclusive and complete for execution of work.
  - .5 Assume responsibility for assigned premises for performance of this work.
  - .6 Be responsible for coordination of all work activities on site, including the work of other contractors engaged by the Departmental Representative such as concrete testing company.
  - .7 Provide security of Contractor's work site and all Contractors and Subcontractor's equipment and material. Secure Contractor's work site at the end of each work day.
  - .8 Do not obstruct access outside of the Contractor's work site. Maintain overhead clearances, keep roadways and walkways clear, and maintain routes for emergency response vehicles.
- 
- .2 Perform work in accordance with Contract documents. Ensure work is carried out in accordance with approved schedules.
  - .3 Do not unreasonably encumber site with material or equipment.

**1.13 EXAMINATION**

- .1 Examine site and be familiar and conversant with existing conditions likely to affect work.
- .2 Provide photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

**1.14 EXISTING SERVICES**

- .1 Where Work involves breaking into or connecting to existing services, carry out work as directed by Departmental Representative or the authority having jurisdiction.
- .2 Record locations of maintained, re-routed and abandoned service lines.
- .3 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

**1.15 LOCATION OF EQUIPMENT AND FIXTURES**

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space, and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative at least 48 hours prior to impending installation and obtain approval for actual location.
- .4 Submit field drawings or shop drawings to indicate the relative position of various services and equipment when required by the Departmental Representative and/or as specified.

**1.16 CUTTING AND PATCHING**

- .1 Propose any cutting of existing surfaces as required to accommodate new work that is not specified on the drawings to the Departmental Representative for review and approval. Cutting should be kept as minimum to minimize intervention to the building's heritage aspects.

- .2 Remove items so shown or specified.
- .3 Do not cut, bore, or sleeve load-bearing members.
- .4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .5 Fit work airtight to pipes, sleeves, ducts and conduits.
- .6 Conceal pipes, ducts and wiring in raised floors, wall and ceiling construction of finished areas except where indicated otherwise.
- .7 Patch and make good surfaces cut, damaged or disturbed, to Departmental Representative's approval. Match existing material, colour, finish and texture.
- .8 Making good is defined as matching construction and finishing materials and the adjacent surfaces such that there is no visible difference between existing and new surfaces when viewed from 1.5 metres in ambient light, and includes painting the whole surface to the next change in plane.

#### 1.17 SETTING OUT OF WORK

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

#### 1.18 ACCEPTANCE OF SUBTRADES

- 1 Each trade shall examine surfaces prepared by others and job conditions which may affect his work, and shall report defects to the General Contractor. Commencement of work shall imply acceptance of prepared work or substrate surfaces.

#### 1.19 QUALITY OF WORK

- .1 Ensure that quality workmanship is performed through use of skilled tradesmen, under supervision of qualified journeyman.
- .2 The workmanship, erection methods and procedures to meet minimum standards set out in the National Building Code of Canada 2010 and Construction Standards as specified herein.
- .3 In cases of dispute, decisions as to standard or quality of work rest solely with the Departmental Representative, whose decision is final.

#### 1.20 WORKS COORDINATION

- .1 Coordinate work of sub-trades:
  - .1 Designate one person to be responsible for review of contract documents and shop drawings and managing coordination of Work.
- .2 Convene meetings between subcontractors whose work interfaces and ensure awareness of areas and extent of interface required.
  - .1 Provide each subcontractor with complete plans and specifications for Contract, to assist them in planning and carrying out their respective work.

- .2 Develop coordination drawings when required, illustrating potential interference between work of various trades and distribute to affected parties.
  - .1 Pay particularly close attention to overhead work above ceilings and within or near to building structural elements.
  - .2 Identify on coordination drawings, building elements, services lines, rough-in points and indicate location services entrance to site.
- .3 Facilitate meeting and review coordination drawings. Ensure subcontractors agree and sign off on drawings.
- .4 Publish minutes of each meeting.
- .5 Plan and coordinate work in such a way to minimize quantity of service line offsets.
- .6 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.
- .3 Submit shop drawings and order of prefabricated equipment or rebuilt components only after coordination meeting for such items has taken place.
- .4 Work cooperation:
  - .1 Ensure cooperation between trades in order to facilitate general progress of Work and avoid situations of spatial interference.
  - .2 Ensure that each trade provides all other trades reasonable opportunity for completion of Work and in such a way as to prevent unnecessary delays, cutting, patching and removal or replacement of completed work.
  - .3 Ensure disputes between subcontractors are resolved.
- .5 Departmental Representative is not responsible for, or accountable for extra costs incurred as a result of Contractor's failure to coordinate Work.
- .6 Maintain efficient and continuous supervision.

#### 1.21 APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- .1 In accordance with Section 01 33 00, submit the requested shop drawings, product data, MSDS sheets and samples indicated in each of the technical Sections.
- .2 Allow sufficient time for the following:
  - .1 Review of product data.
  - .2 Approval of shop drawings.
  - .3 Review of re-submission.
  - .4 Ordering of approved material and/or products. Refer to individual technical sections of specifications.

#### 1.22 RELICS AND ANTIQUITIES

- .1 Relics and antiquities and items of historical or scientific interest shall remain property of Department. Protect such articles and request directives from Departmental Representative.
- .2 Give immediate notice to Departmental Representative if evidence of archeological finds are encountered during excavation/construction, and await Departmental Representative's written instructions before proceeding with work in this area.

#### 1.23 PROJECT MEETINGS

- .1 Departmental Representative will arrange project meetings and assume responsibility for setting times and recording and distributing minutes.

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**1.24 TESTING AND INSPECTION**

- .1 Particular requirements for inspection and testing to be carried out by testing service or laboratory approved by the Departmental Representative are specified various Sections.
- .2 The Contractor will appoint and pay for the services of testing agency or testing laboratory as specified, and where required for the following:
  - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
  - .2 Inspection and testing performed exclusively for Contractor's convenience.
  - .3 Testing, adjustment and balancing of mechanical and electrical equipment and systems.
    - .1 Mill tests and certificates of compliance.
    - .2 Tests specified in the contract documents to be carried out by Contractor which may be under the Departmental Representative's supervision.
- .3 Within 15 working days after Contract award provide a list of proposed testing services or testing laboratories for Departmental Representative's approval.
- .4 The Departmental Representative may require, and pay for, additional inspection and testing services not included in paragraph 1.24.2.
- .5 Where tests or inspections by designated testing laboratory reveal work is not in accordance with the Contract requirements, Contractor shall pay costs for additional tests or inspections as the Departmental Representative may require to verify acceptability of corrected work.
- .6 Contractor shall furnish labour and facilities to carry out specified testing and notify Departmental Representative in advance of planned testing.
- .7 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .8 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Departmental Representative.
- .9 Provide Departmental Representative with 2 copies of testing laboratory reports as soon as they are available.

**1.25 AS-BUILT DOCUMENTS**

- .1 The Departmental Representative will provide 2 sets of drawings and 2 sets of specifications and PDF files, including 2 sets of drawings and specification and original AutoCAD files for "as-built" purposes.
- .2 Keep one set of current white prints of all contract drawings and all addenda, revisions, clarifications, change orders, and reviewed shop drawings in the site office; and have them available at all times for inspection by the Departmental Representative.
- .3 As the work progresses, maintain accurate records to show all deviations from the Contract documents. Note on as-built specifications, drawings and shop drawings as changes occur.
- .4 Provide accurate as-built drawings by a qualified professional surveyor identifying the various elements shown on the drawings in the requested format.

- .5 At completion of the Work, transfer all deviations, including those called up by addenda, revisions, clarifications, shop drawings and change order, to a set of Issued for Construction drawings. Submit the 'red-marked' as-built set to the Departmental Representative in hard copy with contractor's review stamp and date confirming that the set submitted are a true record of "as-built" information.

#### 1.26 CLEANING

- .1 Daily conduct cleaning and disposal operations. Comply with local ordinances and anti\_pollution laws.
- .2 Ensure cleanup of the work areas each day after completion of work.
- .3 On completion of the work, remove all temporary buildings and offices, site sign, all debris, rubbish, etc., clean-up site and leave same neat and tidy to the satisfaction of the Departmental Representative.
- .4 In preparation for interim and final inspections:
  - .1 Examine all sight\_exposed interior and exterior surfaced and concealed spaces.
  - .2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight\_exposed interior and exterior finished surfaces, including glass and other polished surfaces
- .5 Use cleaning materials and methods in accordance with instructions of the manufacturer of the surface to be cleaned.

#### 1.27 DUST CONTROL

- .1 Provide temporary dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of work and public.
- .2 Provide dust tight screens for protection of existing theatre building including its contents for works perform inside the Theatre building.
- .3 Maintain and relocate protection until such work is complete.

#### 1.28 PUBLIC WAY CONSTRUCTION

- .1 Design, erect and maintain hoarding and covered pedestrian walkways to support all loads including windloads and provide protection, complete with signs and electrical lighting as required by authority having jurisdiction.
- .2 Provide one lockable truck entrance gate and one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent street. Equip gates with locks and keys. Paint public side of site enclosure in colour selected by Departmental Representative

#### 1.29 ENVIRONMENTAL PROTECTION

- .1 Prevent extraneous materials from contaminating air beyond construction area, by providing temporary enclosures during work.
- .2 Do not dispose of waste or volatile materials into water courses, storm or sanitary sewers.
- .3 Ensure proper disposal procedures in accordance with all applicable territorial regulations.

#### 1.30 MAINTENANCE MATERIALS, SPECIAL TOOLS AND SPARE PARTS

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- .1 Specific requirements for maintenance materials, tools and spare parts are specified in individual technical sections of specifications.

**1.31 ADDITIONAL DRAWINGS**

- .1 The Departmental Representative may furnish additional drawings for clarification. These additional drawings have the same meaning and intent as if they were included with drawings referred to in the Contract Documents.
- .2 Departmental Representative will furnish up to a maximum of eight (8) sets of Contract drawings and four (4) sets of specification for use by the Contractor at no additional cost. PDF files of all documents will be provided. Should more documents be required, the Departmental Representative will provide them at additional cost.

**1.32 BUILDING SMOKING ENVIRONMENT**

- .1 Smoking within the building and within 7.5m of all air intakes is not permitted.

**1.33 SYSTEM OF MEASUREMENT**

- .1 The metric system of measurement (SI) will be employed on this Contract.

**1.34 FAMILIARIZATION WITH SITE**

- .1 Before submitting tender, site visit is recommended to become familiar with all conditions likely to affect the cost of the work. A pre-tender site meeting may be arranged by the Departmental Representative in June 2015. Attendance at the pre-tender site meeting is not mandatory.

**1.33 SUBMISSION OF TENDER**

- .1 Submission of a tender is deemed to be confirmation of the fact that the Tenderer has analyzed the Contract documents and inspected the site, and is fully conversant with all conditions.

**END OF SECTION**

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**Part 1            General**

**1.1            RELATED SECTIONS**

- |    |                      |                  |
|----|----------------------|------------------|
| .1 | General Instructions | Section 01 11 55 |
| .2 | Closeout Procedures  | Section 01 77 00 |
| .3 | Closeout Submittals  | Section 01 78 00 |

**1.2            ADMINISTRATIVE**

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

**1.3            SHOP DRAWINGS AND PRODUCT DATA**

- .1    Refer to CCDC 2 GC 3.11.
- .2    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.
- .3    Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Yukon Territory, Canada where required as indicated in the specification Sections and/or drawings.

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- .4 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
  - .5 Allow 7 days for Departmental Representative's review of each submission.
  - .6 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
  - .7 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
  - .8 Accompany submissions with transmittal letter containing:
    - .1 Date.
    - .2 Project title and number.
    - .3 Contractor's name and address.
    - .4 Identification and quantity of each shop drawing, product data and sample.
    - .5 Other pertinent data.
  - .9 Submissions include:
    - .1 Date and revision dates.
    - .2 Project title and number.
    - .3 Name and address of:
      - .1 Subcontractor.
      - .2 Supplier.
      - .3 Manufacturer.
    - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
    - .5 Details of appropriate portions of Work as applicable:
      - .1 Fabrication.
      - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
      - .3 Setting or erection details.
      - .4 Capacities.
      - .5 Performance characteristics.
      - .6 Standards.
      - .7 Operating weight.
      - .8 Wiring diagrams.
      - .9 Single line and schematic diagrams.
      - .10 Relationship to adjacent work.
  - .10 After Departmental Representative's review, distribute copies.
  - .11 Submit one reproducible transparency of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

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- .12 Submit the number of copies of shop drawings and/or product data sheets or brochures for requirements requested in specification Sections which Contractor requires for distribution plus copies which will be retained by the Departmental Representative and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
  - .13 Submit electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
    - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
    - .2 Testing must have been within 1 year of date of contract award for project.
  - .14 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
    - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
    - .2 Certificates must be dated after award of project contract complete with project name.
  - .15 Submit electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
    - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
  - .16 Submit electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
    - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
  - .17 Submit electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
  - .18 Delete information not applicable to project.
  - .19 Supplement standard information to provide details applicable to project.
  - .20 If upon review by Departmental Representative, 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.
  - .21 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
    - .1 This review shall not mean that PWGSC 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 requirements of construction and Contract Documents.

- .2 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 sub-trades.

**1.4 SAMPLES**

- .1 Submit for review samples in as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's site office.
- .3 Notify Departmental Representative 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 Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative 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.

**1.5 PROGRESS PHOTOGRAPHS**

- .1 Submit progress photographs.

**1.6 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**

## 1.0 GENERAL

### 1.1 REFERENCES

- .1 Government of Canada.
  - .1 Canada Labour Code - Part II
  - .2 Canada Occupational Health and Safety Regulations.
- .2 National Building Code of Canada (NBC 2010):
  - .1 Part 8, Safety Measures at Construction and Demolition Sites.
- .3 Canadian Standards Association (CSA as amended):
  - .1 CSA Z797-2009 Code of Practice for Access Scaffold
  - .2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes
  - .3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures
- .4 Fire Protection Engineering Services, HRSDC:
  - .1 FCC No. 301, Standard for Construction Operations.
  - .2 FCC No. 302, Standard for Welding and Cutting.
- .5 American National Standards Institute (ANSI):
  - .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.
- .6 Province of British Columbia:
  - .1 Workers Compensation Act Part 3-Occupational Health and Safety.
  - .2 Occupational Health and Safety Regulation
- .7 Current B.C. Electrical Code

### 1.2 RELATED SECTIONS

- .1 Submittal Procedures Section 01 33 00
- .2 Temporary Barriers and Enclosures Section 01 56 00

### 1.3 WORKERS' COMPENSATION AND SAFETY BOARD COVERAGE

- .1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.
- .2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

### 1.4 COMPLIANCE WITH REGULATIONS

- .1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Regulations.
- .2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Regulations.

### 1.5 SUBMITTALS

- .1 Submit to Departmental Representative submittals listed for review. In accordance with Section 01 33 00

- .2 Work effected by submittal shall not proceed until review is complete.
- .3 Submit the following:
  - .1 Health and Safety Plan.
  - .2 Copies of reports or directions issued by Federal and Territory health and safety inspectors.
  - .3 Copies of incident and accident reports.
  - .4 Complete set of Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Material Information System (WHMIS) requirements.
  - .5 Emergency Procedures.
- .4 The Departmental Representative will review the Contractor's site-specific project Health and emergency procedures, and provide comments to the Contractor within 2 days after Receipt of the plan. Revise the plan as appropriate and resubmit to Departmental Representative.
- .5 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 for any new site personnel to Departmental Representative.
- .6 Submission of the Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
  - .1 Be construed to imply approval by the Departmental Representative.
  - .2 Be interpreted as a warranty of being complete, accurate and legislatively compliant.
  - .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

#### 1.6 RESPONSIBILITY

- .1 Assume responsibility as the Prime Contractor for work under this contract.
- .2 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.
- .3 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.

#### 1.7 HEALTH AND SAFETY COORDINATOR

- .1 The Health and Safety Coordinator must:
  - .1 Be responsible for completing all health and safety training, and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.
  - .2 Be responsible for implementing, daily enforcing, and monitoring the site-specific Health and Safety Plan.
  - .3 Be on site during execution of work.

#### 1.8 GENERAL CONDITIONS

- .1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.
- .2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.
  - .1 Provide appropriate means by use of barricades, fences, warning signs, traffic control

- personnel, and temporary lighting as required.
- .2 Secure site at night time as deemed necessary to protect site against entry.

#### 1.9 REGULATORY REQUIREMENTS

- .1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.
- .2 In event of conflict between any provision of the above authorities, the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, the Departmental Representative will advise on the course of action to be followed.

#### 1.10 WORK PERMITS

- .1 Obtain specialty trade permits related to project before start of work.

#### 1.11 FILING OF NOTICE

- .1 The General Contractor is to complete and submit a Notice of Project as required by Territory authorities.
- .2 Provide copies of all notices to the Departmental Representative.

#### 1.12 HEALTH AND SAFETY PLAN

- .1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.
- .2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:
  - .1 Primary requirements:
    - .1 Contractor's safety policy.
    - .2 Identification of applicable compliance obligations.
    - .3 Definition of responsibilities for project safety/organization chart for project.
    - .4 General safety rules for project.
    - .5 Job-specific safe work, procedures.
    - .6 Inspection policy and procedures.
    - .7 Incident reporting and investigation policy and procedures.
    - .8 Occupational Health and Safety Committee/Representative procedures.
    - .9 Occupational Health and Safety meetings.
    - .10 Occupational Health and Safety communications and record keeping procedures.
  - .2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.
  - .3 List hazardous materials to be brought on site as required by work.
  - .4 Indicate Engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.
  - .5 Identify personal protective equipment (PPE) to be used by workers.
  - .6 Identify personnel and alternates responsible for site safety and health.
  - .7 Identify personnel training requirements and training plan, including site orientation for new workers.
- .3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.
- .4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.
- .5 Departmental Representative's review: the review of Health and Safety Plan by Public Works and

Government Services Canada (PWGSC) shall not relieve the Contractor of responsibility for errors or omissions in final Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

### 1.13 EMERGENCY PROCEDURES

- .1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:
  - .1 Designated personnel from own company.
  - .2 Regulatory agencies applicable to work and as per legislated regulations.
  - .3 Local emergency resources.
  - .4 Departmental Representative and site staff.
- .2 Include the following provisions in the emergency procedures:
  - .1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
  - .2 Evacuate all workers safely.
  - .3 Check and confirm the safe evacuation of all workers.
  - .4 Notify the fire department or other emergency responders.
  - .5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
  - .6 Notify Departmental Representative and site staff.
- .3 Provide written rescue/evacuation procedures as required for, but not limited to:
  - .1 Work at high angles.
  - .2 Work in confined spaces or where there is a risk of entrapment.
  - .3 Work with hazardous substances.
  - .4 Underground work.
  - .5 Work on, over, under and adjacent to water.
  - .6 Workplaces where there are persons who require physical assistance to be moved.
- .4 Design and mark emergency exit routes to provide quick and unimpeded exit.
- .5 Revise and update emergency procedures as required, and re-submit to the Departmental Representative.

### 1.14 HAZARDOUS PRODUCTS

- .1 Comply with requirements of Workplace Hazardous Materials Information system (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labeling and provision of material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.
- .2 Where use of hazardous and toxic products cannot be avoided:
  - .1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per Section 01 33 00.
  - .2 In conjunction with Departmental Representative, schedule to carry out work during "off hours".
  - .3 Provide adequate means of ventilation to prevent dust and odour migration to other areas.

### 1.15 ASBESTOS HAZARD

- .1 Carry out work or demolition activities involving asbestos in accordance with applicable Territory regulations.
- .2 Removal and handling of asbestos will be performed as indicated in Section 02 82 00.01

1.16 REMOVAL OF LEAD-CONTAINING PAINTS

- .1 All paints containing TCLP lead concentrations above 5 ppm are classified as hazardous.
- .2 Carry out demolition activities involving lead-containing paints in accordance with applicable Territory regulations.

1.17 ELECTRICAL SAFETY REQUIREMENTS

- 1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.
  - .1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.
  - .2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

1.18 ELECTRICAL LOCKOUT

- .1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.
- .2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental Representative.
- .3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

1.19 OVERLOADING

- .1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.

1.20 CONFINED SPACES

- .1 Carry out work in confined spaces in compliance with Occupational Health and Safety Regulation, Part 9.

1.21 POWDER-ACTUATED DEVICES

- .1 Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the Departmental Representative.

1.22 FIRE SAFETY AND HOT WORK

- .1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.
- .2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

1.23 FIRE SAFETY REQUIREMENTS

- .1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

- .2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

#### 1.24 FIRE PROTECTION AND ALARM SYSTEM

- .1 Fire protection and alarm systems shall not be:
  - .1 Obstructed.
  - .2 Shut off.
  - .3 Left inactive at the end of a working day or shift.
- .2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.
- .3 Be responsible/liable for costs incurred from the fire department, the building owner and the tenants, resulting from false alarms.

#### 1.25 UNFORESEEN HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and advise the Departmental Representative verbally and in writing.

#### 1.26 POSTED DOCUMENTS

- .1 Post legible versions of the following documents on site:
  - .1 Health and Safety Plan.
  - .2 Sequence of work.
  - .3 Emergency procedures.
  - .4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.
  - .5 Notice of Project.
  - .6 Floor plans or site plans.
  - .7 Notice as to where a copy of the Workers' Compensation Act and Regulations are available on the work site for review by employees and workers.
  - .8 Workplace Hazardous Materials Information System (WHMIS) documents.
  - .9 Material Safety Data Sheets (MSDS).
  - .10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.
- .2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.
- .3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

#### 1.27 MEETINGS

- .1 Attend health and safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.

#### 1.28 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance

with health and safety issues identified.

- .3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Section 01 74 19 - Waste Management And Disposal.

**1.2                REFERENCES**

- .1            Canadian General Standards Board (CGSB)
  - .1            CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
  - .2            CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2            Canadian Standards Association (CSA International)
  - .1            CSA-O121-[M1978(R2003)], Douglas Fir Plywood.
- .3            Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses and Conditions (SACC)-ID: R0202D, Title: General Conditions 'C', In Effect as Of: May 14, 2004.

**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                HOARDING**

- .1            Erect temporary site enclosure using new 1.8m high snow fence wired to rolled steel "T" bar fence posts spaces 2.4m maximum on centre. Provide one lockable truck gate. Maintain fence in good repair.
- .2            Design enclosures to withstand wind pressure.
- .3            Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB 1.189 and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition.
- .4            Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

**1.5                GUARD RAILS AND BARRICADES**

- .1            Provide secure, rigid guard rails and barricades around deep excavations and open shafts, open stair wells, and open edges of floors and roofs.
- .2            Provide as required by governing authorities.

**1.6                DUST TIGHT SCREENS**

- .1            Provide dust tight screens to localize dust generating activities, and for protection of workers, finished areas of Work and public.

- .2 Provide dust tight screens for protection of existing theatre building including its contents.
- .3 Maintain and relocate protection until such work is complete.
- 1.7 ACCESS TO SITE**
  - .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.
- 1.8 PUBLIC TRAFFIC FLOW**
  - .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.
- 1.9 FIRE ROUTES**
  - .1 Maintain access to property including overhead clearances for use by emergency response vehicles.
- 1.10 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.
- 1.11 PROTECTION OF EXISTING BUILDINGS AND UTILITIES**
  - .1 Provide protection for existing adjacent buildings, structures and utilities, etc. on site during performance of Work.
  - .2 Provide necessary screens, covers, and hoardings.
  - .3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.
  - .4 Be responsible for damage incurred due to lack of or improper protection.
- 1.12 WASTE MANAGEMENT AND DISPOSAL**
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management And Disposal.
- Part 2 Products**
- 2.1 NOT USED**
  - .1 Not Used.

<b>Part 3</b>	<b>Execution</b>
<b>3.1</b>	<b>NOT USED</b>
.1	Not Used.

**END OF SECTION**

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1.0 GENERAL

1.1 WASTE MANAGEMENT GOALS

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss PWGSC's Waste Management Plan and Goals.
- .2 Accomplish maximum control of solid construction waste.
- .3 Preserve environment and prevent pollution and environment damage.

1.2 DEFINITIONS

- .1 Class III: non-hazardous waste - construction renovation and demolition waste.
- .2 Cost/Revenue Analysis Workplan (CRAW): based on information from WRW, and intended as financial tracking tool for determining economic status of waste management practices.
- .3 Demolition Waste Audit (DWA): relates to actual waste generated from project.
- .4 Inert Fill: inert waste - exclusively asphalt and concrete.
- .5 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .6 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .7 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .8 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
  - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
  - .2 Returning reusable items including pallets or unused products to vendors.
- .10 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .11 Separate Condition: refers to waste sorted into individual types.
- .12 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.
- .13 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill. Refer to Schedule A.
- .14 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting

requirements.

- .15 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

### 1.3 DOCUMENTS

- .1 Maintain at job site, one copy of following documents:
  - .1 Waste Audit.
  - .2 Waste Reduction Workplan.
  - .3 Material Source Separation Plan.
  - .4 Schedules A, B, C, D, E completed for project.

### 1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare and submit following prior to project start-up:
  - .1 Submit 2 copies of completed Waste Reduction Workplan (WRW): Schedule B.
  - .2 Submit 2 copies of completed Demolition Waste Audit (DWA): Schedule C.
  - .3 Submit 2 copies of Materials Source Separation Program (MSSP) description.
- .3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.
  - .1 Failure to submit could result in hold back of final payment.
  - .2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.
  - .3 For each material reused, sold or recycled from project, include amount quantities by number, type and size of items and the destination.
  - .4 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

### 1.5 WASTE AUDIT (WA)

- .1 Conduct WA prior to project start-up.
- .2 Prepare WA: Schedule A.
- .3 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

### 1.6 WASTE REDUCTION WORKPLAN (WRW)

- .1 Prepare WRW prior to project start-up.
- .2 WRW should include but not limited to:
  - .1 Destination of materials listed.
  - .2 Deconstruction/disassembly techniques and sequencing.
  - .3 Schedule for deconstruction/disassembly.
  - .4 Location.
  - .5 Security.
  - .6 Protection.
  - .7 Clear labelling of storage areas.
  - .8 Details on materials handling and removal procedures.
  - .9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.

- .3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as first priority, followed by Reuse, then Recycle.
- .4 Describe management of waste.
- .5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.
- .6 Post WRW or summary where workers at site are able to review content.
- .7 Set realistic goals for waste reduction, recognize existing barriers and develop strategies to overcome these barriers.
- .8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

1.7 DEMOLITION WASTE AUDIT (DWA)

- .1 Prepare DWA prior to project start-up.
- .2 Complete DWA: Schedule C.
- .3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

1.8 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

- .1 Prepare MSSP and have ready for use prior to project start-up.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.
- .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide containers to deposit reusable and recyclable materials.
- .5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .6 Locate separated materials in areas which minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
  - .1 Transport to approved and authorized recycling facility.

1.9 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Protect surface drainage, mechanical and electrical from damage and blockage.
- .4 Separate and store materials produced during dismantling of structures in designated areas.
- .5 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.

#### 1.10 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 Keep records of construction waste including:
  - .1 Number and size of bins.
  - .2 Waste type of each bin.
  - .3 Total tonnage generated.
  - .4 Tonnage reused or recycled.
  - .5 Reused or recycled waste destination.
- .4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

#### 1.11 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Provide temporary security measures approved by Departmental Representative.

#### 1.12 SCHEDULING

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

### 2.0 PRODUCTS

#### 2.1 NOT USED

- .1 Not Used.

### 3.0 EXECUTION

#### 3.1 APPLICATION

- .1 Do Work in compliance with WRW.
- .2 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 DIVERSION OF MATERIALS

- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative, and consistent with applicable fire

regulations.

- .1 Mark containers or stockpile areas.
- .2 Provide instruction on disposal practices.
- .2 On-site sale of salvaged recovered reusable and/or recyclable materials is not permitted.
- .3 Demolition Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Acoustical Insulation	100	
Doors and Frames	100	
Electrical Equipment	80	
Mechanical Equipment	100	
Metals	100	
Rubble	100	
Wood (uncontaminated)	100	
Other		

- .4 Construction Waste:

Material Type	Recommended Diversion %	Actual Diversion %
Cardboard	100	
Plastic Packaging	100	
Rubble	100	
Steel	100	
Wood (uncontaminated)	100	
Other		

### 3.4 WASTE AUDIT (WA)

The following pertains to Schedule A - Waste Audit (WA). Column-1 refers to the category of waste, and a physical description of the material (e.g. off-cuts, clean drywall, etc.). Column-2 refers to the total quantity of materials received by the Contractor. Measurement units must be specified. Column-3 refers to the estimated percentage of material that is waste. Column-4 refers to the total quantity of waste (column-2 x column-3). Column-5 refers to the areas(s) in which the waste was generated. Column-6 refers to the total percentage of recycled material from the specified total quantity of waste (column-4). Column-7 refers to the total percentage of reused material from the specified total quantity of waste (column-4).

- .1 Schedule A - Waste Audit (WA):

(1) Material Category	(2) Material Quantity Unit %	(3) Estimated Waste	(4) Total Quantity of Waste (unit)	(5) Generation Point	(6) % Recycled	(7) % Reused
Wood &						

Plastics						
Material Description						
Off-Cuts						
Warped						
Plastic						
Cardboard						
Other						
Doors & Windows						
Material Description						
Frames						
Glass						
Wood						
Metal						
Other						

**3.6 WASTE REDUCTION WORKPLAN (WRW)**

The following pertains to Schedule B - Waste Reduction Workplan (WRW). Column-1 refers to the category and type of waste materials. Column-2 refers to the persons responsible for completing the WRW. Column-3 refers to Column-4 of Schedule A. Column-4 refers to the amount of reused waste predicted and realized. Column-5 refers to the amount of recycled waste predicted and realized. Column-6 refers to the approved recycling facility.

.1 Schedule B:

(1) Material Quantity Category	(2) Person Amount Responsible Waste	(3) Total of Project (unit)	(4) Reused Actual (units)	(5) Recycle Actual (s) Amount	(6) Material Destination (s)
Wood & Plastics					
Material Description					
Chutes					
Warped					
Plastic					
Cardboard Packaging					
Other					
Doors & Windows					
Material Description					
Painted					
Frames					
Glass					
Wood					
Metal					

Other					
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**3.7 DEMOLITION WASTE AUDIT (DWA)**

The following pertains to Schedule C - Demolition Waste Audit (DWA). Column-1 refers to the type of material salvaged. Column-2 refers to the material quantity shown in column-1. Several columns may be required to identify specific demolition areas. Column-3 refers to the unit of measurement used to describe Column-2. Column-4 refers to the total quantity of salvaged material. Column-5 refers to the cumulative volume of salvaged material. Column-6 refers to the total weight in kilograms. Column-7 refers to remarks and assumptions made about the specified material.

.1 Schedule C - Demolition Waste Audit (DWA):

(1) Material Description Assumptions	(2) Quantity	(3) Unity	(4) Total	(5) Volume (cum)	(6) Weight (cum)	(7) Remarks & Assumptions
Wood						
Wood						
Stud						
Plywood						
Baseboard -wood						
Door						
Trim-Wood						
Cabinet						
Doors & Windows						
Panel						
Regular						
Slab Regular						
Wood						
Laminate						
Byfold-Closet						
Glazing						

**3.8 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT**

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

- .1 Ministry of Environment Lands and Parks  
 810 Blanshard Street, 4<sup>th</sup> Floor  
 Victoria, BC V8V 1X4  
 604-387-1161 / 604-356-6464
- .2 Waste Reduction Commission Soils and Hazardous Waste  
 770 South Pacific Blvd, Suite 303  
 Vancouver BC, V6B 5E7  
 604-660-9550 / 604-660-9596

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1        Section 01 11 55 – General Instructions.
- .2        Section 01 74 19 - Waste Management and Disposal.

**1.2                INSPECTION AND DECLARATION**

- .1        Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
- .2        Request Departmental Representative Inspection.
- .3        Departmental Representative Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
- .4        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        Work is complete and ready for final inspection.
- .5        Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
- .6        Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance.
- .7        Commencement of Lien and Warranty Periods: date of Departmental Representative'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.
- .8        Final Payment: when Departmental Representative considers final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
- .9        Payment of Holdback: after issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback amount.

**1.3                CLEANING**

- .1        Clean site in accordance with Section 01 11 55 – General Instructions.
- .2        Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 19 - Waste Management and Disposal.

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**1.4 DOCUMENTS**

- .1 Collect reviewed submittals and assemble documents fully executed by subcontractors, suppliers, and manufacturers. Submit material prior to final Application for Payment.
- .2 Submit as-built drawings in accordance with Section 01 11 55 – General Instructions.
- .3 Provide warranties and bonds fully executed and notarized.
- .4 Execute transition of Performance and Labour and Materials Payment Bond to warranty period requirements.
- .5 Submit a final statement of accounting giving total adjusted Contract Price, previous payments, and monies remaining due.
- .6 Departmental Representative will issue a final change order reflecting approved adjustments to Contract Price not previously made.
- .7 Prior to applying for a certificate of Substantial Performance, provide the following:
  - .1 Reconciliation of all Change Orders.
  - .2 Workers' Compensation Board letter as evidence that the Contractor and all Subcontractors are in good standing.
  - .3 Letters of Assurance where required as a condition of the work.
  - .4 Occupancy Permit from local authority.
  - .5 Certification by all testing, cleaning or inspection authorities or associations.
  - .6 List of items to be completed or corrected, including the time required to perform the Work as well as the proposed completion date

**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 77 00        -        Closeout Procedures

**1.2                SUBMITTALS**

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

**1.3                FORMAT**

- .1        Organize data in the form of an instructional manual.
- .2        Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279mm with spine and face pockets.
- .3        When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4        Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5        Arrange content by systems under 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.
- .9 Provide 1:1 scaled CAD files in dwg format on CD.

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

- .1 Table of Contents- provide the following:
  - .1 Title of project.  
Date of submission.
  - .2 Names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to 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.

#### 1.5 **AS-BUILTS DOCUMENTS**

- .1 **Contract drawings** and shop drawings: legibly mark each item to record actual construction, including:
  - .1 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .2 Field changes of dimension and detail.
  - .3 Changes made by change order.
  - .4 Details not on original Contract drawings.
  - .5 References to related shop drawings and modifications.
- .2 **Contract Specifications:** legibly mark each item to record actual "Workmanship of construction", including:
  - .1 Manufacturer, trade name, and catalogue number of each "Product/Material" actually installed, particularly optional items and substitute items.
  - .2 Changes made by addenda and change orders.
- .3 As-built information:
  - .1 Record changes in red ink.
  - .2 Mark on 1 set of drawings, specifications and shop drawings at completion of project and, before final inspection, neatly transfer notations to second set.
  - .3 Provide 1 set of CD's in AutoCAD 14 file format with all as-build information of the CD's.
  - .4 Submit all sets to the Departmental Representative.

- 
- .4 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
    - .1 Contract Drawings.
    - .2 Specifications.
    - .3 Addenda.
    - .4 Change Orders and other modifications to Contract.
    - .5 Reviewed shop drawings, product data, and samples. Field test records.
    - .6 Inspection certificates.
    - .7 Manufacturer's certificates.
  - .5 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
  - .6 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.
  - .7 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
  - .8 Keep record documents and samples available for inspection by Departmental Representative.
  - .9 Provide an electronic copy of as-built drawings.

#### **1.6 RECORDING ACTUAL SITE CONDITIONS**

- .1 Record information on set of black line opaque drawings, provided by Departmental Representative.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured 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: mark each item to record actual construction, including:

- .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
- .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

## **1.7 EQUIPMENT AND SYSTEMS**

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures – include the following:
  - .1 Start-up, break-in, and routine normal operating instructions and sequences.
  - .2 Include regulation, control, stopping, shut-down, and emergency instructions.
  - .3 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 instruction.
- .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 Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 11 55 – General Instruction and other individual sections.

- 
- .15 Additional requirements: as specified in individual specification sections.
- 1.8 MANUFACTURER'S DOCUMENTATION REPORTS**
- .1 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and system, instruct Departmental Representative's indicated facility's personnel, and provide detailed written report that demonstration and instruction have been completed.
- .2 Departmental Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.
- 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. Provide information for re-ordering custom manufactured products.
- .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 on-site location as directed; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit to Departmental Representative.
- .6 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 location as directed; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

- .5 Obtain receipt for delivered products and submit to Departmental Representative.
- .6 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 sections.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue all items.
  - .1 Submit inventory listing to [Departmental Representative].
  - .2 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 Departmental Representative.

**1.14 WARRANTIES, BONDS, TEST REPORTS, INSPECTION REPORTS**

- .1 Separate each Document 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, Bonds, Test Results, Inspection Reports executed in duplicate by subcontractors, suppliers, manufacturers, and inspection agencies within 10 days after completion of the applicable item of work.
- .4 Except for items put into use with the Departmental Representative'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.

**1.15 COMPLETION**

- .1 Submit a written certificate that the following have been performed:

- .1 Work has been completed and inspected for compliance with the Contract documents.
- .2 Defects have been corrected and deficiencies have been completed.
- .3 Equipment and systems have been tested, adjusted and balanced, and are fully operational.
- .4 Certificates required by the Boiler Inspection Branch, Fire Commissioner of Canada, and utility companies have been submitted.
- .5 Operation of systems has been demonstrated to the personnel indicated by the Departmental Representative.
- .6 Work is complete and ready for final inspection.

**Part 2          Products**

**2.1              NOT USED**

- .1 Not Used.

**Part 3          Execution**

**3.1              NOT USED**

- .1 Not Used.

**END OF SECTION**

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**Part 1      General**

**1.1      SUMMARY**

- .1 Unless otherwise determined through risk assessment conducted by a qualified person, comply with requirements of this Section when performing following Work:
  - .1 Removal of the lower 900mm of asbestos-containing cement board siding (skirting) using non-powered hand-held tools, and providing that the material is wetted to control the spread of dust or fibres.

**1.2      SECTION INCLUDES**

- .1 Requirements and procedures for applicable procedures and personal protective equipment to be utilized during asbestos abatement of cement board panels.

**1.3      RELATED REQUIREMENTS**

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 35 33 - Health and Safety Requirements
- .3 Section 01 74 19 - Waste Management and Disposal

**1.4      REFERENCES**

- .1 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .2 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .3 Government of the Yukon
  - .1 Occupational Health and Safety Act
  - .2 Yukon Occupational Health Regulations

**1.5      DEFINITIONS**

- .1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .2 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow thorough wetting of fibres.
- .3 Asbestos-Containing Materials (ACMs): materials that contain any asbestos, and are identified under Existing Conditions including fallen materials and settled dust.
- .4 Asbestos Work Area: area where work takes place which will, or may, disturb ACMs.
- .5 Authorized Visitors: Consultant or Departmental Representative and representatives of regulatory agencies.

- 
- .6 Competent worker: in relation to specific work, means a worker who:
    - .1 Is qualified because of knowledge, training and experience to perform the work.
    - .2 Is familiar with the territorial and federal laws and with the provisions of the regulations that apply to the work.
    - .3 Has knowledge of all potential or actual danger to health or safety in the work.
  - .7 Friable material: means material that:
    - .1 When dry, can be crumbled, pulverized or powdered by hand pressure, or
    - .2 is crumbled, pulverized or powdered.
  - .8 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
  - .9 Occupied Area: any area of the building or work site that is outside Asbestos Work Area.
  - .10 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.
  - .11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for work.

## **1.6 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.
- .3 Submit Territorial and/or local requirements for Notice of Project Form.
- .4 Submit proof of Contractor's Asbestos Liability Insurance.
- .5 Submit to Departmental Representative necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.
- .6 Submit proof that all asbestos workers and/or supervisor have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.
- .7 Submit proof satisfactory to Departmental Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

## **1.7 QUALITY ASSURANCE**

- .1 Regulatory Requirements: comply with Federal, Territorial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more stringent requirement applies. Comply with regulations in effect at time Work is performed.

- 
- .2 Health and Safety:
    - .1 Perform construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.
    - .2 Safety Requirements: worker protection.
      - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:
        - .1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Territorial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.
        - .2 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing shall consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing to include suitable footwear, and to be repaired or replaced if torn.
      - .2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
      - .3 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.
      - .4 Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.
      - .5 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing are to be supplied by the Contractor.
      - .6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.
- 1.8 WASTE MANAGEMENT AND DISPOSAL**
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

- 
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
  - .3 Collect and separate for disposal packaging material in appropriate on-site bins for recycling.
  - .4 Separate and place in designated containers steel metal plastic waste.
  - .5 Place materials defined as hazardous or toxic in designated containers.
  - .6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Territorial, Regional and Municipal regulations.
  - .7 Fold up metal banding, flatten and place in designated area for recycling.
  - .8 Disposal of asbestos waste generated by removal activities must comply with Federal, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 mil bags or leak proof drums. Label containers with appropriate warning labels.
  - .9 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

#### **1.9 EXISTING CONDITIONS**

- .1 Reports and information pertaining to ACMs to be handled, removed, or otherwise disturbed and disposed of during this project are bound into this specification in **Appendix B**.
  - .1 With reference to the above-noted reports, the following will have been removed under separate contract, prior to completion of the Work outlined in this contract:
    - .1 Asbestos-containing vermiculite insulation from the main floor joist space/crawlspace.
    - .2 Asbestos-containing white pipe wrap on two domestic water lines from the southwest corner of the Mechanical Room and Rooms 116 (women's washroom), 117 (janitor's room) and 118 (men's washroom).
  - .2 Notify Departmental Representative suspected asbestos-containing material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Departmental Representative.

#### **1.10 SCHEDULING**

- .1 Hours of Work: perform work during normal working hours as indicated in Contract Documents.

#### **1.11 OWNER'S INSTRUCTIONS**

- .1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, following minimum requirements:
  - .1 Fitting of equipment.
  - .2 Inspection and maintenance of equipment.
  - .3 Disinfecting of equipment.
  - .4 Limitations of equipment.

- 
- .3 Instruction and training must be provided by a competent, qualified person.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Drop Sheets:
  - .1 Polyethylene: 0.15 mm thick.
  - .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.
- .2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting of asbestos-containing material.
- .3 Waste Containers: contain waste in two separate containers.
  - .1 Inner container: 0.15 mm thick sealable polyethylene waste bag.
  - .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
  - .3 Labelling requirements: affix pre-printed cautionary asbestos warning in both official languages that is visible when ready for removal to disposal site.
- .4 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
- .5 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.

**Part 3 Execution**

**3.1 PROCEDURES**

- .1 Do construction occupational health and safety in accordance Section 01 35 33 - Health and Safety Requirements.
- .2 Before beginning Work, isolate Asbestos Work Area using, minimum, preprinted cautionary asbestos warning signs in both official languages that are visible at access routes to Asbestos Work Area.
  - .1 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work.
  - .2 Use HEPA vacuum or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.
  - .3 Do not use compressed air to clean up or remove dust from any surface.
- .3 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
  - .1 Use FR polyethylene drop sheets over flooring or ground surfaces such as carpeting, dirt or grass that absorbs dust and over flooring in Asbestos Work Area where dust and contamination cannot otherwise be safely contained. Drop sheets are not to be reused.

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- .4 Wet materials containing asbestos to be cut, ground, abraded, scraped, drilled, or otherwise disturbed.
    - .1 Use garden reservoir type low - velocity fine - mist sprayer.
    - .2 Perform Work to reduce dust creation to lowest levels practicable.
    - .3 Work will be subject to visual inspection and potentially air monitoring.
    - .4 Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas at no cost to the Owner.
  - .5 Frequently and at regular intervals during Work and immediately on completion of work:
    - .1 Dust and waste to be cleaned up and removed using a vacuum equipped with a HEPA filter, or by damp mopping or wet sweeping, and placed in a waste container, and
    - .2 Drop sheets to be wetted and placed in a waste container as soon as practicable.
  - .6 Cleanup:
    - .1 Place dust and asbestos containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste; wet and fold these items to contain dust, and then place in plastic bags.
    - .2 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.
    - .3 Seal waste bags and remove from site. Dispose of in accordance with requirements of Territorial and Federal Authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that the appropriate guidelines and regulations for asbestos disposal are followed.
    - .4 Perform final thorough clean-up of Work areas and adjacent areas affected by Work using HEPA vacuum.

**END OF SECTION**

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**1.0 GENERAL**

**1.1 RELATED WORK**

- |    |                        |                  |
|----|------------------------|------------------|
| .1 | Concrete Reinforcing   | Section 03 20 00 |
| .2 | Cast-in-Place Concrete | Section 03 30 00 |

**1.2 REFERENCES**

- .1 CAN/CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-O86-09, Engineering Design in Wood (Limit States Design).
- .3 CSA O121-08, Douglas Fir Plywood.
- .4 CSA O151-04, Canadian Softwood Plywood.
- .5 CSA S269.1-1975, Falsework for Construction Purposes.
- .6 CAN/CSA-S269.3-M92, Concrete Formwork.

**1.3 SHOP DRAWINGS**

- .1 Prepare shop drawings for formwork and falsework 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 CSA S269.1, for falsework drawings and 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/falsework as directed by Departmental Representative.
- .5 The contractor is responsible for the design of all formwork and shoring and for complying with all Workers' Compensation Board regulations pertaining to formwork construction, design and inspection. Formwork and shoring shall be designed by a qualified professional engineer registered or licensed in Yukon Territory.

**2.0 PRODUCTS**

**2.1 MATERIALS**

- .1 Formwork materials:
  - .1 For concrete without special architectural features, use plywood and wood formwork materials to CSA-O121 and CAN/CSA-O86,

- .2 For concrete with special architectural features, use formwork materials to CAN/CSA-A23.1.
- .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 diameter in concrete surface.
  - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .4 Form liner:
  - .1 Plywood: Douglas Fir to CSA O121 or Canadian Softwood Plywood to CSA O151 square edge.
- .5 Form release agent: chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps.
- .6 Falsework materials: to CSA S269.1.

### **3.0 EXECUTION**

#### **3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork / falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative'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 Fabricate and erect falsework in accordance with CSA S269.1.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 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.
- .8 Align form joints and make watertight. Keep form joints to minimum.
- .9 Use 20mm chamfer strips on external corners and/or 20mm fillets at interior corners of concrete members, joints, unless specified otherwise.
- .10 Build in anchors, sleeves, and other inserts required to accommodate Work specific 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 Formwork removal and reshoring: Do not remove forms and shoring before the concrete has attained sufficient strength to ensure the safety of the structure and not before the following minimum and long term performance periods of time after placing concrete:

24 hours	pile cap sides
14 days	pile cap bottom form

- .2 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.
- .3 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

**END OF SECTION**

**1.0 GENERAL**

**1.1 RELATED WORK**

- |    |                                  |                  |
|----|----------------------------------|------------------|
| 1. | Concrete Forming and Accessories | Section 03 10 00 |
| .2 | Cast-in-Place Concrete           | Section 03 30 00 |

**1.2 REFERENCES**

- .1 ANSI/ACI 315-99, Details and Detailing of Concrete Reinforcement.
- .2 ACI 315R-94, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
- .3 ASTM A775/A775M-04, Specification for Epoxy-Coated Reinforcing Steel Bars.
- .4 CAN/CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.
- .5 CAN3-A23.3-04, Design of Concrete Structures for Buildings.
- .6 CSA G30.3-M1983(R1991), Cold Drawn Steel wire for Concrete Reinforcement.
- .7 CSA G30.5-M1983(R1991), Welded Steel Wire Fabric for Concrete Reinforcement.
- .8 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement.
- .9 CSA G30.14-M1983(R1991), Deformed Steel Wire for Concrete Reinforcement.
- .10 CSA G30.15-M1983(R1991), Welded Deformed Steel wire Fabric for Concrete Reinforcement.
- .11 CAN/CSA-G40.21-04, Structural Quality Steels.
- .12 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .13 CSA W186-M1990, Welding of Reinforcing Bars in Reinforced Concrete Construction.

**1.3 SOURCE QUALITY CONTROL**

- .1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 1 week prior to commencing reinforcing work.
- .2 Inform Departmental Representative of proposed source of material to be supplied.

**1.4 SHOP DRAWINGS**

- .1 Produce shop drawings including placing of reinforcement.
- .2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacing, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacing and locations of chairs, spacers and hangers. Prepare reinforcement

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drawings in accordance with ANSI/ACI 315 and ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

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

## **1.5 SUBSTITUTES**

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.

## **2.0 PRODUCTS**

### **2.1 MATERIALS**

- .1 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .2 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA G30.18.
- .3 Cold-drawn annealed steel wire ties: to CSA G30.3.
- .4 Welded steel wire fabric: to CSA G30.5. Provide in flat sheets only.
- .5 Epoxy coating of non-prestressed reinforcement: to ASTM A775/A775M.
- .6 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
- .7 Mechanical splices: subject to approval of Departmental Representative.
- .8 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 ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures unless indicated otherwise. For epoxy coated bars, fabricate in accordance with ASTM D3963.
- .2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists. For epoxy coated bars, method of bundling and transportation should be in accordance with ASTM A775/A775M and ASTM D3963.

## **3.0 EXECUTION**

### **3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .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 placing drawings and in accordance with CAN/CSA-A23.1.
- .2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.
- .3 Prior to placing concrete obtain Departmental Representative's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

**END OF SECTION**

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**1.0 GENERAL**

**1.1 RELATED SECTIONS**

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

**1.2 REFERENCES**

- .1 ASTM C109-05, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens).
- .2 ASTM C309-03, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .3 ASTM C332-99, Specification for Lightweight Aggregates for Insulating Concrete.
- .4 ASTM C827-01a, Test Method for Early Volume Change of Cementitious Mixtures.
- .5 ASTM C939-02, Test Method for Flow of Grout for Preplaced-Aggregate Concrete.
- .6 ASTM D412-98a(2002), Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
- .7 ASTM D624-00e1, Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .8 ASTM D1751-99, Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .9 ASTM D1752-04, Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .10 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
- .11 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .12 CAN/CSA-A5-98, Portland Cement.
- .13 CAN/CSA-A23.1-09, Concrete Materials and Methods of Concrete Construction.
- .14 CAN/CSA-A23.2-09, Methods of Test for Concrete.
- .15 CAN/CSA-A23.5-98, Supplementary Cementing Materials.
- .16 ASTM C 260 – 01, Specifications for Air-Entraining Admixtures for Concrete.
- .17 ASTM C 494M – 05a, Specifications for Chemical Admixtures for Concrete.

**1.3 CERTIFICATES**

- .1 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.
- .2 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 2 weeks prior to starting concrete work, submit proposed quality control procedures for Departmental Representative's approval for following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.

#### **2.0 PRODUCTS**

##### **2.1 MATERIALS**

- .1 Portland cement: to CAN/CSA-A5.
- .2 Supplementary cementing materials: to CAN/CSA-A23.5.
- .3 Water: to CAN/CSA-A23.1.
- .4 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density.
- .5 Low density aggregate for insulating concrete: to CAN/CSA-A23.1 and ASTM C332 group II.
- .6 Air entraining admixture: to ASTM C260.
- .7 Chemical admixtures: to ASTM C494M. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .8 Non-shrink grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
  - .1 Compressive strength: 50 MPa at 28 days.
  - .2 Consistency:
    - .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30 s.
    - .2 Flowable: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portion) 125 to 145%.
    - .3 Plastic: to ASTM C827. Flow table, 5 drops in 3 s, (ASTM C109, applicable portions) 100 to 125%.
    - .4 Dry pack to manufacturer's requirements.

- .9 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 50 MPa at 28 days.
- .10 Curing compound: to CAN/CSA-A23.1 and to ASTM C309, Type 1-chlorinated rubber.
- .11 Ribbed waterstops: extruded PVC Arctic Grade of sizes indicated with welded corner and intersecting pieces:
  - .1 Tensile strength: to ASTM D412, method A, Die "C", minimum 11.4 MPa.
  - .2 Elongation: to ASTM D412, method A, Die "C", minimum 275%.
  - .3 Tear resistance: to ASTM D624, method A, Die "B", minimum 48 kN/m.
- .12 Premoulded joint fillers:
  - .1 Bituminous impregnated fiber board: to ASTM D1751.
  - .2 Sponge rubber: to ASTM D1752, Type I, flexible grade.
- .13 Weep hole tubes: plastic.
- .14 Dampproofing: Emulsified asphalt, mineral colloid type, unfilled: to CAN/CGSB-37.2.
- .15 Polyethylene film: 6 mil thickness to CAN/CGSB-51.34.

**2.2 MIXES**

- .1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1 to give the following properties:
  - .1 Cement: Type GU Portland cement
  - .2 Minimum compressive strength at 28 days, class of exposure and nominal size of coarse aggregate:

Member	minimum 28-days strength (Mpa)	maximum aggregate size (mm)	exposure class	air content Category
Pile Cap	30	25	F-2	2
Pile in-fill concrete	25	25	F-2	2

- .3 Slump at time and point of discharge: To CSA-A23.1 Clause 4.3.2.3. When superplasticizers are used, the slump may be increased by shall kept below the point where segregation will occur. The cost of superplasticizers shall be included in the cost of the concrete. Smaller aggregate size may be used where necessary to increase slump.
- .4 Air content: To CSA-A23.1 Table 2 & 4 to suit appropriate exposure class.
- .5 Chemical admixtures: following admixtures in accordance with to ASTM C494M. Admixtures shall contain no salts or acids.
- .6 Concrete mix designs shall be submitted to a material consultant for approval and to Departmental representative for review prior to any concrete work.

**3.0 EXECUTION**

### **3.1 PREPARATION**

- .1 Obtain Departmental Representative's approval before placing concrete. Provide 48 h 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 Departmental Representative's approval of proposed method for protection of concrete during placing and curing.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .7 Do not place load upon new concrete until authorized by Departmental Representative.

### **3.2 CONSTRUCTION**

- .1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1 and CAN/CSA-A23.2. Adhere strictly to CSA-A23.1 for proper preparation and protection for cold weather and hot weather concrete work.
- .2 Sleeves and inserts.
  - .1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
  - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Departmental Representative.
  - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Departmental Representative before placing of concrete.
  - .4 Check locations and sizes of sleeves and openings shown on drawings.
  - .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts.
  - .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

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- .2 With approval of Departmental Representative, grout anchor bolts in holes drilled after concrete has set. Drilled holes to be to manufacturer's recommendations.
  - .3 Protect anchor bolt holes from water accumulations, snow and ice build-up.
  - .4 Set bolts and fill holes with epoxy grout.
  - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Drainage holes and weep holes:
- .1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forms and Accessories. If wood forms are used, remove them after concrete has set.
  - .2 Install weep hole tubes and drains as indicated.
- .5 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
- .6 Finishing:
- .1 Finish concrete in accordance with CAN/CSA-A23.1.
  - .2 Use procedures acceptable to Departmental Representative or those noted in CAN/CSA-A23.1 to remove excess bleed water. Ensure surface is not damaged.
  - .3 Use curing compounds compatible with applied finish on concrete surfaces. Applied finish on concrete: Provide written declaration that compounds used are compatible.
- .7 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.
  - .2 Use only straight heat sealed butt joints in field. Use factory welded corners and intersections unless otherwise approved by Departmental Representative.
- .8 Joint fillers:
- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
  - .2 Locate and form isolation, construction and expansion joints as indicated. Install joint filler.
  - .3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.
- .9 Dampproof membrane:
- .1 Install dampproof membrane under concrete slabs-on-grade inside building.
  - .2 Lap dampproof membrane minimum 150 mm at joints and seal.
  - .3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.

- .10 Supply and set anchor bolts, sleeves, pipe hangers, expansion joints and other inserts and openings as indicated in the structural drawings and specifications or in documents by other consultants.
- .11 All dowels, anchor bolts, embedded plates and other inserts shall be placed before the concrete is poured.

### **3.3 SITE TOLERANCE**

- .1 All horizontal surfaces shall meet the Class A Slab and Floor Finish classification (+/- 8mm) in accordance with Table 19 of CAN/CSA-A23.1 straight edge method.
- .2 Tolerance closer than those specified in CSA-A23.1 may be required at certain locations for structural, architectural and construction requirements.

### **3.4 FIELD QUALITY CONTROL**

- .1 Inspection and testing of concrete and concrete materials will be carried out by a CSA certified Testing Laboratory designated by Departmental Representative in accordance with CAN/CSA-A23.1. Submit all concrete testing results to the Departmental representative.
- .2 The costs of tests shall be borne by contractor as specified in Section 01 11 55 – General Instructions.
- .3 Departmental Representative 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 Departmental Representative 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      Submittal Procedures      Section 01 33 00

**1.2      REFERENCES**

- .1      American Society for Testing and Materials International, (ASTM)
- .1      ASTM A 36/A 36M-12, Specification for Structural Steel.
  - .2      ASTM A307-12, Specification for Carbon Steel Bolts and Studs, 60,000psi Tensile.
  - .3      ASTM A325-10e1, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - .4      ASTM A 325M-13, Specification for High-Strength Bolts for Structural Steel Joints.
- .2      Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).
- .1      CISC/CPMA 1-73a, Quick-Drying, One-Coat Paint for Use on Structural Steel.
  - .2      CISC/CPMA 2-75, Quick-Drying, Primer for Use on Structural Steel.
- .3      Canadian Standards Association (CSA International)
- .1      CAN/CSA-G40.20-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel.
  - .2      CAN/CSA-G40.21-04 (R2009), Structural Quality Steels.
  - .3      CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .4      CAN/CSA-S16-09, Design of steel structures, Includes Update No. 1 (2010), Updated No. 2 (2010), Update No. 3 (2013)
  - .5      CSA W47.1-03 (R2009), Certification of Companies for Fusion Welding of Steel Structures.
  - .6      CSA W48-06(R2011), Electrodes.
  - .7      CSA W55.3-08, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .8      CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding).

**1.3      DESIGN REQUIREMENTS**

- .1      All structural steel connections shall be designed by the contractor for forces, moments and shears resulting from the specified load and self weight of the supporting elements and all forces as shown on the drawings, unless noted otherwise. All main connection bolts shall be minimum M20. Use minimum two bolts per connection. All welds shall have 6mm leg minimum.
- .2      If connection for shear only (standard connection) is required:
- .1      Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction".
- .3      If shears are not indicated, select or design connections to support reaction from 120% maximum uniformly distributed load that can be safely supported by beam in bending (60% each end), provided no point loads act on beam.

- .4 Provide splices as indicated on drawings. Unless noted otherwise, all continuous elements called up on the drawings shall be provided with full strength splice either by full strength groove weld or by full strength splice plates on each end of the connection elements.

#### **1.4 SHOP DRAWINGS**

- .1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00 – Submittal Procedures. Shop drawings for anchor bolt layout and embedded plate layout shall also be submitted for review.
- .2 On erection drawings, indicate all details and information necessary for assembly and erection purposes such as, description of methods, sequence of erection, type of equipment used in erection and temporary bracings.
- .3 No fabrication or work shall be commenced until the review and approval of the shop drawings. The contractor shall assume full responsibility for any fabrication and work done prior to review and approval of the shop drawings.
- .4 Contractor shall co-ordinate and verify all dimension and locations prior to production of the drawing.
- .5 All fabricator designed assemblies, components and connections, and drawings to be stamped and signed by qualified professional engineer licensed in the Yukon Territory, Canada.
- .6 The Professional Engineer responsible for the shop drawings shall inspect the installation of the work for conformance with the design and the shop drawings, and shall upon completion of the work submit to the Consultant a completed Schedule S-B: Assurance of Professional Design and Commitment for Field Review by Supporting Registered Professional, and Schedule S-C: Assurance of Professional Field Review and Compliance by Supporting Registered Professional.

#### **1.5 QUALITY ASSURANCE**

- .1 Submit 2 copies of mill test reports showing chemical and physical properties and other details of steel to be incorporated into work at least 2 weeks prior to fabrication of structural steel. Mill test reports shall be certified by metallurgists qualified to practice in British Columbia, Canada.
- .2 Fabricator of structural steel shall, in addition, provide an affidavit stating that materials and products used in fabrication conform to applicable material and products standards called for by design drawings and specifications.

#### **1.6 WASTE MANAGEMENT AND DISPOSAL**

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

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Structural steel: to CAN/CSA-G40.21 Grade as indicated on drawings.
- .2 Anchor bolts: ASTM A307 unless noted otherwise on drawings.

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- .3 Bolts, nuts and washers: to ASTM A 325
  - .4 Welding materials: to CSA W48 Series and CSA W59 and certified by Canadian Welding Bureau.
  - .5 Shop paint primer: to CISC/CPMA 1.
  - .6 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600 g/m<sup>2</sup>.

## **2.2 FABRICATION**

- .1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with reviewed shop drawings.
- .2 Welding shall be performed by certified welders. Fabrication shops shall be approved by the Canadian welding bureau to CSA-W47.1 (Division 1 or 2). Certification shall be supplied to the Departmental Representative upon request.
- .3 Unless noted otherwise, install all rolled steel sections with mill camber upwards.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.
- .5 All areas of galvanized parts shall be grounded off prior to welding. Part 2 coats minimum of zinc rich primer read mix to CAN/CGSB-1.181 after welding.

## **2.3 SHOP PAINTING**

- .1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16 except where members to be encased in concrete.
- .2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface according to SSPC SP7 brush off blast.
- .3 Apply one coat of CISC/CPMD2-75 primer in shop to steel surfaces to achieve minimum dry film thickness of 3 to 4 mils, except:
  - .1 Surfaces to be encased in concrete.
  - .2 Surfaces to receive field installed stud shear connections.
  - .3 Surfaces and edges to be field welded.
  - .4 Faying surfaces of friction-type connections.
  - .5 Below grade surfaces in contact with soil.
- .4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.
- .5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

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**Part 3 Execution**

**3.1 GENERAL**

- .1 Structural steel work: in accordance with CAN/CSA-S16.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

**3.2 CONNECTION TO EXISTING WORK**

- .1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Departmental Representative for direction before commencing fabrication.

**3.3 MARKING**

- .1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark for fit and match.

**3.4 ERECTION**

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.
- .2 Field cutting or altering structural members: to approval of Departmental Representative.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.
- .5 Grout for posts/beams base plate supported by pile caps shall be strenson's M-Bed standard, Masterbuilder's Masterflow 713 or approved equal and shall have minimum strength of 50MPa at 28 days mix to fluid consistency. Also see Section 03 30 00 – Cast-in-place Concrete.
- .6 Install and torque all bolts and drilled anchors in accordance with manufacturer's specifications and procedures.
- .7 Any misfit or misalignment must be reported to the Departmental Representative. The contractor shall provide proposed remedial measures to the Departmental Representative for review and approval. Any remedial work on connections must be reviewed and/or redesigned by the connection engineer. Costs of remedial work are at the expense of the contractor.
- .8 Do not notch or cut openings in any of the framing members and connection without prior approval from the Departmental Representative.
- .9 Provide temporary bracing to structure for stability and safety as required until the completion of the steel structure.

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**3.5 FIELD QUALITY CONTROL**

- .1 The Departmental Representative will not be responsible for inspection of the Contractor's work as described in Clause 7.12 of the CISC Code of Standard Practice for Structural Steel. The Contractor is responsible for the accuracy and completeness of his own work and shall verify that the structural steel has been fabricated, erected and finished in accordance with the contract specifications.
- .2 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Departmental Representative.
- .3 Testing requirements are as follows:
  - .1 Visual Field Inspection and Bolt Torque Testing (Random 10% of Bolts) of all bolted connections.
  - .2 Non Destructive Testing of Welds: 100% of all welds to be visually inspected.
- .4 Welding inspector shall be certified to CSA W178.2 Level 2 or Level 3.
- .5 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.
- .6 Submit test reports to Departmental Representative within 1 week of completion of inspection.
- .7 Costs of tests shall be borne by the Contractor.

**3.6 FIELD PAINTING**

- .1 Touch up damaged surfaces and surfaces without shop coat with primer to SSPC-SP-6 except as specified otherwise. Apply in accordance with CAN/CGSB 85.10.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1      Section 07 21 13      Board Insulation.
- .2      Section 07 28 00      Air and Vapour Retarders.
- .3      Section 07 44 56      Mineral Fiber Cementitious Panels

**1.2                REFERENCES**

- .1      ASTM International
  - .1      ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2      CSA International
  - .1      CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
  - .2      CSA O121-08, Douglas Fir Plywood.
  - .3      CSA O141-05(R2009), Softwood Lumber.
  - .4      CSA O151-09, Canadian Softwood Plywood.
  - .5      CAN/CSA-O325.0-07, Construction Sheathing.
- .3      National Lumber Grades Authority (NLGA)
  - .1      Standard Grading Rules for Canadian Lumber 2010.
- .4      American Wood-Preservers' Association (AWPA)
  - .1      AWPA M2-01, Standard for Inspection of Treated Wood Products.
  - .2      AWPA M4-06, Standard for the Care of Preservative-Treated Wood Products.
- .5      Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1      Material Safety Data Sheets (MSDS).

**1.3                QUALITY ASSURANCE**

- .1      Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2      Plywood identification: by grade mark in accordance with applicable CSA standards.

**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 to the maximum extent economically possible.
- .2      Do not burn scrap materials at the project site

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**1.5 HEALTH AND SAFETY REQUIREMENTS**

- .1 Submit Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 Submittal procedures

**Part 2 Products**

**2.1 MATERIALS**

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
  - .1 CAN/CSA-O141.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Furring, blocking, nailing strips, grounds, rough bucks, curbs, backing and sleepers:
  - .1 Board sizes: "Standard" or better grade.
  - .2 Dimension sizes: "Standard" light framing or better grade.
  - .3 Post and timbers sizes: "Standard" or better grade.
- .3 Panel Materials:
  - .1 Douglas fir plywood (DFP): to CSA O121, standard construction.
  - .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .4 Wood Preservative:
  - .1 Preservative: to CSA-O80 Series, odourless water-borne, for stained finish.

**2.2 ACCESSORIES**

- .1 Fasteners: Galvanized to ASTM A123/A123M-09, for exterior work.
- .2 Nails, spikes and staples: to CSA B111.
- .3 Bolts: as indicated, galvanized to ASTM A123/A123M-09, complete with nuts and washers.

**Part 3 Execution**

**3.1 DEMOLITION AND SALVAGE**

- .1 Remove existing skirting and flashings at perimeter of building, as indicated.
- .2 Carefully remove lower sections of existing wood siding for reuse, metal and existing asbestos cement board siding on the lower portion of the building perimeter as required to complete structural work. Refer to drawings for specific areas and extent.
- .3 Retain all of the wood siding for re application. Remove all fasteners. Take care not to split or damage the face of the salvaged siding. Remove fasteners through the non exposed face of the siding.
- .4 Store the salvaged siding in a secure covered area until it is required for reapplication.

### **3.2 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for rough carpentry installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied

### **3.3 PREPARATION**

- .1 Treat surfaces of materials with wood preservative before installation.
- .2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and 1 minute soak on plywood.
- .3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.
- .4 Treat material as follows :
  - .1 Wood sleepers supporting wood skirting, in direct contact with ground or fill.
  - .2 Exterior wooden stair risers, steps, ramps and boardwalk.

### **3.4 INSTALLATION- GENERAL**

- .1 Comply with requirements of NBC, supplemented by the following paragraphs.
- .2 Align and plumb faces of furring and blocking.
- .3 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .4 Install wood fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.
- .5 Install sleepers and connections as indicated on Structural drawings.
- .6 Use caution when working with treated materials. Use high quality respirator masks.
- .7 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .8 Countersink bolts where necessary to provide clearance for other work.

### **3.5 INSTALLATION OF SKIRTING / VENT WALL ASSEMBLY**

- .1 After installation of new piling and structural beams:
  - .1 Construct wood skirting walls, roof and vent wall.
  - .2 Apply SBS Membrane to surfaces as detailed.
  - .3 Install copper flashings, perforated metal insect screens, and necessary blocking.
  - .4 Re install and add portions of copper downspouts in areas indicated.
  - .5 Install new metal siding, and cementitious siding materials in areas indicated.
  - .6 Re install salvaged wood siding in areas indicated.

**3.6**

**CLEANING**

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 06 10 11            Rough Carpentry

**1.2                REFERENCES**

- .1            Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
  - .1            Architectural Woodwork Quality Standards, 1st edition, [2009].
  - .2            Section 12 - Historic Restoration Work

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Samples:
  - .1            Call for sample area to be reviewed and acceptance thereof will become the standard for which all other areas must meet.
  - .2            Sample area will become part of the work.
  - .3            New lumber if used, to be tested and measured via moisture meter for moisture content with results submitted to Departmental Representative.

**1.4                QUALITY ASSURANCE**

- .1            Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board for any new lumber materials to be used.

**1.5                DELIVERY, STORAGE AND HANDLING**

- .1            Storage and Handling Requirements:
  - .1            Temporary Storage of removed floor materials should be [off ground] [indoors] [in dry location] and in, a well-ventilated area, in this case the same area in which the material came from, so that removed material does not take on different moisture characteristics and adversely affect the final reinstallation.
  - .2            Store and protect surrounding [wood flooring] from [nicks, scratches, and blemishes] and from drilling equipment, and all greases oils and drilling compounds.
  - .3            Every effort to carefully remove and replace the existing flooring should be made a priority, however if required, replace defective or damaged materials with new that closely resembles the existing in colour, type, shade and quality of wood. .

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**Part 2 Products**

**2.1 MATERIALS**

- .1 Hardwood lumber: Any new lumber used, to match the moisture content of the moisture content of the neighbouring existing material in accordance with :
  - .1 National Hardwood Lumber Association (NHLA).
  - .2 To be measured via moisture meter with results submitted to Departmental Representative.
  - .3 Match with existing size, wood, grain, cut, colour and pattern with final selection made by Departmental Representative.
- .2 Furring, blocking, nailing strips, grounds, rough bucks, curbs, backing and sleepers as required to re-support subfloor.

**2.2 ACCESSORIES**

- .1 Nails: to CSA B111; galvanized to ASTM A123/A123M for interior areas.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of all wood materials previously installed, are acceptable for removal and reinstallation.
  - .1 Visually inspect substrate in presence of Departmental Representative
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

**3.2 INSTALLATION**

- .1 Only scribe and cut as required to remove the first floor board tongue if tongue and grooved floor boards were used.
- .2 For installation of interior micro-piles limit extent of the hardwood flooring removal to a maximum of 4 - floor boards at pile locations.
- .3 Exercise due care without damage to the hardwood flooring boards, when replacing stagger flooring so that joints are racked properly, no h-joints, ladder joints or joints closer than 250 mm from one another are permitted.
- .4 All work will be to the satisfaction of the Departmental Representative.
- .5 Provide adequate protection to the adjacent hardwood flooring from any damages during removal and reinstallation of the floor boards and protection from gouges, scratches, crushing, water, oil, greases and other contaminants, during the pile installation process.
- .6 Fastening:
  - .1 Should finish nail fastening be required (eg. for the board with the tongue removed) set finishing nails using the invisible nailing technique by raising a thin

shaving using a 6mm chisel with gouge shaped edges to prevent tear out, drive and set finishing nail, and then glue back the shaving as required.

**3.3 CLEANING**

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

**3.4 PROTECTION**

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

**END OF SECTION**

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**Part 1            General**

**1.1                RELATED SECTIONS**

- .1    06 10 11 Rough Carpentry
- .2    07 28 00 Air and Vapour Barriers
- .3    07 46 16 Preformed Metal Cladding
- .4    07 61 00 Copper Roofing Flashing

**1.2                REFERENCES**

- .1    American Society for Testing and Materials International (ASTM)
- .2    Underwriters Laboratories of Canada (ULC)
  - .1    CAN/ULC-S701-[05], Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
- .3    Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1    Material Safety Data Sheets (MSDS).

**1.3                SUBMITTALS**

- .1    Product Data:
  - .1    Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.
  - .2    Submit copy of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's insulation products and adhesives.

**1.4                WASTE MANAGEMENT AND DISPOSAL**

- .1    Separate waste materials for 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 packaging material for recycling in accordance with Waste Management Plan.

**Part 2            Products**

**2.1                INSULATION**

- .1    Extruded polystyrene XPS: to CAN/ULC-S701.
  - .1    Type: 4. Compressive strength: ASTM D1621, minimum 210 kPa. (30 psi min).
  - .2    Edges: Tongue and groove sides, square edge ends.
  - .3    Thermal Resistance: Long term aged RSI value of 0.87/25 mm, to ASTM C518.
  - .4    Board Size: 610 x 2440 mm, thickness as indicated on Drawings.

- .5 Water Absorption: to ASTM D2842, 0.7% by volume maximum.
- .6 Water Vapour Permeance: to ASTM E96, 50 ng/Pas m2.

## **2.2 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

## **2.3 WORKMANSHIP**

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .4 Offset both vertical and horizontal joints in multiple layer applications.
- .5 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

## **2.4 EXAMINATION**

- .1 Prior to commencement of work ensure:
  - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

## **2.5 FOUNDATION PERIMETER AND CRAWLSPACE FLOOR INSULATION**

- .1 Type 4 XPS rigid insulation.
- .2 Under crawlspace application: extend boards as indicated. Lay boards on level compacted fill as indicated.
- .3 Exterior of foundation walls; apply boards to plywood walls as indicated.

## **2.6 CLEANING**

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

**1.2                REFERENCES**

- .1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA).
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).
- .3 Underwriters' Laboratories of Canada (ULC).
  - .1 CAN/ULC-S101-07, Fire Endurance Tests of Building Construction and Materials.
  - .2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
  - .3 CAN/ULC-S705.1-01 (with August 2004 Amendment), Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification.
  - .4 CAN/ULC-S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

**1.3                SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 Submittal Procedures
- .2 Manufacturer's Instructions: provide to indicate special handling criteria, installation sequence and cleaning procedures.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets
  - .1 Indicate precautions for workers when handling and applying sprayed foam
- .4 Submit product data sheets for system materials. Include product characteristics, performance criteria, physical size, finish and limitations.
- .5 Quality assurance submittals:
  - .1 Submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
  - .2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.

**1.4                QUALITY ASSURANCE**

- .1 Applicators to conform to CUFCA Quality Assurance Program.
- .2 Qualifications:
  - .1 Installer: person specializing in sprayed insulation installations with documented experience and approved by foam manufacturer.

- .2 Manufacturer: company with not less than 5 years experience producing type of foam material required for this project, with sufficient production capacity to produce and deliver required units without causing delay in work.
- .3 Mock-up:
  - .1 Construct mock-up in accordance with Section 01 33 00 – Submittal Procedure.
  - .2 Construct mock-up of sprayed insulation not less than 10 m<sup>2</sup> in size in location directed by DCC Representative.
  - .3 Notify DCC Representative not less than 2 working days in advance for inspection of completed mock-up.
  - .4 Allow 2 working days for inspection of mock-up by DCC Representative before proceeding with sprayed insulation work.
  - .5 Approved mock-up may be part of finished work.

## **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

## **1.6 SITE ENVIRONMENTAL REQUIREMENTS**

- .1 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
- .2 Ventilate application areas as required, to maintain non-toxic, unpolluted, safe working conditions for applicators.
- .3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .5 Apply insulation only when surfaces and ambient temperatures are within foam manufacturer prescribed limits.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Insulation: spray polyurethane, closed cell, spray applied polyurethane foam, medium density, closed Cell SPF meeting the requirements of CAN / ULC-S705.1
- .2 Primers: in accordance with foam manufacturer recommendations for existing surface conditions.

## **Part 3 Execution**

### **3.1 MANUFACTURERS INSTRUCTIONS**

- .1 Comply with manufacturer written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions and data sheets.

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**3.2 APPLICATION**

- .1 Apply insulation to clean surfaces in accordance with CAN/ULC-S705.2 and foam manufacturer printed instructions, whichever more stringent.
- .2 Use primer where recommended by manufacturer.
- .3 Apply insulation to thicknesses detailed/indicated.
- .4 Accommodate installation of items to be tied into sprayed insulation.
- .5 Trim excess and protruding insulation so as not to interfere with application of subsequent work.

**3.3 CLEANING**

- .1 Remove insulation material spilled during installation and leave work area ready for application of cladding materials.

**3.4 FIELD QUALITY CONTROL**

- .1 Section 01 45 00: Quality control, Field testing.
- .2 Inspection will include verification of insulation thickness, density and pull testing.
  - .1 Site Tests
    - .1 The Licensed Installer shall conduct daily visual inspection, adhesion/cohesion testing and density measurements as outlined by the CAN/ULC S705.2-05 Installation standard. All foam installed must have a field density no less than 5% of the tested value of 37 kg m<sup>3</sup> or 2.30 lb ft<sup>3</sup> (>35 kg m<sup>3</sup> or 2.18 lb ft<sup>3</sup>) as a minimum.
    - .2 The Licensed Installer shall complete the Daily Work Sheet and record all information required including the results of the testing. The Daily Work Sheet shall be kept on site for routine inspection.
      - Copies of the Daily Work Record shall be forwarded to the owner and owner's representative.
      - Copies of the Daily Work Record shall be sent to the Sprayed Insulation Manufacturer, Quality Assurance Program as required by the Sprayed Insulation Manufacturer to ensure compliance with all warranties and or guarantees.

**END OF SECTION**

**Part 1            General**

**1.1                SECTION INCLUDES**

- .1      Film vapour retarders.
- .2      Sheet air retarders.

**1.2                RELATED SECTIONS**

- .1      Section 06 10 00 - Rough Carpentry.

**1.3                REFERENCES**

- .1      American Society for Testing and Materials (ASTM):
  - .1      ASTM E 1745-09 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
  - .2      ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.
  - .3      ASTM D5147 Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Materials.
- .2      Canadian General Standards Board (CGSB).
  - .1      CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
  - .2      CAN/CGSB 37-GP-56M, Standard for Modified Bituminous Sheet Membranes.
- .3      ASTM C1193 - Standard Guide for Use of Joint Sealants.
- .4      ASTM E96 - Test Methods for Water Vapour Transmission of Materials.

**1.4                DEFINITION**

- .1      Vapour Retarder: A material or assembly of materials that resists water vapour diffusion through it.

**1.5                SUBMITTALS**

- .1      Section 01 33 00: Submission procedures.
- .2      Product Data: Provide data indicating material characteristics, performance criteria and limitations.
- .3      Manufacturer's Installation Instructions: Indicate preparation and installation requirements, techniques.

**1.6                WHMIS**

- .1      Comply with WHMIS requirements when handling and using sealant materials.

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**1.7 INSPECTION TESTING**

- .1 Coordinate inspection of vapour barrier elements prior to vapour barrier system being covered up by other trades.

**Part 2 Products**

**2.1 VAPOUR RETARDER**

- .1 Crawlspace vapour retarder: Purpose made reinforced polyethylene vapour barrier manufactured from virgin materials with a permeance of less than 0.01 perms.
  - .1 Permeance tested in accordance with ASTM E1745
  - .2 Strength to ASTM E1745 Class A
  - .3 Thickness: 10 mils minimum
  - .4 Tape all joints minimum 150mm overlap use proprietary tape as supplied by manufacturer of vapour retarder.

**2.2 SELF ADHESIVE MEMBRANE**

- .1 Modified Bituminous Membrane: Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) type, reinforced with non-woven cross laminated polyethylene; smooth surfaced; 1.5 mm thick; 1M wide roll. To ASTM D5147.
- .2 Membrane must be approved by the manufacturer for below grade use in cold climate conditions.

**2.3 SEALANTS/TAPES**

- .1 Underslab vapour retarder: sealant/tapes to membrane manufacturer's recommendations.

**2.4 ACCESSORIES**

- .1 Under slab retarder: proprietary seam tape as recommended by manufacturer.
- .2 Primer: Water based surface conditioner as recommended by self adhesive membrane manufacturer.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verify condition of substrate and adjacent materials .

**3.2 PREPARATION**

- .1 Remove loose or foreign matter, which might impair adhesion.
- .2 Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances that may impede installation.

- .3 Ensure ambient temperature is within the manufacturers recommended limits.

### **3.3 CRAWLSPACE VAPOUR RETARDER**

- .1 Install the retarder in accordance with this section and Manufacturer's instructions.
- .2 Install vapour retarder as a continuous, airtight floor moisture barrier system under the entire building area. The barrier shall be sealed with manufacturers flexible sealant/tape at all edges, seams and penetrations to provide a water and air tight seal.
- .3 Lap seams a minimum of 150 mm sealed in the overlapping areas sealed manufacturers proprietary polyethylene tape.
- .4 Continue the barrier vertically up all columns, pipes and interior concrete grade beams for a distance of at least 200 mm.
- .5 Tape and seal the floor barrier around columns and pipes
- .6 Tape and seal at all perforations, penetrations and at structural elements.

### **3.4 SELF ADHESIVE MEMBRANE**

- .1 Apply primer at a rate recommended by the materials manufacturer. Protect surface conditioner from rain or frost until dry.
- .2 Install membrane waterproofing in accordance with manufacturer's instructions.
- .3 Roll out membrane. Minimize wrinkles and bubbles.
- .4 Remove release paper layer. Roll out on substrate with a mechanical roller to encourage full contact bond.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1      Section 06 10 53 Rough Carpentry.
- .2      Section 07 46 13 Wall Cladding.
- .3      Section 07 61 00 Sheet Metal Roofing
- .4      Section 07 62 00 Metal Flashing and Trim

**1.2                REFERENCES**

- .1      ASTM International
  - .1      ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2      ASTM E96/E96M-[10], Standard Test Methods for Water Vapour Transmission of Materials.
- .2      Canadian General Standards Board (CGSB)
  - .1      CGSB 41-GP-6M-[83], Sheets, Thermosetting Polyester Plastics, Glass Fibre Reinforced.
- .3      Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1      Material Safety Data Sheets (MSDS).

**1.3                DESIGN REQUIREMENTS**

- .1      Design composite building panel wall to provide for thermal movement of component materials caused by ambient temperature range listed in NBC for building location without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .2      Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.
- .3      Design panel system including, hat channels and connections to withstand wind loads and rain loads listed in NBC for building location without suffering permanent damage.
- .4      Design panel system including, hat channels and connections for seismic conditions listed in NBC for building location.
- .5      Provide for positive drainage of condensation occurring within wall construction and water entering at joints, to exterior face of wall in accordance with NRC "Rain Screen Principles".

**1.4                SUBMITTALS**

- .1      Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for cementitious materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit copy of WHMIS MSDS in accordance with Section 01 35 33 - Health and Safety Requirements. Indicate VOC's for cementitious materials.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Yukon Territory, Canada.
    - .1 Indicate dimensions, wall openings, head, jamb, sill and mullion detail, materials and finish, anchor details, compliance with design criteria and requirements of related work.
- .4 Samples:
  - .1 Submit samples of panel materials indicating finishes and manufacturers full range of colours.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturers written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

#### **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 – Waste Management and Disposal to the maximum extent economically possible.

### **Part 2 Products**

#### **2.1 MATERIALS**

- .1 Cementitious Board: thickness as indicated

#### **2.2 COMPONENTS**

- .1 Panels:
  - .1 Description: proprietary manufactured asbestos-free composite product consisting of Portland cement, lime stone, bonding agent, high quality colour pigments, reinforcing fibres, water and air formed under pressure to produce panels intended for exterior wall use; insect resistant, fire resistant and non-combustible.
  - .2 Dimensions: 8 mm thick cut from 3040 mm x 1220 mm special order size sheets.
  - .3 Exposed face: cement composite panels with top finishing and core coloured through, protected with factory-applied removable protective film.

- .4 Finish: factory applied and covered with dry strippable polyethylene film to protect surfaces from damage during fabrication, shipping and erection.
- .5 Colours: As selected by Departmental Representative.
- .2 Panel support:
  - .1 Galvanized hat track channel to ASTM A653/A653M-11- lengths to suit.
  - .2 Panel fasteners: approx. 15 mm o.d. saucer headed stainless steel alloy rivets provided by panel manufacturer, each fitted with EPDM weather-sealing washer, heads coloured to match adjacent panel colours.
- .3 Ventilation screens
  - .1 Purpose made perforated aluminum brake u-shaped section as detailed.

### **2.3 FABRICATION**

- .1 Cut panels to size/shape arrangements detailed/indicated and to produce following panel-to-panel joint when installed.
  - .1 Vertical joint width: 5 mm.
- .2 Cut panels using sharp shears, saws and tools recommended by panel manufacturer. Make cuts that will produce true even joints free of chips and splinters.
- .3 Apply proprietary sealing compound to all cut edges, following manufacturers recommendations.
- .4 Brake form metal flashings to profile required, in maximum lengths.
- .5 Paint ungalvanized steel clips, supports and reinforcing steel with steel primer or isolation coating.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable in accordance with manufacturer's written instructions.

### **3.2 INSTALLATION**

- .1 Install horizontal/vertical tracks over previously installed SAM membrane as detailed.
- .2 Install flashings as detailed.
- .3 Install vertical/horizontal hat tracks, spaced to accept panels.
  - .1 Drill oversized holes through hat channel attachment flanges to accommodate thermal movement of hat channels.
  - .2 Provide stainless steel alloy washer under head of each attachment screw to prevent screw head from being pulled through over-sized hole.
  - .3 Provide stainless steel alloy or aluminum alloy or pvc plastic (thermal break) washers as required to shim hat channels that do not conform to planes required to bring panels within tolerances described in Installation Tolerances.

- .4 Install screens at bottom of assembly
- .5 Install panels to hat tracks, using manufacturers proprietary fasteners.

### **3.3 INSTALLATION TOLERANCES**

- .1 Maintain following installation tolerances:
  - .1 Maximum variation from plane or location shown on approved shop drawings: 10 mm/metre of length and up to 20 mm/100 metre maximum.
  - .2 Maximum offset from true alignment between 2 adjacent members abutting end to end, in line: 0.75 mm.

### **3.4 CLEANING**

- .1 Progress Cleaning
  - .1 Wash down exposed acrylic exterior surfaces using solution of mild domestic detergent in warm water, applied with soft clean wiping cloths.
  - .2 Wash down exposed aggregate exterior surfaces using fine water spray.
  - .3 Remove excess sealant with recommended solvent.
  - .4 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

### **3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by mineral fibre reinforced panel installation.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED SECTIONS**

- .1            Section 06 10 11 - Rough Carpentry.
- .2            Section 07 28 00 - Air and Vapour Retarders.

**1.2                REFERENCES**

- .1            ASTM A755/A755M-11 - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.

**1.3                SYSTEM DESCRIPTION**

- .1            Assembly of components includes preformed and prefinished metal cladding system, and flashings, to match existing in colour and profiles; site assembled.

**1.4                DESIGN REQUIREMENTS**

- .1            Components: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall.
- .2            Maximum Allowable Deflection of Panel: 1/90 of span.
- .3            Movement: Accommodate movement within system without damage to components or deterioration of seals, movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.
- .4            Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
- .5            Products: Provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials.
- .6            Vapour Retarder: Provide continuity of vapour retarder at building enclosure elements in conjunction with vapour retarders specified in Section 07 28 00.

**1.5                SUBMITTALS**

- .1            Section 01 33 00: Submission procedures.
- .2            Shop Drawings: Indicate dimensions, layout, joints, construction details, note methods of anchorage to match existing.
- .3            Samples: Submit two samples of cladding, (1) 200 x 200 mm in size illustrating finish colour, sheen, profile and texture of new with (1) 200 x 200 mm in size illustrating finish colour, sheen, profile and texture of existing for comparison.

**1.6                DELIVERY, STORAGE, AND PROTECTION**

- .1            Section 01 61 00: Transport, handle, store, and protect products.

- .2 Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- .3 Store prefinished material off ground protected from weather, to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- .4 Prevent contact with materials which may cause discolouration or staining.

## **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 to the maximum extent economically possible.

## **Part 2 Products**

### **2.1 EXTERIOR SHEET MATERIALS**

- .1 Precoated Galvanized Steel: ASTM A653/A653M, Z275 G90 zinc coating designation; shop pre-coated with silicone polyester coating.
  - .1 Exposed Exterior Surfaces: Colour as selected from manufacturer's full range to match existing.

### **2.2 ACCESSORIES**

- .1 Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant; colour as selected.
- .2 Sealants: Manufacturer's standard type suitable for use with installation of system; non-staining, non-skinning, non-shrinking and non-sagging; ultra-violet and ozone resistant; colour as selected..
- .3 Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized; fastener cap same colour as exterior panel. Exposed fasteners same type and finish to existing panel system.
- .4 Field Touch-up Paint: As recommended by panel manufacturer.
- .5 Bituminous Paint: Asphalt base.
- .6 Vapour retarder: refer to Section 07 28 00.

### **2.3 COMPONENTS.**

- .1 Exterior Sheet: Minimum 0.6 mm, 24 ga thick pre-coated steel, profile as indicated to match existing.
- .2 Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitred to required angles. Mitred internal corners to be back braced with pre-coated sheet stock to maintain continuity of profile.
- .3 Expansion Joints: Same material, thickness and finish as exterior sheets type, of profile to suit system.
- .4 Miscellaneous Trim, Caps, Flashings and Closures: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

- .5 Anchors: Galvanized steel.

## **2.4 FABRICATION**

- .1 Form sections true to shape, accurate in size, square, and free from distortion or defects.
- .2 Form pieces in longest practicable lengths.
- .3 Panel Profile: To match existing.
- .4 Fabricate corners in one continuous piece with minimum 450 mm long pieces.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Section 01 70 00: Verify existing conditions before starting work.
- .2 Verify that building framing members are ready to receive panel system.

### **3.2 INSTALLATION – VAPOUR RETARDER**

- .1 Install metal cladding over previously installed self adhesive membrane vapour retarder membrane as described in 07 28 00.
- .2 Weather lap edges 150 mm and ends minimum 100 mm
- .3 Stagger vertical joints of each layer.

### **3.3 INSTALLATION**

- .1 Install metal cladding system on walls to manufacturer's written instructions.
- .2 Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
- .3 Fasten cladding ; aligned, level, and plumb.
- .4 Locate joints over supports. Lap panel ends minimum 50 mm, 2 inches.
- .5 Provide expansion joints where indicated.
- .6 Use concealed/exposed fasteners to match existing unless otherwise approved by Consultant.
- .7 Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

### **3.4 CLEANING**

- .1 Progress Cleaning
  - .1 Wash down exposed acrylic exterior surfaces using solution of mild domestic detergent in warm water, applied with soft clean wiping cloths.
  - .2 Wash down exposed aggregate exterior surfaces using fine water spray.
  - .3 Remove excess sealant with recommended solvent.
  - .4 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

**3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by mineral fibre reinforced panel installation.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 07 28 00: Air and Vapour Barriers.
- .2            Section 07 46 16: Preformed Metal Cladding

**1.2                REFERENCES**

- .1            ASTM International
  - .1            ASTM B370-[11], Standard Specification for Copper Sheet and Strip for Building Construction.
- .2            CSA International
  - .1            CSA A123.3-[05(2010)], Asphalt Saturated Organic Roofing Felt.

**1.3                PERFORMANCE REQUIREMENTS**

- .1            Flashing system shall accommodate movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to seasonal temperature changes and live loads.

**1.4                SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Product Data:
  - .1            Submit manufacturer's instructions, printed product literature and data sheets for copper sheet metal roofing and include product characteristics, performance criteria, physical size, finish and limitations.
- .3            Samples:
  - .1            Submit duplicate 300 x 300 mm samples of sheet metal roofing, fascia and downspout materials.

**1.5                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2            Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3            Storage and Handling Requirements:
  - .1            Store materials in dry location and in accordance with manufacturer's recommendations.
  - .2            Store and protect sheet metal roofing from nicks, scratches, and blemishes.
  - .3            Replace defective or damaged materials with new.

**1.6 WASTE MANAGEMENT**

- .1 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

**Part 2 Products**

**2.1 SHEET METAL MATERIALS**

- .1 Copper sheet: to ASTM B370, H00 temper designation, for roofing, 060 temper designation for flashings and fascia.

**2.2 DOWNSPOUTS**

- .1 Provide copper downspouts to match existing.

**2.3 ACCESSORIES**

- .1 Underlay: SBS membrane. See Section 07 28 00 Air and Vapour Barriers
- .2 Joint Sealant: One-part, copper compatible elastomeric polyurethane, polysulfide, butyl or silicone rubber sealant as tested by sealant manufacturer for copper substrates.
- .3 Fasteners: stainless steel, concealed.
- .4 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

**2.4 FABRICATION**

- .1 Shop fabricate work to the greatest extent possible.
- .2 Manufacture various copper flashing profiles as indicated.
- .3 Form individual pieces in 2400 mm maximum lengths. Make allowances for expansion at joints.
- .4 Hem exposed edges on underside 12 mm or as detailed.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Form flat lock seams at panel connections.
- .7 Miter exterior corners, provide flat seam connections.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sheet metal roofing installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 INSTALLATION**

**3.3 FLAT SEAM**

- .1 Use rectangular copper sheets to make flat seam flashing.
- .2 Lay sheets with long dimension parallel to exterior walls as indicated.
- .3 Lock cleats into seams and flatten smooth in direction of water flow.

**3.4 CLEANING**

- .1 Progress Cleaning
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

**3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by sheet metal roofing installation.

**END OF SECTION**

**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1            Section 07 21 29 Sprayed Insulation.

**1.2                REFERENCES**

- .1            ASTM International
  - .1            ASTM C475-[02(2007)], Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
  - .2            ASTM C840-[08], Standard Specification for Application and Finishing of Gypsum Board.
  - .3            ASTM C1002-[07], Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
  - .4            ASTM C1280-[99], Standard Specification for Application of Gypsum Sheathing.
  - .5            ASTM C1396/C1396M-[09a], Standard Specification for Gypsum Wallboard.
- .2            Underwriters' Laboratories of Canada (ULC)
  - .1            CAN/ULC-S102-[07], Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1            Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2            Product Data:
  - .1            Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4                DELIVERY, STORAGE AND HANDLING**

- .1            Deliver, store and handle materials in accordance with Section 01 11 55 – General Instructions with manufacturer's written instructions.
- .2            Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3            Storage and Handling Requirements:
  - .1            Store gypsum board assemblies materials level off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2            Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
  - .3            Protect from weather, elements and damage from construction operations.
  - .4            Handle gypsum boards to prevent damage to edges, ends or surfaces.
  - .5            Replace defective or damaged materials with new.

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**1.5 AMBIENT CONDITIONS**

- .1 Maintain temperature 10 degrees C minimum, 21 degrees C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

**Part 2 Products**

**2.1 MATERIALS**

- .1 Water-resistant board: to ASTM C1396/C1396M 16 mm thick, Type X, 1200 wide mm wide x maximum practical length, ends square cut, edges bevelled.
- .2 Metal furring runners, carrying channels, hangers, tie wires, inserts, anchors.
- .3 Gypsum board furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .4 Steel drill screws: to ASTM C1002.
- .5 Joint compound: to ASTM C475, asbestos-free.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

**3.2 ERECTION**

- .1 Application and finishing of gypsum board to ASTM C840 except where specified otherwise.
- .2 Application of gypsum sheathing to ASTM C1280.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C840 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.

- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles as required.
- .7 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .8 Install wall furring for gypsum board wall finishes to ASTM C840, except where specified otherwise.
- .9 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Check clearances with equipment suppliers.
- .10 Furr duct shafts, beams, columns, pipes and exposed services where existing.
- .11 Erect drywall resilient furring transversely across joists spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.

### **3.3 APPLICATION**

- .1 Apply gypsum board after bucks, anchors, blocking, electrical and mechanical work have been approved.
- .2 Apply single layer gypsum board to all exposed wood structure and or metal furring and stud framing using screw fasteners Maximum spacing of screws 300 mm on centre.
  - .1 Single-Layer Application:
    - .1 Apply gypsum board on ceilings prior to application of vertical gypsum board to ASTM C840.
    - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
- .3 Apply water-resistant gypsum board where indicated in crawl space locations. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads.
- .4 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .5 Install gypsum board with face side out.
- .6 Do not install damaged or damp boards.
- .7 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

### **3.4 INSTALLATION**

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure using contact adhesive for full length at 150 mm on centre.
- .2 Locate control joints at changes in substrate construction at approximate 15 m spacing on ceilings.
- .3 Install control joints straight and true.
- .4 Splice corners and intersections together and secure to each member with 3 screws.
- .5 Install access doors to electrical and mechanical fixtures specified in respective sections.

- .1 Rigidly secure frames to furring or framing systems.
- .6 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .7 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWC! Levels of Gypsum Board Finish:
  - .1 Levels of finish:
    - .1 Level 1: embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable.
- .8 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .9 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .10 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .11 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .12 Mix joint compound slightly thinner than for joint taping.
- .13 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .14 Allow skim coat to dry completely.
- .15 Remove ridges by light sanding or wiping with damp cloth.

### **3.5 CLEANING**

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 55 – General Instructions.
- .2 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 19
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.6 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by gypsum board assemblies installation.

**END OF SECTION**

**Part 1      General**

**1.1          INTENT**

- .1      **Work** in Division 20, 21, and 33 will include **all** drawings and **all** sections of the specifications that form the Contract Documents, including all addenda, and including Division 01 and Division 00, whether defined in Division 20, 21, and 33 or elsewhere, or whether defined in mechanical drawings or elsewhere.
- .2      Include all costs to obtain all permits and to pay for all fees and charges, including inspection charges by the authorities that issue the permits; coordinate all related inspections. Permits, fees and inspections including:
  - .1      Sprinklers.
  - .2      Ventilation.
  - .3      Foundation Drainage.
- .3      Contract documents of the Specifications and Drawings, are generally diagrammatic and approximately to scale unless detailed otherwise. They establish scope, material and installation quality and are not detailed demolition/installation instructions.
- .4      Review Contract Documents and notify the Engineer of issues of conflict that require clarification prior to submitting tender. Failure by the Contractor to secure clarification does not relieve the Contractor to comply with the intent of the design and/or the Contract Document.
- .5      Duct demolition in the crawlspace is intended to be replaced with new in future with replacement of the existing heating system.
- .6      Sprinkler system demolition is to include removal of crawlspace sprinklers only and the remaining building is to remain protected by the sprinkler system.

**1.2          ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Where required by authorities having jurisdiction, submit for approval, drawings, diagrams, details and supporting data clearly showing sequence of demolition and removal work of building supporting structures and underpinning.

**1.3          METRIC CONVERSION**

- .1      All units in this division are expressed in SI units. Soft metric conversions are used throughout.
- .2      Submit all shop drawings and maintenance manuals in SI units.
- .3      On all submittals use the same SI units as stated in the specification.
- .4      Equivalent Nominal Diameters of Pipes - Metric and Imperial
  - .1      Where pipes are specified with metric dimensions and only Imperial sized pipes are available, provide equivalent nominal Imperial sized pipe as indicated in the table, and

provide adapters to ensure compatible connections to all metric sized fittings, equipment and piping.

- .2 When CSA approved SI Metric pipes are available and are provided, the contractor shall provide adapters to ensure compatible connections between the SI Metric pipes and all new and existing pipes, fittings, and equipment.
- .3 Record accurately on "as-built" drawings the type of pipe (i.e., Metric or Imperial) installed.

**EQUIVALENT NOMINAL DIAMETERS OF PIPES**

mm	Inches	mm	Inches	mm	Inches
3	1/8	50	2	250	10
6	1/4	63/65	2-1/2	300	12
10	3/8	75/80	3	375	15
13/15	1/2	100	4	450	18
19/20	3/4	125	5	500	20
25	1	150	6	600	24
30/32	1-1/4	200	8	750	30
38/40	1-1/2				

**.5 Metric Duct Sizes**

- .1 The metric duct sizes are expressed as 25 mm = 1 inch.

**1.4 DRAWINGS AND SPECIFICATIONS**

- .1 The responsibility and scope of each subtrade rests solely with the General Contractor. Extras will not be considered based on the grounds of difference in interpretation of specifications as to which trade involved is to provide certain specifications or materials.
- .2 Refer to architectural and structural drawings for building dimensional data and construction details.
- .3 Drawings and specifications are complementary each to the other, and what is called for by one shall be binding as if called for by both.
- .4 Should any discrepancy appear between drawings and specifications which leaves the Contractor in doubt as to the true intent and meaning of the plans and specifications, obtain a ruling from the Engineer in writing or by Addendum, before submitting tender. If this is not done, it will be assumed that the most expensive alternate has been included.
- .5 Prior to construction start, examine all contract documents, including all drawings and specifications, and work of other trades to ensure that work can be satisfactorily carried out without changes to building.
- .6 The scope of work in this division shall include all work defined in the Contract Documents, including work which may exceed the minimum requirements of codes and standards that are referenced in the Contract Documents.

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**1.5 EXAMINATION OF SITE**

- .1 Before submitting tender, visit and examine the site and note all characteristics and features affecting the work. Report discrepancies to the Departmental Representative seven (7) days prior to tender closing. No allowances will be made for any difficulties encountered or any expenses incurred because of any conditions of the site or item existing, thereon, which are visible or known to exist at the time of tender. Failure to advise Departmental Representative of discrepancies will assume contractor accepts documents as presented without potential of additional costs.

**1.6 COORDINATION OF WORK**

- .1 Cooperate and coordinate with other trades on the project. Phase work in sequence with the General Contractor.
- .2 Make reference to electrical, mechanical, structural and architectural drawings when setting out work. Consult with respective Divisions in setting out removal of ductwork, and piping, so that conflicts are avoided and symmetrical even spacing is maintained.
- .3 Where dimensional details are required, work with the applicable architectural and structural drawings.
- .4 Full size and detailed drawings shall take precedence over scale measurements from drawings.
- .5 Coordinate with the Contractor and Electrical Trade all requirements for electrical services to mechanical components and equipment. Motor voltages will be defined in Division 26.
- .6 Prepare and submit drawings to the Contractor and structural engineer defining mechanical system support loads and support details. Include definition of pipe and/or loads on structural elements and anchor arrangements.

**1.7 CUTTING AND PATCHING**

- .1 Patch and make good building where damaged from demolition. Work to be performed by the trade or contractor responsible for that type of work.
- .2 Protect all openings from debris and dust with poly covers sealed tightly to the ductwork.

**1.8 EXCAVATION AND BACKFILL**

- .1 Refer to and comply with requirements of Division 33.
- .2 Prior to start of excavation confirm all service invert elevations and locations. Set grades to suit.
- .3 Provide all labour and materials for trench excavation inside the building that is required to accommodate installation of the mechanical work, including shoring and pumping.
- .4 Provide 150 mm compacted sand bedding under and first 300 mm of compacted sand over piping.
- .5 Do not install buried pipe until foundation work (i.e. piles, footings, etc.) within 15 m piping has been completed.

**1.9 CERTIFICATE OF SUBSTANTIAL PERFORMANCE**

- .1 Comply with Division 00 and Division 01:

- .1 Closeout Procedures Section 01 77 00
- .2 Submittal Procedures Section 01 33 00
- .2 Obtain and submit letter of compliance confirming that automatic sprinkler installation and hose systems are installed and tested, consistent with the contract documents.
- .3 In addition to the requirements of Division 00 and Division 01, and prior to application for a "Certificate of Substantial Performance" of the work, the contractor shall certify the following in writing to the Engineer:
  - .1 Documentation required by the following sections has been submitted:
    - .1 General Documentation Section 20 05 05
    - .2 Systems Demonstration Section 20 05 06
  - .2 Following information has been submitted:
    - .1 Completed record drawings.
- .4 Within ten (10) days of receipt of a written application for a "Certificate of Substantial Performance", the Engineer shall visit the site to confirm that all requirements listed in this section are complete. Mechanical Contractor shall attend this site review and provide a copy of the O&M Manual.
- .5 If, after the Engineer's site visit the application for a "Certificate of Substantial Performance" is not approved, the contractor shall reapply in accordance with the Engineer's site visit report and pay for costs of re-inspection services.

**1.10 COORDINATION WITH DIVISION 26 WORK**

- .1 Coordinate all demolition work with Division 26 demolition work.

**1.11 CONTRACT PRICE BREAKDOWN**

- .1 Submit a breakdown of the contract price using the following form within thirty (30) days of contract award and well before first progress claim for review and approval by Engineer.
- .2 Progress claims shall be submitted using this contract price breakdown.

**CONTRACT PRICE BREAKDOWN**

	<b>MATERIAL</b>	<b>LABOUR</b>
.1	Ventilation Demolition	
.2	Fire Protection Demolition/Installation	
.3	Subsurface Drainage	

<b>Part 2</b>	<b>Products</b>
<b>2.1</b>	<b>NOT USED</b>
<b>Part 3</b>	<b>Execution</b>
<b>3.1</b>	<b>NOT USED</b>

**END OF SECTION**

**Part 1      General**

**1.1      RELATED REQUIREMENTS**

- .1      Section 01 74 19 – Waste Management and Disposal
- .2      Section 20 05 01 – General Mechanical

**1.2      REFERENCES**

- .1      Canadian Standards Association (CSA International)
  - .1      CSA S350-M1980(R1998), Code of Practice for Safety in Demolition of Structures.

**1.3      ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Where required by authorities having jurisdiction, submit for approval, drawings, diagrams, details and supporting data clearly showing sequence of demolition and removal work of building supporting structures and underpinning.

**1.4      HAZARDOUS MATERIAL DISCOVERY**

- .1      Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately if material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.
- .2      PCB: Polychlorinated Biphenyl: stop work immediately if material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.
- .3      Mould: stop work immediately if material resembling mould is encountered during demolition work. Notify Departmental Representative.

**1.5      SITE CONDITIONS**

- .1      Should material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
  - .1      Do not proceed until written instructions have been received from Departmental Representative.
- .2      Notify Departmental Representative before disrupting building access or services.

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**Part 2        Products**

**2.1            NOT USED**

**Part 3        Execution**

**3.1            PREPARATION**

- .1    Inspect building with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2    Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3    Notify and obtain approval of utility companies before starting demolition.
- .4    Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
  - .1    Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.
  - .2    Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action..

**3.2            PREPARATION**

- .1    Keep noise, dust, and inconvenience to occupants to minimum.
- .2    Protect building systems, services and equipment.
- .3    Provide temporary dust screens, covers, railings, supports and other protection as required.
- .4    Do Work in accordance with Section 01 35 33 - Health and Safety Requirements.

**3.3            DEMOLITION**

- .1    Remove parts of existing building to permit new construction. Sort materials into appropriate piles for recycling.
- .2    Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.

**3.4            DISPOSAL**

- .1    Dispose of removed materials, to appropriate recycling facilities where available in Yukon, otherwise in accordance with authority having jurisdiction.

**3.5            CLEANING**

- .1    Upon completion, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1      General**

**1.1      RELATED REQUIREMENTS**

- .1      Section 01 74 19 – Waste Management and Disposal
- .2      Section 20 05 01 – General Mechanical

**1.2      REFERENCES**

- .1      American National Standards Institute/National Fire Protection Association ANSI/NFPA 13, Standard for the Installation of Sprinkler Systems.
- .2      American National Standards Institute/National Fire Protection Association ANSI/NFPA 25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.
- .3      CAN/ULC S543, Internal Lug Quick Connect Coupling for Fire Hose.
- .4      CAN/ULC-S524, Standard for the Installation of Fire Alarm Systems.
- .5      CAN/ULC-S537, Standard for the Verification of Fire Alarm Systems.
- .6      NFPA 72, Standard for the Installation, Maintenance and Use of Protective Signaling Systems.

**1.3      ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Provide product literature for following items:
  - .1      Piping and fittings
  - .2      Sprinklers
  - .3      Seismic bracing means and methods.

**1.4      EXTRA MATERIALS**

- .1      Provide spare sprinklers and tools as required by ANSI/NFPA 13.

**Part 2      Products**

**2.1      PIPE AND FITTINGS**

- .1      Pipe: steel: to ANSI/NFPA 13.
- .2      Fittings and joints to ANSI/NFPA 13:
  - .1      Ferrous: galvanized, screwed.

**2.2      VALVES (GENERAL)**

- .1      Valves: Conform to ANSI/NFPA 13 and ULC/FM approved of one manufacturer for fire protection; bearing manufacturer's name, trademark, figure number and pressure rating.

- .2 Unless otherwise specified valves to be rated for 1.2 MPa working water pressure.

### **2.3 BALL VALVES**

- .1 Valves up to 50mm dia nominal used on auxiliary drains where supervision is not required: threaded, bronze body, bronze ball, twin seal, EPDM seats and seal, lever handle, O-ring.

### **2.4 SPRINKLERS (GENERAL)**

- .1 General: quick response to ANSI/NFPA 13 and ULC listed for fire services. Fire sprinklers shall be of one manufacturer throughout the building. No mixing of sprinkler brands shall be permitted.
- .2 Pendent sprinklers: chrome plated semi-recessed bulb type in finished areas. Brass in unfinished areas.
- .3 Upright sprinklers: chrome plated in finished areas, bulb type. Brass in unfinished areas.
- .4 Temperature ratings and listings to requirements of ANSI/NFPA 13.

### **2.5 SIGNS**

- .1 Bilingual Signs for control drain and test valves: to ANSI/NFPA 13.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Install, inspect and test to acceptance in accordance with ANSI/NFPA 13 the manufacturers recommendations and listings and the requirements of the Authority having jurisdiction.
- .2 Provide "Contractors Material Test Certificate" as per ANSI/NFPA 13 for insertion in O & M Manual.
- .3 Valve identification:
  - .1 Identify drain valves and all auxiliary valves.

### **3.2 SITE TEST**

- .1 In accordance with NFPA 13, supplemented as specified.
- .2 Upon complete installation of piping and apparatus for sprinkler systems, test joints for tightness and inspect condition of piping in presence of Authority having jurisdiction, and the Departmental Representative.
- .3 Documentation:
  - .1 Provide written certification to Engineer that system was installed, flushed and tested in accordance with appropriate codes, approved plans and calculations.
  - .2 Certificate to include:
    - .1 Contractors name.
    - .2 Contractors address.
    - .3 Contractors license number.

- .4 List of approved materials and devices installed.
- .5 Description of system test conducted.
- .6 Dates of flushing and testing.
- .7 Certification that connections conform to acceptable standards.
- .8 Certification that system is complete and in service.
- .9 Approved signage has been provided and attached as appropriate.
- .10 Hose connections of system and test connections match those of responding fire department.
- .3 Record drawings:
  - .1 All drain connections to be referenced on the record drawings and added to the building's O&M manual.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 19 Waste Management and Disposal.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**1. GENERAL PROJECT REQUIREMENTS**

- .1 The general requirements, instructions to bidders, this specification and any addenda here to form part of the contract documents and shall be read in conjunction with them. Work shall include the furnishing of all labour and materials unless specifically noted otherwise to complete and put into operating condition all electrical systems as indicated on the drawings and specified herein.
- .2 Responsibility as to which trade provides required articles or materials rests solely with the general contract trade. Extras will not be considered based on grounds of difference in interpretation of specifications as to which trade involved shall provide certain specialties or materials.
- .3 Provide temporary construction lighting and power throughout the project and include all utility costs in scope of work. Remove all temporary lighting and power after project is complete.

**2. STANDARDS OF MATERIAL AND WORKMANSHIP**

- .1 All materials shall be new, of the quality specified and shall conform to the standards of the Canadian Standards Association. Where equipment or materials are specified by technical description only, they shall be of the best commercial quality obtainable for the purpose.
- .2 All work shall be executed in a neat and workmanlike manner by qualified tradespersons. Electrical contractor shall keep a competent foreman and necessary assistants all satisfactory to the engineer on the job during the progress of the work.
- .3 Work done in renovations and additions shall, at a minimum, meet the standard of work and material of the existing portions of the building.

**3. CODES, PERMITS AND INSPECTIONS**

- .1 Comply with all laws, ordinances, rules, regulations and codes of all authorities having jurisdiction relative to this project.
- .2 Complete installation is to comply with the Canadian electrical code (2015) and the national building code (2010) including the latest amendments and local municipal codes and related CSA electrical bulletins.
- .3 Submit to the electrical inspection authority having jurisdiction the necessary number of drawings and specifications for review and approval prior to commencement of the project.
- .4 Pay all associated fees and obtain all permits, licenses etc. to complete the project..5obtain a certificate of acceptance from the inspection authority having jurisdiction upon completion of the project and include in the O&M manual.

**4. DRAWINGS AND SPECIFICATIONS**

- .1 The drawings and specifications are complementary each to the other and what is called for by one shall be binding as if called for by both.
- .2 Should any discrepancy appear between the drawings and specifications which leaves the electrical contractor in doubt as to the true intent and meaning of the plans and specifications, a ruling shall be obtained from the engineer or architect in writing before submitting tender. If this is not done, it will be assumed that the more expensive alternate will be required.

**5. EXAMINATION OF OTHER DRAWINGS**

- .1 This contractor shall examine carefully the structural, architectural and mechanical drawings and work of other trades to their satisfaction that the work under this contract can be acceptably carried out as shown on the plans. Should an issue arise showing conflict with, or requiring additional work beyond the work of these drawings, the contractor shall bring this matter to the attention of the architect or engineer prior to submitting his tender.

**6. EXAMINATION OF THE SITE**

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1. Before submitting tender, visit site is mandatory to become familiar with all conditions likely to affect the cost of the work. A pre-tender site visit will be arranged by the Departmental Representative in May 2015, refer to section 01 11 55 for more details on pre-tender site visit.
  2. Prior to submitting his tender, the electrical contractor shall carefully examine the site and ascertain all conditions that shall affect his contract. No extras will be allowed for work resulting from conditions that would have been evident upon a thorough examination of site.
  - .3 Questions or apparent conflicts need to be submitted by the contractor for clarification by the consultant prior to submittal of tender. In cases where clarification is not submitted to the consultant the more expensive solution shall be considered correct.
- 7. SHOP DRAWINGS**
- .1 Electrical contractor shall submit shop drawings to the engineer for review of electrical components for all systems.
  - .2 All drawings shall be submitted in PDF version via the general contractor for review.
  - .3 The engineer's review of shop drawings shall be for general design only and shall not relieve the electrical contractor or suppliers from their responsibility for errors, proper fitting, and construction of the work and furnishing of materials. The review shall not be construed as approving departures from the contract document requirements if such departures are not specifically noted in a covering letter accompanying such drawings. Electrical contractor shall be responsible for verifying all dimensions.
  - .4 Shop drawings to indicate all information required to discern whether the equipment meets the requirements of this specification and the drawings. wiring diagrams, schematics, risers and relevant details, where required, shall be unique to the project and not generic in form. Manufacturer's sales literature will not be acceptable.
- 8. UNIFORMITY OF EQUIPMENT**
- .1 Unless otherwise specifically called for in the specifications, uniformity of manufacture shall be maintained for any particular item throughout the building.
  - .2 Where the project encompasses renovations or additions to an existing building the manufacturer shall match the existing unless noted otherwise. All new manufacturers' equipment that varies from the e
- 9. EQUIVALENT PRODUCTS**
- .1 All tenders shall be based on the product specified or equivalent products, which have been given written approval prior to tender by the engineer. The engineer's decision as to the equivalency of products shall be final.
  - .2 Electrical contractor and/or suppliers wishing to submit equivalent products shall do so in PDF format via an email to the engineer. if the product is approved as an equivalent, an email of confirmation shall be sent from the engineer. it shall be the electrical contractor's responsibility to ensure that any suppliers quoting to the electrical contractor have obtained the written approval of the engineer.
  - .3 All requests for equivalent material approval must be emailed not less than Ten (10) days prior to closing of tender. No equivalent requests will be considered after this time.
  - .4 The approval of equivalent products will be granted on the basis of general design only. Such approvals will not relieve the electrical contractor from providing all necessary components and functions required in the specifications or on the drawings.
  - .5 Alternate services rated equipment shall meet the utilities' requirements.
  - .6 Any change in the footprint size due to alternate equipment shall not result in a redesign. Any cost to revise the design due to an alternate manufacturers' requirement shall be borne by the electrical contractor.
- 10. SETTING OUT OF THE WORK**

- .1 The electrical contractor shall be responsible for correcting all work completed contrary to the intent of drawings and specifications and shall bear all cost for same. Where intent of drawings and specifications is not clear, he shall obtain clarification of the architect before proceeding with work.
- .2 The electrical contractor shall give the work personal supervision lay out their own work, do all necessary leveling and measuring or employ a competent engineer to-do so. Figures, full size and detail drawings shall take precedence over scale measurements.
- .3 Where equipment supplied by the electrical contractor must be built in with the work of other trades, the electrical contractor shall be responsible for the supplying of the equipment to be built in or measurements to allow necessary openings to be left so as not to hold up the work.
- .4 Electrical contractor shall be responsible for any damage caused the owner or any of the other trades by improper location or carrying out of his work.
- .5 The electrical contractor, in setting out of his work, shall make reference to architectural, structural and mechanical drawings. The electrical contractor shall consult with the respective trades in setting out locations for conduit runs, luminaries, panel assemblies, etc., so that conflicts are avoided and symmetrical even spacing is maintained.
- .6 Switch mounting heights shall be coordinated with architectural details and shall be adjusted, if required, to coordinate with millwork, millwork paneling, masonry course lines, etc.
- .7 Where outlets occur in exterior walls, the electrical contractor shall ensure that there is insulation behind the outlet boxes to prevent condensation through the boxes.

**11. CUTTING AND PATCHING**

- .1 The general contractor will be responsible for all cutting and patching required for the electrical installation. Structural members shall not be cut without the consent of the architect.
- .2 Where work by the electrical contractor damages work of other trades, the electrical contractor shall repair and make good such damage to the satisfaction of the trade concerned and the architect.

**12. PAINTING AND FINISHES**

- .1 All electrical fittings, supports, hanger rods, pull boxes, channel frames, conduit racks, outlet boxes, brackets, clamps, etc., shall have galvanized finish or paint finish over corrosion-resistant primer.
- .2 Pull boxes, junction boxes, terminal panels, etc. shall be finished in red for the fire alarm system.

**13. PROJECT CLEAN-UP**

- .1 The electrical contractor and his sub-trades shall at all times during construction, keep the site free of all debris, boxes, packing, etc., resulting from work of this trade.
- .2 At the completion of the work, the electrical installation shall be left in a clean finished condition to the satisfaction of the architect.

**14. SITE REVIEWS AND CONSTRUCTION DOCUMENTS**

- .1 Contractor shall contact the consultant for a minimum of rough-in and final reviews. Additional reviews will be completed as required; contractor is to make consultant aware regarding any conditions that warrant special reviews. Contractor shall ensure that all required work is completed prior to calling for review. Additional charges may be levied should additional reviews be required due to lack of completion of work to be reviewed.
- .2 Progress claims submitted shall be broken down for each system and include a materials and labor portion for review. Progress claims submitted without proper breakdown will not be reviewed.

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- .3 All revisions resulting in costs to the owner shall be submitted with a full breakdown of materials and labor for each portion of the work.
  - .4 Requests for information (RFI's) shall be submitted for onsite questions only after the issue has been reviewed and discussed without resolution on site with the appropriate trades. Minor issues should be dealt with through phone or email.
- 15. ELECTRICAL SYSTEMS TESTS**
- .1 All portions of the electrical work shall be tested and checked for satisfactory operation.
  - .2 Before energizing any portion of the electrical system, perform megohmmeter tests on all feeders and branch circuits. Results of such tests shall conform to the requirements of the Canadian electrical code and shall be to the satisfaction of the authorized inspection agency and the engineer.
  - .3 Upon completion of the contract and immediately prior to substantial review and takeover, check the load balance on all feeders and at distribution centers, panels, etc. the tests shall be carried out by turning on all possible loads in the contract area and checking load current balance. If load unbalance exceeds 15%, reconnect circuits to balance the load.
- 16. RECORD DRAWINGS**
- .1 The general contractor shall furnish to the electrical contractor one full sized set of drawings to be used for recording work as actually installed. The electrical contractor shall accurately record on this set of drawings, day by day, all outlets, conduit, fixtures and equipment as actually installed on the job. Any discrepancies noted by the electrical contractor between the design drawings and the existing installation shall be noted on the record drawings.
  - .2 Upon completion of the project and before final payment the electrical contractor shall obtain the services of an engineering firm to update all information from the record prints to AutoCAD format files, including all changes to the original tender drawings covered by addenda, change orders, field changes, job conditions, etc. The record drawings shall be turned over to the engineer for approval and updating in AutoCAD. The electrical contractor shall include all costs for record drawings in the bid.
  - .3 All revisions are to be done in the same AutoCAD version as the originals and drafting is to match existing drawing quality and style. The drawings shall clearly indicate one very page that they are record documents as supplied by the electrical contractor. The electrical contractor's company name, address and contact individuals are to be included on every drawing. The drawings will clearly be identified as "record documents." The completed electronic AutoCAD drawings on a CD and one full sized copy of the drawings shall be turned over to the owner upon completion.
- 17. GUARANTEE/WARRANTIES**
- .1 Furnish a written guarantee/warranty countersigned and guaranteed by the general contract trade stating:
    - .1 That all work executed under this contract will be free from defects of material and workmanship for a period of one (1) year from the date of final acceptance of this work.
    - .2 The above parties further agree to, at their own expense, repair and replace all such defective work and other work damaged thereby which fails or is otherwise defective during the term of the guarantee/warranty provided that such failure is not due to improper usage.
    - .3 The period of the guarantee specified shall in no way supplant any other guarantee of a longer period but shall be binding on work not otherwise covered.
  - .2 Provide additional warranties for manufacturer's systems as required by other sections of this specification.
- 18. OPERATION AND MAINTENANCE MANUAL**

- .1 Provide four copies of the maintenance manuals to the consultant for review. Returned copies shall have their visions made and sent to the owner at the end of the project.
- .2 Each manual shall have a list of sections, contact information for the general contractor, electrical contractor and all sub-contractors, electrical engineering firm and all systems manufacturers, all warranties, guarantees and certificates, copies of approved shop drawings, single line diagrams and schematics for all systems, test and verification results and cleaning and maintenance procedures.

**19. SUBSTANTIAL COMPLETION**

- .1 Before calling for substantial completion review the contractor shall provide the following relevant documents to the consultant:
  - .1 Emergency and exit lighting system test certificate.
  - .2 Fire alarm verification and certification reports.
  - .3 Connection to monitoring company for the fire alarm system.
  - .4 Letter of inspection from the authority having jurisdiction.
  - .5 Operation and maintenance manuals have been submitted for review.
  - .6 Sealed seismic drawings and letter of assurance from the seismic engineer have been submitted to consultant and included in maintenance manual.
  - .7 All exit lights and emergency lighting systems installed and operational.
  - .8 All junction outlet boxes covered.
  - .9 Record drawings submitted for updating.
- .2 Should a substantial completion review be called for and the consultant finds the project is not compliant with the above an additional review may be required. Such additional reviews may be charged to the electrical contractor.

**20. SEISMIC RESTRAINTS**

- .1 Retain the services of a qualified seismic engineer to provide seismic restraint requirements, installation details, site reviews and letter of assurance for the project. Exact scope of seismic work shall be determined by the seismic engineer. All seismic details shall be submitted as shop drawings to the consultant and included in the maintenance manual.
- .2 Provide letters of assurance from the seismic engineer to the electrical engineer after field reviews by the seismic engineer at substantial completion.

**21. FIRE STOPPING**

- .1 The contractor shall seal all openings in the floor or fire rated walls with a fire barrier material equal to the rating of the floor or wall being penetrated.
- .2 All communication and low voltage cabling, when grouped and penetrating a fire separation shall be sealed via an EZ path device by STI or an equivalent product. Equivalent products must be approved by the engineer.
- .3 All variations of fire stopping systems to be utilized shall be submitted to the consultant in the shop drawing phase and shall be included in the maintenance manual. Each type of fire stopping shall be noted by the appropriate ULC listed detail.
- .4 The contractor is to include in their tender a visual manufacturer walk-through during construction to verify installation systems, methods and materials are correctly installed; manufacturer is to provide documentation of this walk-through to the engineer.
- .5 The electrical engineer reserves the right to 'spot' test completed fire stopping installations up to 10%. such tests shall be repaired at no additional cost.

**22. DEMOLITION**

- .1 Examine the site prior to submittal of tender. Make the consultant aware of any issues posing a potential problem or that has not been included in the current scope of work.
- .2 Remove all unused conduit cabling and wiring, etc. back to source.

- .3 Provide temporary services for fire alarm, security, power, lighting, exit and emergency lighting systems required to maintain temporary systems required for the occupants during construction.
- .4 All systems in occupied spaces to remain operational during construction. repair any systems affected by construction as required.
- .5 All equipment to remain to be cleaned prior to turn over. all lighting to remain to be re-lamped and re-ballasted; replace all lenses that have yellowed or are broken.
- .6 Existing data closets in areas of construction to be thoroughly cleaned including air blasting of electronic equipment. During construction provide dust protection for all electronic equipment.
- .7 All electrical equipment removed from the site shall become property of the owner and shall be turned over to the owner. any equipment the owner refuses shall become property of the contractor.

**23. RECEWAYS AND FITTING**

- .1 Electrical Metallic Conduit (EMT) shall be installed for all building wiring unless noted otherwise. Conduits to be installed in conformance with the Canadian electrical code. Color code conduit and junction box covers as noted in other sections of this specification. Size conduits to the Canadian electrical code requirements.
- .2 In-ground conduit shall be PVC conduit. Label both ends of stub-up locations with felt marker indicating use of conduit. Ensure conduit is sealed during construction and free of debris prior to installing wire in conduit.
- .3 All conduits to have a green bonding conductor; do not use the conduit as a bond to electrical boxes and equipment.
- .4 Conduits to be free from burrs and kinks; bends shall be kept to a maximum 45 degree angle for offsets and saddles wherever possible. Provide a pull box or junction box for each 360 degree bend in the conduit run. In exposed areas the install of conduits shall be uniform in appearance and installed in parallel or right angles with the building structure.
- .5 When possible, large groups of conduits shall be installed together on conduit racks utilizing redi-rod and uni-struts.
- .6 Provide bushing on all connectors on conduits 27mm in size and larger. All connectors and couplings shall be steel; aluminum or die-cast zinc is not acceptable.
- .7 Where a run of conduit is not continuous and is greater than 3m in length, a bonding bushing shall be used to bond the conduit to the cable tray or bonded conduit system.
- .8 Conduits may not be supported from t-bar or t-bar hanger system.
- .9 Flexible conduit (flex) may be used for connections to devices such as speakers, fire alarm devices, motors etc. include a green bonding conductor from the device outlet box to the EMT or cable tray for bonding continuity. Utilize liquid tight flexible conduit where required.
- .10 Conduits and cables terminating in the top of equipment in sprinklered areas shall terminate with water-tight connectors.

**24. PULLBOXES AND OUTLET BOXES**

- .1 Supply and install pull boxes and junction boxes as shown on the drawings and as required to suit job conditions. Pull boxes shall conform to Canadian electrical code requirements and shall be finished in enamel over corrosion resistant primer with screw-on or hinged cover. Utilize table 23 of the CEC for determining sizes of boxes.
- .2 In removable ceiling areas, pull boxes are to be installed above the ceiling. Pull boxes in finished walls and plaster or non-removable ceilings shall have overlapping type trims with covers prime coated and painted on job to match wall or ceiling. Color pull box covers as noted in other sections of this specification.
- .3 Device outlet boxes shall be 4x4 with single or double gang plaster ring, depth to be as required; coordinate with general contractor for depth of wall finishing. Outlet boxes shall be supported on two sides. handy boxes shall not be used.

- .4 When installed in concrete utilize appropriate masonry boxes intended for such applications.
- .5 When installed in wood walls, plastic outlet boxes shall only be used with permission of the consultant.
- .6 Where indicated, utilize multi-service boxes for office outlets, equal to spyder technology multi-gang boxes.
- .7 Mounting heights for device outlets shall be as follows:
  - .1 Emergency battery packs - 2440mm or 300mm down from ceiling
  - .2 Exit lights - ceiling mounted, 300mm down from the ceiling or 450mm above the door.
  - .3 Pull stations - 1050mm
  - .4 Horn-strobe/bells - 2440mm or 300mm down from ceiling
- .8 Where devices are installed in an accessible location, heights of devices shall meet the requirements of the NBC building code.

**25. ACCESS DOORS**

- .1 The electrical contractor shall supply and install access doors required for proper servicing of all electrical work. Access doors shall be complete with necessary frames and hinged doors held closed with captive studs. Access panel shall be of not less than 3 mm steel, prime coat finished and painted on the job to match the wall or ceiling finish.
- .2 Number of access doors to be kept to an absolute minimum and to be used only with the permission of the architect.
- .3 Access doors to be fire rated where required.

**26. BUILDING WIRING**

- .1 All wiring shall be copper with RW75 x-link or R75 nylon 600V insulation installed in EMT conduit. No wire smaller than no.12 AWG shall be used for branch circuit wiring. Wiring shall be color coded to the Canadian electrical code requirements. Rigid threaded galvanized steel conduit shall be used where required by code. 90 degree wiring maybe used but shall be de-rated to 75 degree wiring where connected to 75 degree rated equipment.
  - .1 Wiring larger than 2/0 may be paralleled as permitted by code.
  - .2 Cabling may be aluminum when sized 1/0 or larger.
  - .3 Cabling shall be fire rated where applicable by code.
  - .4 Armoured cabling may be used where permissible by the consultant; riser Teck 90 cable or equal shall be used for vertical runs.
  - .5 Corline flexible conduits may be used in slabs where permissible by the structural engineer.
- .2 AC90 (BX) cable shall be complete with anti-short bushings. Length of ac90 cable shall not to exceed 3 meters. AC90cable may be used for fixture drops and in walls only. Install EMT conduit in ceiling space to within 1 meter of wall for connection to ac90 cable. AC90 cable may not be used in electrical rooms.
- .3 Non-metallic sheathed cable (lumex) shall be used where applicable by the Canadian electrical code and only with approval from the consultant.
- .4 Provide dedicated neutral conductors for all circuits feeding electronic equipment. (no sharing of neutrals).
- .5 Conductors to be sized so as to limit voltage drop to the limits outlined in the Canadian electrical code.
- .6 Aluminum wiring shall not be used for connections to vibrating equipment such as motors, roof top units etc.

**27. GROUNDING AND BONDING**

- .1 Supply and install complete grounding and bonding system as indicated and as required by Canadian electrical code, the local electrical inspection department and as defined in other sections of this specification.
- .2 All components shall be securely and adequately bonded to ground and where required to accomplish this, bonding jumpers, bonding studs and bushings shall be used. Ensure that all raceways, distribution equipment, terminal panels and equipment for low voltage systems, fire alarm, sound, etc.. Are securely and adequately bonded.

**28. SURFACE MOUNTED RACEWAY SYSTEMS**

- .1 Surface " where shown on the drawings" non-metallic raceway system shall be equal to remold 800 series, complete with necessary corners, boxes, adaptors, coupling fittings, etc. as required to provide a complete continuous installation.
- .2 Install surface raceway system in service rooms and as noted on the drawings only. Provide all mounting hardware and miscellaneous accessories necessary for a complete installation. Surface raceway systems to be supported every minimum 900 mm on center and at each corner, bend and outlet box.

**29. IDENTIFICATION AND LABELING**

- .1 Electrical contractor shall provide and install identifying labels for all electrical equipment and devices.
- .2 All devices shall have adhesive labels from a brother P-touch device or equivalent.

**30. CLARIFICATIONS**

- .1 Electrical contractor shall provide and install all material and labor to complete the work as shown in the drawings and described herein, the current building contains hazardous materials need to be removed and disposed by others. Electrical contractor to provide all precautions for his forces and shall remove all electrical equipment obstruction the architectural and civil work and re-install as per the original layout for complete operational system. the intent of this project is to left the building and change the foundation and change flooring and some floor joists, and all the siding containing asbestos will be removed and replaced as well, this work will be a challenge and require an electrical contractor to disconnect all wiring, conduits and remove devices prior to commence the civil/structural work, electrical contractor must do all necessary work to allow other trades to complete their work and re-store safely all disconnected electrical systems.

PROJECT NO. R.068835.001  
PALACE GRAND THEATRE FOUNDATION REPLACEMENT  
DAWSON CITY, YUKON TERRITORY  
GENERAL REQUIREMENTS

**26 05 00**  
**COMMON WORK RESULTS**  
**FOR ELECTRICAL**  
May 2015

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\_\_\_\_\_  
END OF SECTION \_\_\_\_\_

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**PART 1        GENERAL**

**1.1        Related Sections**

- .1        Section            33 46 13.01        Foundation Drainage

**1.2        References**

- .1        American Society for Testing and Materials International (ASTM)
  - .1        ASTM C 117, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
  - .2        ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3        ASTM D 422-63, Standard Test Method for Particle-Size Analysis of Soils.
  - .4        ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5        ASTM D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>)(2,700 kN-m/m<sup>3</sup>).
  - .6        ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
  - .2        CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .3        Canadian Standards Association (CSA International)
  - .1        CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
  - .1        CSA-A3001, Cementitious Materials for Use in Concrete.
  - .2        CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .4        U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1        EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.3        Definitions**

- .1        Excavation classes: one class of excavation will be recognized; common excavation.
  - .1        Rock : solid material in excess of 1.00m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment with 1.0m<sup>3</sup> 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.
- .2        Topsoil:
  - .1        Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
  - .2        Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other

litter, and free from cobbles, stumps, roots, and other objectionable material.

- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .6 Unsuitable materials:
  - .1 Weak, chemically unstable, and compressible materials.
  - .2 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.1.
    - .2 Coarse grained soils containing more than 10 % by mass passing 0.075 mm sieve.
- .7 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

#### **1.4 Quality Assurance**

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of BC, Canada.
- .3 Keep design and supporting data on site.
- .4 Engage services of qualified professional Engineer who is registered or licensed in Yukon, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .5 Health and Safety Requirements:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

#### **1.5 Waste Management And Disposal**

- .1 Divert excess materials from landfill to local facility for reuse as directed by Departmental Representative.

#### **1.6 Existing Conditions**

- .1 Buried services:
  - .1 Before commencing work establish location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
  - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

- .5 Prior to beginning excavation Work, notify applicable Departmental Representative, establish location and state of use of buried utilities and structures.
- .6 Confirm locations of buried utilities by careful soil hydrovac methods or as otherwise approved by the departmental representative
- .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
- .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing/re-routing.
- .9 Record location of maintained, re-routed and abandoned underground lines.
- .10 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
  - .1 Conduct, with Departmental Representative, 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 as directed by Departmental Representative.
  - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

**PART 2 PRODUCTS**

**2.1 Materials**

- .1 Type 1 fill shall be as follows:
  - .1 Well graded sand and/or gravel.
  - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.

Sieve Designation (mm)	Percent passing
25	100
19	80 to 100
9.5	50 to 85
4.75	35 to 70
2.36	25 to 50
1.18	15 to 35
0.300	10 to 30
0.075	0 to 5

- .2 Type 2 fill: 5 mm minus bedding sand with maximum 5% passing the 75 µm sieve.
- .3 Type 3 fill: Clear crush 19mm minus gravel
- .4 Type 4 fill : Clear crush 150mm minus broken rock

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**PART 3 EXECUTION**

**3.1 Temporary Erosion And Sedimentation Control**

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

**3.2 Site Preparation**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

**3.3 Preparation/Protection**

- .1 Protect existing features.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

**3.4 Stripping Of Topsoil**

- .1 Begin topsoil stripping of areas as directed by the Departmental Representative after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as directed by Departmental Representative.
  - .1 Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Departmental Representative.
  - .1 Stockpile height not to exceed 2 m and should be protected from erosion.
- .4 Dispose of unused topsoil off site.

**3.5 Stockpiling**

- .1 Stockpile fill materials in areas designated by Departmental Representative.
  - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

**3.6 Cofferdams, Shoring, Bracing And Underpinning**

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 33 - Health and Safety Requirements.
- .2 During backfill operation:
  - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
  - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500mm above toe of sheeting.

### **3.7 Dewatering And Heave Prevention**

- .1 Riprap and headwall installation are to be done at low tides and in dry conditions.
- .2 Keep excavations free of water while Work is in progress.
- .3 Provide for Departmental Representative's review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .4 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .5 Protect open excavations against flooding and damage due to surface run-off.
- .6 Dispose of water in a manner not detrimental to public and private property, or portion of Work completed or under construction.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .7 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

### **3.8 Excavation**

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Remove concrete, masonry, paving, walks demolished foundations and rubble and other obstructions encountered during excavation.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .5 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .6 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site.
- .9 Do not obstruct flow of surface drainage or natural watercourses.

- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .12 Correct unauthorized over-excavation as follows or as otherwise directed by the departmental representative:
  - .1 Fill under bearing surfaces and footings with Type 1 fill compacted to not less than 100% of corrected Standard Proctor maximum dry density.
  - .2 Fill under other areas with Type 1 fill compacted to not less than 97% of corrected Standard Proctor maximum dry density.
- .13 Hand trim, make firm and remove loose material and debris from excavations.
  - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
  - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.

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### **3.9 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.

### **3.10 Backfilling**

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Departmental Representative has inspected and approved installations.
  - .2 Departmental Representative has inspected and approved of construction below finish grade.
  - .3 Inspection, testing, approval, and recording location of underground utilities.
  - .4 Removal of concrete formwork.
  - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground or as directed by the departmental representative.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 200mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations:
  - .1 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .2 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 0.30 m.
- .7 Backfill within crawl space to consist of the following:

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- .1 Levelling course beneath insulation is to consist of Type 2 bedding sand compacted to 95% Standard Proctor Maximum Dry Density and trimmed to grade..
  - .2 Backfill above the insulation is to consist of 50 mm of Type 2 sand followed by a 100mm thickness of Type 3 fill compacted with hand held vibratory equipment.
  - .8 Backfill of the perimeter interceptor drain is to consist of the following:
    - .1 The 150mm diameter perforated PVC drain pipe should be covered in 300mm of Type 3 material all wrapped in non woven geotextile – Nilex 4553 or equal with seams lapped 500 mm min..
    - .2 The overlying fill should consist of Type 4 fill – 150mm minus clean broken rock placed up to the surface grade.
    - .3 The drain backfill should be in contact with the layer of Type 4 fill placed on the crawl space floor so that there is a hydraulic connection between the crawl space interior and the perimeter drain.
  - .9 Exterior skirting backfill shall consist of Type 1 backfill compacted to 97% Standard Proctor Maximum Dry Density and sloped to shed water away from the building 3% crossfall minimum.

### **3.11 Restoration**

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as directed by Departmental Representative.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by Work as directed by Departmental Representative.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

**1 General**

**1.1 Purpose of Document**

This specification covers all labour, material, equipment and services required for the supply and installation of drilled and grouted steel pipe piles.

**1.2 Related Documents**

- Canadian Foundation Engineering Manual 4<sup>th</sup> Edition – Canadian Geotechnical Society
- Geotechnical Report for the project (Latest Edition)

**1.3 Codes, Standards and Publications**

Minimum requirements for all work under this specification shall be in accordance with the latest editions and amendments to the following references and codes, at the time the contract is awarded. All mandatory federal, provincial and local codes are to be complied with. Where conflict exists between codes or between this and another specification, a written ruling from the Departmental Representative shall be obtained. Where government or regulatory requirements conflict with this specification, the more rigorous shall govern.

**1.3.1 ASTM – American Society for Testing and Materials**

Document Title	Document No.
Standard Specification for Welded and Seamless Steel Pipe Piles	ASTM A252

**1.3.2 CSA – Canadian Standards Association**

Document Title	Document No.
General Requirements for Rolled or Welded Structural Quality Steel	CSA G40.20
Structural Quality Steel	CSA G40.21
Design of Steel Structures	CSA S16
Certification of Companies for Fusion Welding of Steel	CSA W47.1
Filler Metals and Allied Materials for Metal Arc Welding	CSA W48
Welded Steel Construction (Metal-Arc Welding)	CSA W59
Certification of Welding Inspection Organizations	CSA W178.1
Certification of Welding Inspectors	CSA W178.2
Welding of Reinforcing Bars in Reinforced Concrete Construction	CSA W186

**1.3.3 CISC – Canadian Institute of Steel Construction**

Document Title	Document No.

Document Title	Document No.
Handbook of Steel Construction	CISC
Code of Standard Practice for Structural Steel	CISC

**1.3.4 Building Codes and Regulations**

Document Title	Document No.
National Building Code of Canada 2010	NBCC
Yukon Occupational Health and Safety Act	OHSA
Workers' Compensation Board Regulations(or Applicable Provincial document)	WCB

**1.4 Language and Measurement System**

Not applicable.

**1.5 Operating Environment**

Not applicable.

**1.6 Product Data and Submittals**

1. The Construction Contractor shall submit documentation for the methods of quality control/quality assurance (QC/QA) used; i.e., checklists, inspection forms, data records and mill test reports.
2. The Construction Contractor shall submit detailed technical information on all pile installation equipment, installation procedures, sequences, and methods of operation at least 15 working days prior to the start of piling operations.
3. The Construction Contractor shall submit the welder's certificate of conformance with CSA W47.1, prior to the start of piling operations.

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4. The Departmental Representative shall prepare a record for each pile installed. These records shall include, as applicable:
    - a. pile number
    - b. date, time, weather conditions and ambient temperature
    - c. location (coordinates) of the pile
    - d. a log of soil/rock and groundwater conditions encountered during drilling
    - e. a record of pile depth and base condition
    - f. details regarding the equipment used such as drilling rig, drilling method and bit type and diameter
    - g. installation time
    - h. pile size
    - i. location of splices
    - j. pile cut-off elevation
    - k. ground elevation
    - l. pile tip elevation
    - m. total pile length after pile cut-off
    - n. any abnormalities or comments.
    - o. sequence of pile installation for piles in groups
    - p. continuous drilling interruptions (includes start time, stop time, tip elevation, and reason for interruption)
    - q. description of pile damage and reason for damage
    - r. affect of pile installation on adjacent piles, volume of cast-in-place concrete or grout when placed in pipe piles
  5. Records for each pile installed in a day shall be submitted to the Departmental representative within 3 days after finishing installation.
  6. Proposals for repairs or changes due to improper placement of piles or due to structural damage shall be submitted to the Departmental Representative for approval in writing.
  7. Proposals to use materials other than those specified shall be submitted in writing for approval by the Departmental Representative. Proposal information shall include complete details of materials, welding procedures, inspection methods, and acceptance criteria.
  8. Pile tolerances shall be measured by the Construction Contractor and submitted to the Departmental Representative within 5 working days after completing a group/area of piling.
  9. Departmental Representative's written approval is required for detailed drawings and welding procedures for splices, attached piling heads, and shear rings. Thirty days before the start of piling operations the Construction Contractor shall submit the drawings and welding procedures to the Departmental Representative for approval.
  10. The Construction Contractor shall submit a record of field welding of pile splices and welding inspection reports or non-destructive examination (NDE) testing, which shall be prepared by, or under the direct supervision of a Canadian Welding Bureau (CWB) certified welding inspector.

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**1.7 Quality Assurance**

**1.7.1 Inspection**

1. Prior to the start of piling operations, the Departmental Representative shall have the right to inspect all equipment to verify adequacy for installation requirements, and to inspect all piles prior to driving and reject any piles which are damaged, out of dimensional tolerance, or have other manufacturing or material defects.
2. The Construction Contractor shall provide the Departmental Representative with the following:
  - a. full access to the site
  - b. reasonable time to perform the required inspections
  - c. marks on the piles at the requested intervals to facilitate the recording of field conditions vs depth.
3. The presence of the Departmental Representative or an independent testing agency retained by the Owner shall in no way relieve the Construction Contractor of any obligation to perform the pile installations in accordance with this specification.

**1.7.2 Weld Testing**

1. All welds for splices shall be visually inspected in accordance with CSA W59, Welded Steel Construction (Metal-Arc Welding).
2. Inspection personnel shall be certified by the CWB, in accordance with CSA W178.2, Certification of Welding Inspectors, Level II or Level III.
3. The extent of NDE on welds shall be 10% of all splices initially. The frequency may be reduced if the construction contractor consistently demonstrates compliant welds. Any changes in testing frequency shall be approved in writing by the Departmental Representative. NDT methods shall be either ultrasonic or radiographic.

**1.7.3 Static Axial Compressive Load Test**

1. The compressive load tests shall be conducted in accordance with ASTM D1143.
2. The maximum test load shall be at least 200% of the design compressive load.
3. The maximum load application shall be held and monitored for a period of 2 hours.
4. The test and reaction piles shall not be used as production piles.

**1.7.4 Lateral Load Test**

1. The lateral load tests shall be conducted in accordance with ASTM D3966.
2. The maximum test load shall be limited to that load which produces 12 mm of lateral deflection for safety and load stability reasons.
3. The test and reaction piles shall not be used as production piles.

**1.8 Delivery, Storage and Handling**

1. Pipe piles shall be delivered and stored horizontally on timber sills.
2. Timber separators shall be used to avoid metal-to-metal contact of the piles.
3. Sufficient timber sills and separators shall be provided to keep the deflection of stored piles within

tolerable limits.

## **2 Products**

### **2.1 General**

1. All materials shall be new and free from defects that may impair strength and durability.
2. Steel pipe piles shall be in accordance with ASTM A252, Grade 3, with specified minimum yield strength of 310 MPa, except as required by Item 4 below. Alternate steel pipe piles may be used only if approved in writing by the Departmental Representative.
3. Steel piles in low temperature service shall meet steel requirements outlined in Section 1.5.
4. Splices shall be complete penetration welds.
5. Concrete/grout fill for pipe piles shall conform to project Section 03 33 00 – Cast-in-Place Concrete, Concrete Supply. Sika Arctic 100 cement or other cementitious material approved by the Departmental Representative shall be used in the pipe pile fill.
6. Deviation from straightness of fabricated steel pipe piles shall not exceed  $L/1000$ , where L is the pile's length.
7. Pipe piles shall have a minimum D/T (Diameter/thickness) ratio less than or equal to 30.
8. Pile holes shall be cased as necessary to maintain an open hole for installation of the steel piles.

### **2.2 Welding Materials**

1. All welding shall conform to CSA W59, Welded Steel Construction (Metal-Arc Welding). Welders must be qualified under the provisions of CSA W47.1.
2. Welding electrodes shall be compatible with the welding process and base materials being used. The electrodes shall comply with CSA Standard W48, Filler Metals and Allied Materials for Metal Arc Welding.
3. Welding electrodes for joining steel elements to be used in low temperature service (as defined in Section 05 12 23 - Structural Steel for Buildings) shall have notch toughness properties exceeding that of the steel elements being connected.

### **2.3 Coatings**

1. Steel piles shall not be coated, unless noted otherwise on the drawings.

### **2.4 Steel Piles in Low Temperature Service**

Steel piles subjected to unfactored tensile stress in excess of 70 MPa (10 ksi), which are supporting primary structural steel members and exposed to temperatures less than or equal to  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ), shall conform to the material specifications in Table 2-1 and to CSA G40.21, Structural Quality Steel. The limit of 70 MPa (10 ksi) applies only to tensile stresses due to load combinations of unfactored loads, excluding wind, seismic, lifting and transport loads, which are considered transient loads. Primary structural steel members are main load-carrying members such as columns, girders, beams that support equipments and bracing required for stability.

**Table 2-1: Low Temperature Steel Requirements**

Structural Load Category	Material Section Thickness		
	$t < 13\text{mm}$	$13\text{mm} \leq t \leq 20\text{mm}$	$t > 20\text{mm}$

Impact[1], Fatigue[2], or Fracture Critical[3]	Type W	Type WT Cat 4	Type WT Cat 4
All Other Steel	Type W	Type W	Type WT Cat 4
<p>1. Impact loading is such that the time to peak load is on the order of 0.1 s. Wind, seismic, transport, lifting and bridge crane loads are not impact loads. A fatigue analysis may be required for weldments if the stress ranges exceed the endurance limits listed in CSA S16, Clause 26. Bridge crane loading shall not be considered fatigue due to the low frequency of crane use.</p> <p>2. Fracture critical members or connections are those for which local failure would cause complete structural collapse with serious consequences to life. Any members identified as fracture critical must be approved in writing by the Owner prior to specifying Type WT steel.</p>			

1. Steel piles that require improved notch toughness properties shall meet the following minimum grades:
  - H-piles                      Grade 350 WT
  - pipe piles                      Grade 300 WT or Grade 350 WT
  - a. Steel plates and hot-rolled sections conforming to Type WT Category 4 may be substituted with ASTM A572/A572M steel plates and ASTM A992/A992M hot rolled sections, both of Grade 50 and with charpy impact of 27J at -45°C
  - b. In cases when hot rolled steel sections or pipes with the required toughness category are not available, the Contractor may fabricate equivalent welded steel sections or pipes using steel plate with the required toughness category
2. Steel piles that require notch-tough steel (Type WT) shall be clearly identified on the design and erection drawings.
3. The upper 1.5m of the pile (assuming a 1.2m thick active layer within the building) should be coated with arctic heavy grease and wrapped with polyethylene sheets also coated with arctic heavy grease (or equivalent) to reduce the potential for pile uplift forces

### **3 Execution**

#### **3.1 General**

1. Pile size and type shall be indicated on the drawing.
2. The drilled hole diameter should be at least 50mm greater than the pile diameter, at least large enough to allow a tremie pipe to access the annulus between the pipe and the hole.
3. The piling contractor shall temporarily case the drilled hole as required to maintain an open hole for pile installation.
4. Piles shall be drilled to the tip elevation shown on the construction drawings. Piles shall be installed under the supervision of the Departmental Representative.
5. After the pile base has been checked by the departmental representative and deemed to be suitable and free of slough, water and other deleterious materials, the pile should be installed as follows:

The pile shall be lowered onto the hole with redundant tremie pipes affixed to the perimeter.

The pipe pile should then be placed, pushed and vibrated inside the hole so that the base of the pile is resting on the bottom of the hole.

Reinforcing steel should be installed inside the pipe down to the full depth of the pile or as specified by the structural engineer.

The pile interior should be concreted up to the desired elevation.

The pile exterior should be grouted up to the desired elevation and casing, if used, should be retrieved.

6. Field monitoring of the freeze back rate should be performed in at least two piles using thermistor cables. The thermistor string should be installed, with thermistors at one metre spacings along the length of the pile exterior. Following installation, thermistors should be read once per week for a period of at least 10 weeks. Readings should be reported to the Departmental Representative.
7. Difficult drilling in the frozen sand and gravel containing cobbles/boulders should be expected. The piling rig should have sufficient capability to remove the obstructions and advance through dense/hard material.
8. the Piles shall not be installed closer than 6 m from concrete that has been in place less than 3 days.
9. Sufficient pile length shall be provided above the cut-off elevation so that any portion of the pile damaged during driving may be cut off.
10. Disposal of cut-off piles, drilled material and other waste shall be in compliance with the Federal, Provincial and Local regulations and as directed by the Departmental Representative.
11. Steel piles shall not be installed within 1 m of an existing underground utility without pre-exposing the utility to confirm its location and alignment. Steel piles shall not be installed within 0.5 m of an existing exposed underground utility unless the pile location is excavated to and the pile driving starts at or below the underside of the utility.

12. The number of splices shall be kept to a practical minimum. The number and location of splices are subject to review by the Departmental Representative.
13. The Construction Contractor shall ensure that the ground conditions at the piling site are adequate to support the equipment.
14. When piles are installed in groups, they shall be installed from the centre outwards and, in some cases, it may be necessary to leave some time between the drilling of piles in order to gain greater penetration as the soil is densified.
15. The Construction Contractor shall obtain an excavation permit from the Owner before commencing the work. This permit is a clearance that no underground services are interfering with the installation of the piles.
16. The Departmental Representative shall determine if voids around the piles require filling.
17. The Construction Contractor shall place and maintain all safety devices (e.g., barricades, lights, and warning signs) necessary to protect persons, property, equipment, and vehicles of the Departmental Representative and others.
18. The Construction Contractor shall comply with all the safety regulations as specified by the Federal, Territorial and Local regulatory bodies.
19. For the duration of the work, the Contractor shall ensure that the project survey monuments are protected from disturbance or damage due to piling activities.

### **3.2 Installation Tolerances**

1. The tolerance for drilled piles shall meet the following criteria:
  - a. pile tops, at cut-off elevation, are within a horizontal dimension of 75 mm of the location specified by design drawings
  - b. piles are within 2% of the specified slope
2. Piles shall be cut off square, true and level. After installation the Construction Contractor responsible for piling shall rough cut the top of pile to 150 mm above the elevations shown on the drawings (with a tolerance of 25 mm). The final cut shall be made by the Construction Contractor responsible for steel erection or the Construction Contractor responsible for construction of concrete pile caps or other overlying elements.
3. Heave and displacement of each pile shall be recorded after all piles in a group have been installed. Piles that heave more than 6 mm shall be re-installed to their original elevation.
4. Piles that do not meet the requirements of this specification, including those piles that are damaged, broken, misplaced, improperly driven or out of alignment shall be corrected by the Construction Contractor, as directed by the Departmental Representative. This may include extracting the rejected piles and driving new piles or additional piles. All corrective work shall be at the Construction Contractor's expense.

### **3.3 Pile Installation Equipment**

1. The Construction Contractor shall furnish all necessary equipment to install the piles. All equipment shall be in first class working condition to eliminate avoidable delays in the work.
2. Cranes: The cranes or other lifting equipment shall be of sufficient size and with sufficient boom length to raise, set, and install the maximum length of pile section.
3. Auxiliary Equipment: The Construction Contractor shall be responsible for supply and adequate performance of any auxiliary equipment used in conjunction with the pile installation (e.g., augers

and compressors) so that work will not be delayed.

**3.4 Splicing**

1. Splices shall be made using a continuous full penetration weld to develop the full strength of the steel member. The use of field splice details different from that indicated on the contract drawings shall require written approval from the Departmental Representative.

**4 Definitions and Acronyms**

<b>Topic</b>	<b>Description</b>
Construction Contractor	Party that performs the work or services for construction, fabrication and installation of equipment and materials at the site or other designated location
Manufacturer	Party responsible for manufacturing or fabricating the materials, equipment, various system components and related accessories
Departmental Representative	Engineer or other employee acting on behalf of the owner
Supplier	Party supplying the equipment or materials

<b>Topic</b>	<b>Description</b>
CWB	Canadian Welding Bureau
NDE	non-destructive examination
PDA	pile driving analyzer
QA	quality assurance
QC	quality control

**END OF SECTION**



1. WORK INCLUDED

.1 The unit prices submitted in the Form of Tender shall include the entire cost of supplying all labour, material, equipment and applicable taxes required to install micro-piles where called for on the drawings and outlined in this specification. The work to be performed under this section shall consist of drilling, furnishing, grouting, and testing of piles at locations shown on the plans, or as directed by the Departmental Representative, and in conformity with this specification.

2. DEFINITIONS

.1 Pile Length: Refers to the portion of the pile that transmits the load to the surrounding ground.

.2 Alignment Load (AL):  $AL = 10\%$  of design load ( $P_d$ )

.3 Design Load ( $P_d$ ): Refers to the anticipated final maximum load in the pile as shown on the drawings. It is also referred to as the working load.

.4 Maximum Test Load ( $P_t$ ):  $P_t = 1.5P_d$ . Note: Test load factor can vary from  $1.1P_d$  to  $2.0P_d$ , depending on the application. A factor of 1.50 is used herein.

.5 Proof Test: Refers to the incremental loading of a pile by recording the incremental movement of the pile at each specified load stage.

.6 Creep Test: Refers to a test used to determine the movement of the pile at constant load over a specific period of time.

3. GENERAL

.1 Performance

Perform all work and supply materials as specified herein and in accordance with the Contract documents.

.2 Soil Report

A copy of the soil report is attached in Appendix A.

.3 Responsibility of the Contractor

Firms undertaking to bid this work shall have a minimum of five years experience in projects of this magnitude and shall have equipment and manpower suitable and available for the entire duration of the project. The Contractor shall submit a reference list of work performed of equal magnitude and scope.

.4 Inspection and Testing

The Departmental Representative will retain an independent testing agency for the testing of cement grout and the inspection of the work. The contractor shall submit to the Departmental Representative the mill test certificate of the steel used to fabricate the micro-piles.

.5 Shop Drawings

Submit shop drawings for approval to the Departmental Representative a minimum of 4 weeks prior to commencement of work.

Shop drawings shall include the following information:

- Pile layout
- Pile component details, pile length and borehole diameter
- Pile design capacity

- Grade and properties of the pile material
- Percent of pile yield load at working procedure
- Grout: cement type, strength, additives, mix design
- Proposed drilling method
- Sequence of drilling and installation

.6 Acceptability

Failure of any pile to meet the performance test criteria will result in rejection of the pile in question. The criteria for performance acceptance are outlined in paragraph 9.

.7 Jobsite Conditions

The length of piles has been determined based on available geological data.

If during construction, the site conditions are found to be significantly different from those anticipated, the length and/or the spacing of piles may be changed as directed by the Departmental Representative.

.8 Basis of Payment

The price shall include all costs for mob and demobilization, supply, drilling, installation, grouting and testing of successfully completed anchors as measured by the Departmental Representative.

4. PRODUCTS

.1 General Description

The DYWIDAG micro-pile is a pressure grouted compression and tension pile of small diameter (micro-pile). The load-bearing component is a DYWIDAG Threadbar. The grout cylinder encases the Threadbar, which is kept in the center of the borehole by centralizers.

The cement grout protects the steel against corrosion, and stabilizes the pile within the soil against buckling. The load is transferred to the ground by skin friction between the grout body and the soil.

.2 DYWIDAG Threadbar

The micro-piles shall consist of a 32 mm diameter (#10) DYWIDAG Threadbar manufactured in accordance with ASTM A615 or CSA G30.18M.

Grade Steel: 517/690 MPa  
Steel Area:  $A_s = 819 \text{ mm}^2$   
Yield capacity:  $P_y = 424 \text{ KN}$

.3 Corrosion Protection

The Threadbar shall be shop grouted inside a corrugated PVC sheathing for the entire length. Corrugated sheathing shall be made of PVC material with a minimum compressive strength of 103 MPa (14,500 psi) and a minimum tensile strength of 48 MPa (7,000 psi). PVC material shall be free of water-soluble chlorides and other ingredients that might enhance corrosion, hydrogen embrittlement or stress corrosion on the steel tendon. The ultimate bond stress between the PVC sheathing and the cement grout shall be a minimum of 4.8 MPa (700psi) based on the minimum

compressive grout strength of 28 MPa. The cement grout for the pile shall be non-shrink Portland Cement grout with a minimum 28 day compressive strength of 30 MPa.

.4 Anchorage Nuts and Couplers

Anchor nuts and couplers shall be compatible with the DYWIDAG micro-pile system, and shall develop at least 100% of the ultimate tensile strength of the DYWIDAG Threadbar in tension and compression.

5. MICRO-PILE FABRICATION

- .1 Micro-piles shall be shop-fabricated in accordance with approved shop drawings, using personnel trained and qualified in this type of work.
- .2 The prefabricated pile assemblies shall be protected against physical damage and corrosion at all times prior to installation. Any pile or pile component (including the protective sheathing) that is damaged during the work shall be replaced at the expense of the Contractor.

6. DRILLING

- .1 Casing is required for drilling of the piles to the minimum borehole diameter as indicated on the contract drawings. Where installation is required beneath the existing building, and/or where overhead space is restricted, threaded casing will be required.
- .2 Pile holes shall be drilled within plus or minus 1% of the theoretical centerline and shall be located within plus or minus 50 mm from the location as shown on the contract drawings.
- .3 Pile holes shall be thoroughly cleaned prior to the installation of piles.
- .4 The Contractor shall keep a record of all drilling procedures and drilling time, which shall be made available to the Departmental Representative.

7. INSTALLATION

- .1 The installation of the micro-piles shall be supervised by a Professional Engineer or by their representative.
- .2 Steel or plastic centralizers shall be provided to ensure that the micro-pile assembly is centrally located in the hole, providing a minimum grout cover of 15.0 mm.
- .3 The Contractor shall maintain a record showing the pile number, cement grout quantity and installation date for each micro-pile.

8. GROUTING

- .1 The pile grout shall be Portland Cement grout with a minimum design compressive strength of 35 MPa at 28 days. Grout should consist of Sika 100 Arctic grout or equivalent approved by the

- 
- Departmental Representative. The mixing water shall be free of any deleterious material. No detrimental quickset additives such as calcium chloride are permitted.
- .2 Mix-design for grout to be designed by the Contractor, meeting the requirements specified herein.
  - .3 Use equipment capable of continuous mechanical mixing and pumping to produce a grout free of lumps and undispersed cement.
  - .4 The grout shall be pumped into the cased hole through a grout tube attached near the bottom of the Dywidag bar, until neat grout exits from the top of the drill casing.
  - .5 The grout shall always be injected at the lowest point of the pile.
  - .7 Grout shall be injected while extracting the casing and grout tube simultaneously. A minimum injection pressure of 150 psi (1.0 MPa) shall be maintained during the grouting operation.
  - .8 The Departmental Representative may request the use of a multi-stage post grouting system capable of developing grouting pressure of up to 900 psi (6.2 MPa) for piles in soft, cohesive ground.
    - Post-grouting shall be performed in accordance with the manufacturer's recommendations.
  - .9 After each grouting operation, the piles shall remain in an undisturbed condition until adequate grout strength has been achieved.

#### 9. PERFORMANCE TEST

- .1 All performance testing equipment must be used in accordance with the specifications of the manufacturer and must at all times be maintained in good condition.

The contractor shall provide all necessary devices and instruments for testing of the piles, meeting standard pile testing procedures.
- .2 Proof testing shall not be carried out until the grout has reached its specified strength.
- .3 All performance test data shall be recorded and made available to the Departmental Representative upon request.
- .4 Load versus displacement data for each test shall be plotted on a load extension graph.
- .5 Pile displacements under constant creep test load shall be plotted as displacement in millimetres versus the log of time in minutes.

.6 Performance testing for the micro-piles shall be conducted as follows:

1. The Departmental Representative may select that all or a certain number of piles be performance tested and creep tested. Cost for testing shall be borne by the Contractor. Allow costs for 6 piles at the locations selected by the Departmental Representative.

2. All selected piles shall be proof tested to 150% of design load.

3. An alignment load (AL), equivalent to 10% of the design load shall be applied to remove the slack from the pile and to engage the equipment. At this time, the dial gauge for elongation measurement shall be set to zero. The pile shall then be loaded by a hydraulic jack in a single operation to  $0.5P_d$  and maintained at that load for 30 minutes for creep measurement. The creep measurement shall be recorded at 1, 3, 5, 10, 15, 20, and 30 minutes. The pile shall then be unloaded to AL and the residual displacement recorded.

4. Repeat the test at  $1.0P_d$  and  $1.5P_d$ . Hold load at  $1.0P_d$  for 30 minutes for creep measurement. Unload the pile to AL and record the residual displacement. Acceptance criteria are met when the slope of the free displacement versus log time plot is less than 1.5 mm per log cycle and the test load levels of  $1.5P_d$ .

5. Reference Resting procedures can be modified to suit job requirements:

- a) Long term tests (24 hours)
- b) Short term tests (30 minutes)

#### 10. Thermistor Installation

One micropile shall be installed with a thermistor string with individual thermistor beads spaced 1.5 m apart. The string shall be attached to the exterior of the centralizers during installation so that the thermistor beads are close to the grout/soil interface of the micropile. The thermistor installation should be monitored on a daily basis to measure the temperature of the pile exterior during construction or as otherwise directed by the Departmental Representative.

**END OF SECTION**

**Part 1            General**

**1.1                SECTION INCLUDES**

- .1            Drainage mat for retaining wall.

**1.2                RELATED SECTIONS**

- .1            Section : 06 10 11 Rough Carpentry.

**1.3                SUBMITTALS**

- .1            Section 01 33 00: Submission procedures.
- .2            Shop Drawings: Indicate dimensions and composition of drainage mat .
- .3            Product Data: Provide manufacturers installation instructions.

**Part 2            Products**

**2.1                DRAINAGE MAT**

- .1            Purpose made, three dimensional, multilayer drainage mat, consisting of a core of fused entangled filaments with non - woven geotextile fabrics attached to either side. Mat is to be designed to relieve hydrostatic pressure from soils abutting below grade structures.

**2.2                ACCESSORIES**

- .1            Fasteners as recommended by manufacturer.

**Part 3            Execution**

**3.1                EXAMINATION**

- .1            Verify existing conditions before starting work.
- .2            Verify that retaining wall and rigid insulation are installed and prepared to receive drainage mat

**3.2                INSTALLATION**

- .1            Fasten drainage mat to exterior of rigid insulation applied to the plywood retaining wall.
- .2            Use fasteners as recommended by the manufacturer.
- .3            Use drainage mat in lengths as long as possible to minimize joints in the fabrics

**3.3                FIELD QUALITY CONTROL**

- .1            Provide photos of the installed mat for Departmental Representative's approval prior to backfilling.

**3.4 PROTECTION OF FINISHED WORK**

- .1 Protect drainage mat cover from damage or displacement until backfilling operation begins.

**END OF SECTION**

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**Part 1      General**

**1.1      RELATED REQUIREMENTS**

- .1      Section 01 74 19 – Waste Management and Disposal
- .2      Section 20 05 01 – General Mechanical
- .3      Section 31 23 10 – Excavating, Trenching and Backfilling

**1.2      REFERENCES**

- .1      ASTM International
  - .1      ASTM D698-07e1, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - .2      ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
- .2      CSA International
  - .1      CSA B1800-11, Thermoplastic Non-Pressure Pipe Compendium (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8, B182.11 and B182.13).
    - .1      CSA B182.2 PSM Type PVC Sewer Pipe and Fittings
    - .2      CSA B182.4 Profile PVC Sewer Pipe and Fittings

**1.3      ACTION AND INFORMATIONAL SUBMITTALS**

- .1      Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Product Data:
  - .1      Submit manufacturer's instructions, printed product literature and data sheets for pipes, pipe fittings, tiles, and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2      Submit manufacturer's certification that drain pipe materials meet requirements of this Section.
  - .3      Certification to be marked on pipe.
  - .4      Submit manufacturer's certification that geotextile materials meet requirements of this Section.

**1.4      DELIVERY, STORAGE AND HANDLING**

- .1      Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2      Storage and Handling Requirements:
  - .1      Store materials in accordance with manufacturer's recommendations.

- .2 Geotextiles to be protected against excessive UV exposure and contamination from deleterious materials.
- .3 Store and protect pipes, fittings and tiles from damage.
- .4 Replace defective or damaged materials with new.

**1.5 SITE CONDITIONS**

- .1 Examine foundation plans and Geotechnical Report (by Amec Foster Wheeler, dated Feb 18, 2015).

**Part 2 Products**

**2.1 MATERIALS**

- .1 Perforated plastic pipe and fittings: to CSA-B1800. Diameter as indicated on plans, otherwise minimum 150mm nominal diameter.

**2.2 BEDDING AND SURROUND MATERIALS**

- .1 Drain rock: clean crushed stone or coarse clean gravel with not more than 10% of fine material that will pass through a 0.15" (5mm) sieve.
- .2 Geotextile filter fabric: non-woven geotextile shall be used to fully envelope the drain rock surrounding the drain tile. Lap all joints 450 mm min, tightly seal any penetrations.
  - .1 To meet the following physical property requirement (Nilex Nonwoven 4553 or equivalent):
    - .1 Minimum average roll value (MARV): the average value minus two standard deviations of a given property established by the manufacturer during production. The average roll value for a given property must meet or exceed this value.

.2 Table

<i>Test</i>	<i>Test Method</i>	<i>Acceptance Requirement</i>
Tensile strength, MARV, minimum	CAN/CGSB 148.1, Method 7.3	330 N
Elongation at break, typical	CAN/CGSB 148.1, Method 7.3	>50%
Tear strength, MARV, minimum	CAN/CGSB 4.2, Method 12.2	180 N
Puncture strength, MARV, minimum	ASTM D 6241	990 N
Permittivity, minimum	CAN/CGSB 148.1, Method 4	1 /s
Filtration opening size, typical	CAN/CGSB 148.1, Method 10	0.180 mm
UV stability, minimum	ASTM D 4355	50% tensile strength retained at 500 hours

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**2.3 BACKFILL MATERIAL**

- .1 Backfill as indicated in Section 31 23 10 Excavating, Trenching and Backfilling, using foundation backfill material.
- .2 Excavated or graded material existing on site may be suitable to use if approved by Departmental Representative.

**Part 3 Execution**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for drainage materials installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant .
- .2 Make sure graded base conforms with required drainage pattern before placing bedding material.
- .3 Make sure improper slopes, unstable areas, areas requiring additional compaction or other unsatisfactory conditions are corrected to approval of Departmental Representative.
- .4 Make sure foundation wall and dampproofing have been installed and approved by Departmental Representative before placing bedding material.

**3.2 BEDDING PREPARATION**

- .1 Cut trenches in sub-base and place bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .2 Shape bed true to grade and to provide continuous, uniform bearing surface for tubing.
- .3 Shape transverse depressions, as required, to suit joints.
- .4 Compact each layer full width of bed to at least 95% of corrected maximum dry density.
- .5 Fill excavation below design elevation of bottom of specified bedding with common backfill.
- .6 Place geotextile filter material to fully envelope the drain rock surrounding the drain tile. Lap all joints 450mm minimum, tightly seal any penetrations.

**3.3 PIPE OR TUBING INSTALLATION**

- .1 Make sure pipe interior and coupling surfaces are clean before laying.
- .2 Lay pipe drains on prepared bed, true to line and grade with inverts smooth and free of sags or high points.
  - .1 Ensure barrel of each pipe is in contact with bed throughout full length.

- .3 Begin laying at outlet and proceed in upstream direction.
  - .1 Lay bell and spigot pipe with bell ends facing upstream.
- .4 Make joints tight in accordance with manufacturer's instruction.
- .5 Make watertight connections to existing drains, new or existing manholes and catchbasins, or sumps where indicated, or as directed by Departmental Representative.
  - .1 Connect using appropriate adapters manufactured for this purpose.
  - .2 Provide cleanouts where directed.
- .6 Install end plugs at ends of collector drains to protect pipe ends from damage and ingress of foreign material.
- .7 Top of weeping tile to be below the level of the floor slab or crawlspace ground cover.
- .8 Wrap with geotextile filter as indicated.
- .9 Protect sub-drains against flotation during installation.

### **3.4 PIPE OR TUBING SURROUND MATERIAL**

- .1 Upon completion of pipe laying and after Departmental Representative has inspected and approved Work in place, surround and cover pipe as indicated.
  - .1 Minimum 150mm of surround and cover drain rock to be provided, as specified above
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness, as indicated.
- .3 Place layers uniformly and simultaneously on each side of tubing.
- .4 Compact each layer from pipe invert to mid-height of pipe to at least 95% maximum density to ASTM D698.
- .5 Compact each layer from mid-height of tubing to underside of backfill to nominally compact drain rock.

### **3.5 BACKFILL MATERIAL**

- .1 Place backfill material above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Under paving and walks, compact backfill to at least 95% corrected maximum dry density. In other areas, compact to at least 90% maximum density to ASTM D698.
- .3 Use appropriate compaction equipment.
  - .1 Conduct hand tamping around confined areas of pipe.
  - .2 Do not use water or other hydraulic means to place or consolidate backfill material.

### **3.6 FOUNDATION**

- .1 Make penetrations through foundation structures only after receipt of written approval from Departmental Representative.

**3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 19 Waste Management and Disposal.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

**END OF SECTION**

## **APPENDIX A**

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**Geotechnical Site Assessment**  
Proposed Renovation of the Palace Grand Theatre  
Dawson City, YT

Submitted to:

**Public Works and Government Services Canada**  
Vancouver, BC

Submitted by:

**Amec Foster Wheeler Environment & Infrastructure,**  
**a division of Amec Foster Wheeler Americas Limited**

Surrey, BC

18 February 2015

Amec Foster Wheeler File: KA21109



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**APPENDED FIGURES**

- Figure 1 – Site Location Plan
- Figure 2 – Borehole Location Plan
- Figure 3 – Marked up 1962 foundation plan

**LIST OF APPENDICES**

APPENDIX A – Borehole Logs

## 1.0 INTRODUCTION

Further to our proposal of September 2, 2014, Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) presents this preliminary geotechnical site assessment report for the proposed renovation of the Palace Grand Theatre in Dawson City, YT. The site location, as shown in Figure 1, is in downtown Dawson City in the valley of the Yukon River.

The theatre was built in 1962 and is modelled on a previous theatre constructed in the time of the Klondike Gold Rush. The three storey theatre is a wood framed building constructed on approximately 250 to 300mm diameter timber piles with an unheated crawl space. Soil-related movement and related distress to the building has been reported over time and accordingly, we have been retained to provide geotechnical input into the building renovation which could include replacement and/or modifications to the existing foundations.

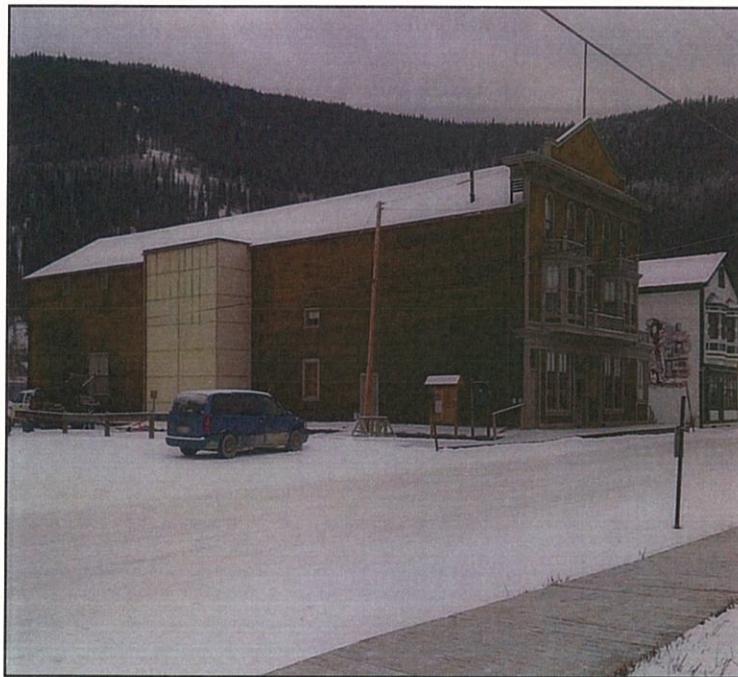


Photo 1: Front/west side of Theatre, viewing northeast

## 2.0 FIELD WORK

Amec Foster Wheeler visited the site on October 7, 2014, to observe the condition of the theatre and nearby infrastructure and plan out the drilling investigation. The subsurface exploration program was conducted by Amec Foster Wheeler on October 28 and November 14, 2014. Due to a breakdown of the ODEX compressor, the drilling ceased on October 28. Drilling was limited to one borehole on November 14 due to the loss of the ODEX hammer in dense cobbles and boulders at a depth of about 13 m in BH14-01. Drilling conditions in the sand and gravel are

difficult and drilled pile installations will require specialty equipment. Drilling difficulties are described in some of the other reports noted in Section 2.1 below.

Prior to drilling, Amec Foster Wheeler contacted various underground utility operators in Dawson City, including the city operations department, local gas, telephone and electric power companies. A total of four boreholes, BH14-01 to BH14-04 were advanced using a truck-mounted auger drill rig equipped with ODEX to a depth of up to 13 m. The attached Figure 2 is a site plan showing borehole locations.

An Amec Foster Wheeler representative located the boreholes, recorded the soil conditions encountered and collected soil samples. The soil samples were submitted to Amec Foster Wheeler's Surrey Civil Engineering Laboratory to confirm field classifications and to determine the moisture content and other soil properties. Borehole logs are presented in Appendix A. Laboratory test results are presented on the borehole logs.

The boreholes were backfilled with cut material immediately after the drilling was completed and sealed at the surface with bentonite pellets.



**Photo 2: Drilling at BH14-01**

## 2.1 Review of Existing Information

The following existing geotechnical information from the vicinity was reviewed as part of our work.

- Palace Grand Theatre, Code Upgrade Assessment  
Number Ten Architecture, March 2014
- Palace Grand Theatre, Structural Assessment  
Stantec, March 2014

- Surficial Geology Map and Summary Report of the Dawson Area, Geological Survey of Canada, NTS 116 B and C
- Geophysical and Borehole Investigations of Permafrost Conditions Associated with Compromised Infrastructure in Dawson and Ross River, Yukon Laxton & Coates, 2010
- Geotechnical Investigation, Fry Recreational Centre, Dawson City, YT Chilkoote Geological Engineers Ltd, 2010
- Discussions of Local Soil Conditions with Parks Canada and City of Dawson Operations Staff
- Original 1962 Structural foundation drawings, S-1 and S-2

### 3.0 SITE CONDITIONS

#### 3.1 Theatre Building

The theatre fronts on King Street to the south, residential properties to the east and north beyond which are Third Avenue and York Street respectively. To the west is a parking lot beyond which is Second Avenue. The theatre is approximately 36 m X 14 m in plan area with an irregularly shaped, one storey utility room attached to the northeast quadrant. Stairwells have been constructed onto the midpoint of the east and west sides of the theatre building. The west stairwell is visible in Photo 1. The main floor of the theatre is approximately 0.9 m above surrounding grade and underlain by a crawl space. The crawl space has an irregular surface comprised of silt/sand soil.

The building is reportedly heated by forced air circulation from a furnace in the utility room from mid-April to September. The theatre is unheated during the winter months except for the utility room which is heated year round.

#### Main Theatre

During our visit of October 7, 2014, the following observations were made relating to the main part of the theatre:

- The main part of the theatre itself appears to be in good functional condition without obvious signs of large scale settlement damage.
- Beneath the theatre, the crawl space floor was damp with intermittent puddles. The floor surface was unfrozen and relatively stiff such that it could support foot traffic.
- Past movements of the foundations appear to have occurred in at least two locations on the west side of the building. Beneath the west side of the stage, a pile has rotated/moved upward and laterally about 500 mm so that it is not connected to the overlying structure. Another pile has moved about 25 mm upward beneath the western beam in the main concert hall area, causing a rise in the main floor level at that location. The section of beam connected to the top of this pile had rotated noticeably such that the beam was 5° or more from the horizontal, indicating that the uplift force had a lateral component.

- Cribbing had been placed, reportedly in 2008, on top of gravel pads placed on the crawl space floor, at regular intervals beneath the entire western wall beam of the theatre. The cribs have settled up to about 50 mm, due to settlement of the crawl space floor, relative to the beam such that the top of the cribbing was not everywhere in contact with the beam. Shims had been placed between the top of the cribbing and beam intermittently along the length of the beam. Intermittent gaps were present between the cribbing/shims and overlying beam.
- The crawl space floor has a sub-surface drain which runs from the north/central part of the building to a manhole located beneath the wooden sidewalk near the southeast corner of the building.
- This manhole is 1.65 m deep and is connected to the storm drain beneath King Street. This storm drain is reported to be at similar depth by the City Works Manager. Another storm drain is reported to be at similar depth beneath York Street.
- The theatre has several downspouts. These empty out onto the ground surface outside of the building perimeter.
- The east side of the theatre and utility room has 0.9 m high plywood skirting equipped with vents at approximately one metre intervals. On the south and west sides, there is an approximately 300 mm high boardwalk on the building exterior. There are no skirting vents on the south, west and north sides of the building but the boardwalk and/or skirting is not air tight such that cold air penetrates through gaps in the wooden boards.
- The west side of the building is bordered by an empty lot which could enable windblown snow to accumulate against the west side of the building. The other sides are sheltered somewhat by nearby structures.
- Parks Canada representatives reported that the crawl space of the building was often wet during the summer months such that they were concerned with rotting timbers and mold. Accordingly they periodically vented the crawl space in the summer to alleviate the humidity in the crawl space.
- Further to the third bullet point above, the structural engineer has reported that the existing piles appear to be vertical but the perimeter north/south beams, which rest on top of piles, have rotated such that the base of the beam has moved toward the middle of the building. Accordingly, the perimeter beams and the piles supporting the perimeter beams may require replacement.

## Utility Room

With regards to the utility room, we understand that it is in good operational condition with no reported settlement damage to the structure.

The lowest portion of the crawl space floor was beneath the utility room where it contained standing water. The crawl space floor had settled about 0.6 m more beneath the utility room than in the main part of the theatre. For some of the interior utility room piles, unreinforced concrete pads had been constructed around the pile at the original ground surface (the pile continues up to the floor beam another 0.9 m above). The ground beneath the concrete pads had settled about

0.6 m and in one case the concrete had separated from the pile such that there were pieces of concrete on the crawl space floor.

## Stairwells

Structural damage is apparent in the east and west emergency stairwells. The east stairwell has settled/rotated away from the main part of the building such that water ingress and related water damage is apparent. Related unevenness in the stairway floor was not obvious.

The west stairwell exhibits similar separation and water damage in the walls. As well, the west side of the stairway is several centimetres lower than the east/building side, indicating that the west foundation of the stairwell has settled relative to the main part of the building.

## 3.2 Climate

Air temperatures from 1962 to the present were reviewed, and projected near future air temperatures were assessed. It was found that from 1962 to the present, the mean annual air temperature in Dawson has increased by approximately 1.5 °C (1962-1966 average air temperature was -5.4 °C; 2010-2014 average air temperature was -3.9 °C). It was calculated that the average air temperature from 1962 to 2014 was approximately -4.4 °C.

Prediction of the future annual air temperatures was undertaken with the use of data in the report "Responding to Global Climate Change in Canada's Arctic, Volume II of Canada Country Study: Climate Impacts and Adaptation (1997)." The report assesses potential changes in air temperatures for the period of time from 1992 to 2100 (108 years) assuming that the content of carbon dioxide will be doubled for the given period of time, and that CO<sub>2</sub> in the atmosphere is the major cause of future temperature changes.

The report mentioned above provides an assessment of the increase in the seasonal air temperature for the central Yukon from 1992 to 2100 (108 years) as follows: March-May at 4 °C (rate 0.037 °C/year); June-August at 6 °C (rate 0.056 °C/year); September-November at 4 °C (rate 0.037 °C/year); and December-February at 3.5 °C (rate 0.032 °C/year). Based on the above calculated rates, the increase of the mean annual air temperature from 2014 to 2050 (36 years) was calculated to be in the order of 0.5°C such that the mean annual air temperature in 2050 is expected to be -3.9 °C.

## 3.3 Subsurface Conditions

Surficial geology information indicates that the Dawson City town site area consists of fluvial deposits of the Yukon River interlain by similar deposits from the Klondike River. Shallow peat is present on the surface indicative of a swamp environment on the flood plain prior to construction of the town. Dawson City is in the zone of discontinuous permafrost and accordingly frost lenses can be expected particularly in the upper silty soil beneath the peat.

The boreholes encountered fill on top of the peat, over ice rich frozen silt underlain by dense sand and gravel containing zones with cobbles and boulders.

**Fill** material consisting of silt, sand and gravel was encountered in the upper 0.2 to 0.6 m of all boreholes on the site. Deeper fill, consisting of a mixture of sand, silt, gravel and organics was encountered to a depth of 1.5 m at BH14-03 and 14-04.

**Peat** was encountered beneath the fill to a depth of up to 2.0 m at BH14-01 and BH14-02. The peat was soft and dark brown and interlayered with grey silt. It was frozen and contained lenses of ice. Excess ice in the form of free water was apparent in the samples after they had thawed. Most of the peat had been disturbed and/or replaced with fill at the locations of BH14-03 and BH14-04.

**Silt/Sand** was encountered beneath the peat to a depth ranging from 3.5 to 4.1 m. The material was frozen and contained intermittent frost lenses and excess ice. As per the peat, our samples contained free water after they had thawed, indicative of excess ice.

**Sand and Gravel** was encountered beneath the silt /sand to the explored depth of 13.1 m. The material was frozen but was relatively dry. Our samples revealed no excess ice. The unit contained layers of cobbles and boulders and in general drilling was difficult. Moisture content in the unit was typically less than ten percent. Portions of the sand and gravel were silty with fines content as high as 20%.

Reports from the area indicate that the sand and gravel is a good foundation material. Recent construction projects have involved excavation down to the sand and gravel and replacement with structural fill or piers excavated down through the peat and silt into the sand and gravel.

Bedrock was not encountered on the site, due to difficulties in drilling through the sand and gravel. Bedrock is reported at a depth of 17 m on the recreation centre site and at a similar depth at the MV Keno site, both within a kilometer of the Palace Grand Theatre.

### 3.4 Groundwater Conditions

Groundwater was not encountered during drilling in late October and early November, 2014. Thaw of marginally frozen ground, due to heat generated by drilling, and related sloughing did occur at some of the boreholes.

Shallow groundwater is expected to be present in the seasonal active layer during the summer and early fall. The depth of the active layer and amount of groundwater is expected to vary depending on the temperature and rainfall experienced during a specific summer.

Groundwater could be present beneath the seasonal frost and above the permafrost within the building footprint.

### 3.5 Ground Temperature and Ground Ice Conditions

Thermistor strings were installed in two of the boreholes, BH14-01 and BH14-03 to a depth of up to 6.71 m. The strings were installed inside 25 mm diameter standpipes. The annulus between

the standpipe and the hole was backfilled with the sandy portion of the drill cuttings. The standpipe was not backfilled at all so that the thermistor can be removed and re-used if desired.

Temperature readings are provided below. Parks Canada operations staff will continue to read the thermistors periodically over the next year.

**Table 3-1: Temperature Readings**

Thermistor Location	Depth (m)	Temperature Readings °C					
		Nov 15, 2014	Nov 26, 2014	Dec 3, 2014	Dec 17, 2014	Jan 7, 2015	Jan 14, 2015
Air temp	Surface	-22	-18	-21	-16.0	-38.0	-9.6
BH 14-01	0.15	-7.8	-7.8	-9.2	-9.4	-22.8	-11.3
	0.20	-6.2	-6.9	-8.7	-8.9	-21.5	-11.2
	0.71	-0.9	-0.7	-1.1	-1.8	-6.1	-5.1
	2.21	-1.2	-1.1	-1.1	-1.1	-1.1	-1.1
	3.71	-0.9	-0.9	-0.9	-0.9	-0.9	-0.9
	5.21	-0.9	-0.9	-0.9	-1.1	-1.1	-1.1
	6.71	-0.5	-0.9	-0.9	-0.9	-0.9	-0.9

Thermistor Location	Depth (m)	Temperature Readings °C	
		14-Nov-14	15-Nov-14
Air temp	Surface	-16	-20
BH 14-03	0.1	-11.3	-13.1
	1.6	-0.93	-0.73
	3.1	-0.78	-0.68
	4.6	-0.56	-0.59

Table 3-1 shows ground temperatures outside the footprint of the theatre building. Due to difference in heat balance parameters influencing the ground temperature outside the building from those within the building footprint, the ground temperature in the crawl space of the footprint may or may not differ considerably from that measured in BH 14-01 and BH 14-03. Results of calculations of the ground temperature within the building footprint and a discussion of interior ground temperatures with a comment relative to the thermistor readings are provided in Section 3.6.

High volumetric ice content was encountered in the upper frozen materials consisting of fill, peat and silt as noted by the moisture contents shown on the borehole logs. The underlying sand and gravel unit was frozen as well, but was relatively dry. No excess ice was observed in the sand and gravel in our boreholes.

### 3.6 Ground Temperature in the Crawl Space

Ground temperature in the crawl space is a function of numerous thermal parameters such as outside air temperature and room temperature, total plan area of the structure, height of the crawl space, total area of ventilation windows, thermal resistance of floor, thermal resistance of skirt, and average wind speed. The above parameters were assessed based on knowledge of the theatre building design, operation details, and climate data.

The following parameters were used for calculation of the ground temperature in the crawl space:

- Mean annual air temperature from 1962 to 2014: -4.4 °C;
- Mean annual air temperature in the middle of the 21<sup>st</sup> century: -3.5 °C;
- Mean annual room temperature in the unheated portion of the theatre from 1962 to 2014: -1.5 °C;
- Mean annual room temperature in the unheated portion of the theatre in the middle of the 21<sup>st</sup> century: -0.6 °C;
- Mean annual room temperature in the utilities section: +20 °C;
- Average wind speed: 6600 m/h;
- Thermal resistance of wood floor (unheated theatre): 1 m<sup>2</sup> °C W<sup>-1</sup>;
- Thermal resistance of concrete floor (utilities section): 0.25 m<sup>2</sup> °C W<sup>-1</sup>;
- Thermal resistance of skirt: 0.25 m<sup>2</sup> °C W<sup>-1</sup>;
- Total area of ventilation windows: 0.4275 m<sup>2</sup>.

Calculations of the ground temperature were carried out with the use of methodology published in Russian Construction Norms and Rules (SNiP 2.02.04-88, Foundations in Permafrost, Appendix 4, pages 38-40).

Results of calculations have shown that the ground temperature within the crawl space at the present time likely ranges from -0.8 °C to -1 °C, similar to the temperatures measured at depth in BH 14-01. However, the ground temperature will gradually warm, and at the middle of the 21<sup>st</sup> century perhaps will be in the order of +0 °C to -0.3 °C, based on "Climate Change guidelines". As a result of the potential increase of the ground temperature, shallow taliks (i.e., thawed zones that never freeze in subsequent winters) can be developed within the building footprint in the future. It is expected that the taliks will contain groundwater following thawing of the ice rich peat and silt. As the talik deepens there is less adfreeze bond on the piles to resist frost-jacking in the freezing active layer. The pile may potentially heave depending on the building dead load applied to the pile. The reduced adfreeze bond may also result in pile settlement under applied load, especially if little end-bearing capacity is mobilized in the sands and gravels.

From the results of the calculations it is concluded that the mean annual permafrost temperature today within the footprint of the theatre building is likely in the order of -0.8 to -1 °C which is sufficient for the use of adfreeze piles to support the structural load of the building. The mean annual ground temperature within the footprint will gradually be warmed up in the near future to approximately ±0 °C, unless measures are taken to prevent ground warming.

Geothermal modelling indicates that preservation of the ground temperature within the footprint in a range of approximately  $-1\text{ }^{\circ}\text{C}$  is possible, if the total area of the ventilation windows is increased to approximately  $1.0\text{ m}^2$ . Placement of rigid insulation either over the entire building footprint or around the piles (existing and proposed) is also recommended. The insulation does not change noticeably the mean annual permafrost temperature, but considerably reduces thickness of the active layer and frost-jacking forces. Results of calculations of the active layer with and without insulation are provided below.

### 3.7 Thickness of the Active Layer in the Crawl Space

If the total area of the ventilation windows will be increased to approximately  $1\text{ m}^2$ , the mean annual permafrost temperature within the crawl space was determined to be slightly below freezing ranging likely from  $-0.8$  to  $-1\text{ }^{\circ}\text{C}$ . The simple Stefan's equation which does not consider influence of the permafrost temperature to the active layer thickness was modified for a soil profile consisting of 2 layers. Based on results of the drilling, it was assumed that the soil profile includes an upper peat layer, 2 m thick, underlain with silt. The physical and thermal properties of the identified soils and thaw index used in calculations are provided in Table 3-2. It was assessed based on data in Section 3.2 that the thaw index in the middle of the 21<sup>st</sup> century will be approximately 1650 degree-days, just marginally greater than the average thaw index from 1962 to 2014 (1560 degree-days).

**Table 3-2: Soil Properties**

Soil	Dry Density, $\text{kg/m}^3$	Moisture Content, %	Thermal Unfrozen Conductivity, $\text{W/m}^{\circ}\text{K}$	Heat Unfrozen Capacity, $\text{MJ/m}^3/^{\circ}\text{C}$	Thaw Index, degree-days
Peat	500	50	0.93	0.77	1650
Silt	1600	35	1.75	1.84	

The calculations were carried out for 3 scenarios: 1) no insulation on the ground surface; 2) a 50 mm thick layer of STYROFOAM insulation on the ground surface; 3) a 100 mm thick layer of STYROFOAM insulation on the ground surface. Results of the calculations are provided in Table 3-3.

**Table 3-3: Active Layer Thickness**

Scenario	Active Layer Thickness, m
No insulation	2.3
50 mm insulation	1.6
100 mm insulation	1.2

#### 4.0 DISCUSSION

If no mitigation measures are undertaken, long term thaw can occur to a considerable depth beneath the building in the near future, if the premises concerning global warming predictions are accepted. Accordingly, there is a possibility of additional future movements within the upper fill, silt and peat and possibility of jacking of piles that do not have adequate penetration into the sand and gravel. In other words, the frost related movement that has occurred in the past can be expected to continue into the future, and could become worse (as there is less embedment in frozen ground to resist seasonal frost heaving in the upper part of the pile). Saturation of soils with melting water will contribute to an increase of frost heaving in the upper freeze/thaw zone.

Because the building is apparently supported on relatively long piles, settling/heaving movements in the upper soils do not presently impact the stability of such piles and overall integrity of the structure. However, some of the piles may not be deep enough to resist uplift forces due to freeze/thaw of the active layer.

We understand that the cribbing on the west side of the building was installed as a backup measure in 2008 in case lateral/uplift movements of the piles continued or worsened (if the overlying beam became disconnected with the piles it would be supported by the cribbing). It appears that the cribbing is not presently required for support and can be removed following selective remediation/replacement of the affected piles.

With regard to foundation reconstruction, in our opinion, the main foyer, concert hall and stage area are presently in reasonable condition without signs of extreme settlement damage. Subject to implementation of the drainage, insulation and ventilation measures recommended in the following sections, and input from the structural engineer, it may be possible to keep some of the existing pile foundations with some adjustments which could include selective replacement of piles, pile caps and beams to level the building. Entire reconstruction of the foundation involving excavation and replacement of the ice rich permafrost with clean granular fill, temporary relocation and/or large scale lifting of the building is not considered to be necessary.

Similarly, the utility room appears to be in good condition and it may be possible to maintain the existing foundations. The purpose of the aforementioned concrete pads on the original crawl space floor is unclear. Additional lateral support may be required for some of the piles and connections at the top of the piles as directed by the structural engineer. We expect that the mitigation measures described in the following sections will enhance the lateral stability of the existing piles as well.

The 1962 drawings show that the stairwells are each supported on two piles beneath the exterior walls. These piles are too short or otherwise inadequate and have settled and/or moved laterally such that the stairwells have settled/rotated relative to the main part of the theatre. It is our opinion that the stairwells, especially on the west side of the building, are in poor condition and require reconstruction with new foundations.

Surface water and shallow groundwater likely contribute to an increase of permafrost temperature and increase the extent of seasonal and long term thaw. It is our opinion that the situation can be enhanced by improving drainage, regardless of the foundation remediation measures selected. Drainage improvements are also expected to improve the crawl space humidity problem noted in the summer time.

Insulation installed beneath and parallel to the crawl space floor combined with improved ventilation of the crawl space would reduce the thickness of the active layer and frost heave forces acting on the piles.

## 5.0 RECOMMENDATIONS

### 5.1 Drainage

The site is poorly drained, with water and general wetness observed in the crawl space. The following drainage improvement measures are expected to reduce the magnitude of seasonal and long term thaw and reduce humidity in the summer time and control mold development.

- Following the implementation of structural improvements, the crawl space should be filled to the desired level (we envisage this to be about 1.0 to 1.2 m below floor level) with clean granular fill containing less than 5% fines. A 19 mm minus crushed sand and gravel would suit this purpose. The fill should be at least 300 mm thick.
- The crawl space surface should be crowned along a north/south line in the middle of the building with a 2% grade down to the east and west.
- Drains, consisting of 150 mm diameter perforated pipe covered with drain rock all wrapped in non-woven geotextile/filter cloth should be installed beneath the crawl space floor at 5 m intervals from north to south. The exact location of the drains is flexible and can be altered to avoid foundations and related insulation. The drains should be at least 300 mm deep, immediately below the insulation which can be installed, and start at the centreline of the crawl space and grade downward toward the east or west building perimeter at a minimum gradient of 2%.
- The existing crawl space drain should be left in place or if convenient, connected into the new drains.
- Following the installation of the drains and granular fill, the crawl space floor should be surfaced with a concrete mud slab. A vapour barrier could be installed beneath the mud slab if desired.
- The crawl space floor drains should connect into a perimeter drain constructed around the building. The perimeter drain should be at least 1 m deep and consist of 300 mm diameter perforated pipe covered in at least 300 mm of drain rock all wrapped in filter cloth. The trench above the drain installation should be filled with a free draining material such as 150 mm minus broken rock.
- The perimeter drain should be installed at a minimum 2% gradient down to the City storm drain beneath King Street. Part of the perimeter drain could connect into the storm drain beneath York Street on the north side of the site if that is convenient. The existing manhole beneath the boardwalk at the southeast corner of the site can be

incorporated into the drainage scheme if desired. Such a measure could reduce the number of new connections required into the city storm drainage system.

- Downspouts, which currently discharge onto the ground, should be connected into the new perimeter drainage network.

## 5.2 Ventilation and Insulation

The wooden skirting along the east side of the building is about 0.9 m high and has ventilation windows at regular 1 m to 1.5 m intervals. It was assessed that the total area of the ventilation windows is approximately 0.4275 m<sup>2</sup>. Mitigation measures should include an increase of the total area of the ventilation windows to 1.0 m<sup>2</sup>. Such increase of the ventilation windows allows provision of the permafrost temperature beneath the building in the order of approximately -1 °C at least to the middle of the 21<sup>st</sup> century. The total area of the ventilation windows can be further increased to approximately 1.2 m<sup>2</sup>, and the windows be provided with blinds to adjust the open area, if needed. Ventilation windows are not provided along the other sides of the building, which may explain in part why the west side of the building has experienced more freeze/thaw related movements than the east side. If temperatures do not respond as predicted then it would be possible to convert to a forced air system which should include a powerful air intake (fan) which draws external winter air and blows it by a pipe into the crawl space. More engineering recommendations on application of the forced ventilation system can be provided upon request.

Due to considerable heat release from the floor of the utility room, air should be allowed into the crawl space during the summer months (May through September) unless the floor of the utility room is insulated with at least a 25 mm thick layer of STYROFOAM insulation.

It is recommended that the skirting on the west side of the building be constructed in a similar manner to the skirting on the east side (ie: 0.9 m high with ventilation windows at regular intervals, providing the total area of the ventilation windows around the building is at least 0.9 m<sup>2</sup>).

In order to reduce the thickness of the active layer, 50 mm or 100 mm thick sheets of Styrofoam SM insulation may be installed about 300 mm below the ground surface over the entire footprint area, or for a distance of 5 m around existing timber piles (and newly installed piles).

## 5.3 Foundations

For the main theatre building and utility room, we expect that the use of some of the existing timber piles will continue, depending on the findings of the structural engineer. Some select piles on the perimeter of the building, presently augmented with cribbing on the west side, may require replacement, new pile caps, re-setting and/or replacement of overlying beams as directed by the structural engineer.

If required, it may be possible to install new piles at select locations along the west building exterior perimeter, connected by a beam to another new or existing pile further to the east or even to the east perimeter pending input by the structural engineer.



Significant damage was observed in the stairwells which will likely require new foundations and replacement.

We envisage that new piles will be adfreeze piles with the annulus between the pile and hole wall backfilled with sand slurry or grout. The drilling method must be able to drill and case through the sand and gravel. Parts of the existing floor may require removal and replacement to allow equipment access to the building interior, if new interior piles are required.

Driven steel piles, using large equipment that can penetrate the sand and gravel, if predrilled, are not recommended (unless the building is moved onto a new foundation at a nearby site) due to the potential for damage to the building.

Pile foundations should be designed in accordance with the National Building Code of Canada (NBCC) 2010 which is based on Limit States Methodology. This methodology requires determination of pile design parameters for the Ultimate Limit State (determines pile capacity) and Serviceability Limit State (determines pile deformation). Due to the absence of long term strength for ice, the adfreeze pile design is usually governed by the adfreeze bond of the Serviceability Limit State for pile settlement of 1 mm/year. The end bearing resistance usually is not incorporated in the adfreeze pile design due to the uncertainty in ice content and hole conditions at the pile tip depth.

According to the expected soil profile, ice contents and ground temperatures (if mitigation measures will be implemented), adfreeze piles (steel pipe or timber or adfreeze micropiles with diameter not less than 150 mm) may be designed applying the following values:

**Table 5-1: Ultimate and Serviceability Adfreeze Bonds**

Depth of Pile Below Final Grade (m)	Ultimate Bond (kPa)	Serviceability Bond (kPa)
0 to 2 (peat)	0	0
2 to 4 (silt) if insulation 2.3 to 4 if no insulation	100	15
Below 4 (sand and gravel)	150	20

In order to determine the factored geotechnical resistance in compression at the Ultimate Limit State, the Ultimate Adfreeze Bond (Table 5-1) should be multiplied by a geotechnical resistance factor of 0.4. Table 5-1 shows that irrespective of insulation application, the peat layer is ignored for assessment of the adfreeze bond due to a very low serviceability bond.

As was mentioned above, the adfreeze strength under Serviceability Limit States design is controlled by the creep deformation characteristics of ice-rich material and the bond strength to resist uplift on piles due to seasonal frost action. This design capacity is for long-term loading including snow and permanent occupancy loads. Stresses due to short-term live loads, such as wind and daily occupancy loads in effect for less than 50 percent of the time (over a short term),

may be taken as 30 percent greater than the values given above. The adfreeze capacity of the piles should be calculated using the pile-slurry interface (the outside diameter of the pile).

The upper portion of the pile, within the active layer (see Table 3-3), should be coated with arctic heavy grease and wrapped with polyethylene sheets also coated with arctic heavy grease (or equivalent) to reduce the potential for pile uplift forces. A minimum embedment length of the pile should be calculated by a structural engineer based on structural loading, serviceability adfreeze bond provided in Table 5-1, and frost heave stress. The upper (2 m or 2.3 m if no insulation will be placed) portion of the pile should also be considered as laterally unsupported for design purposes, including seismic loading. The minimum centre-to-centre spacing of the designed adfreeze piles should be three pile diameters.

Steel pipe and timber adfreeze piles develop load carrying capacity based on the adfreeze bond between the frozen backfill and the pile material. Where steel pipe piles are used, it is essential that the steel pile below the 2-2.3 m depth be properly cleaned and free of paint, lacquer, oil, grease, dirt and excessive rust to promote the development of a good bond. Round hollow structural section (HSS) steel is recommended as the material for the piles. Alternatively, timber piles may be considered instead of steel. For adfreeze micropiles, the load carrying capacity is based on the adfreeze bond between the grout and the frozen soil.

Adfreeze piles should be installed in pre-drilled oversized holes. To obtain proper backfill of the pile-hole annulus with sand slurry (steel pipe piles and timber piles), it is important to partially backfill about half of the hole with a mixture of non-saline sand and fresh water prior to installing the pile. The pile should then be pushed and vibrated down to the bottom of the hole, at the same time, adding more sand and fresh water mixture around the pile-hole annulus. Piles installed in the manner described above will require a pile hole at least 50 mm in diameter larger than the outside diameter of the pile. If it is impractical to fill half of the hole with the sand slurry prior to placing the pile, then the hole diameter should be in the order of 100 mm larger than the pile diameter to facilitate good slurry placement. If steel piles are adopted, the interior of the piles should also be filled with dry, non-saline sand or fine gravel to 1 m below the final ground elevation or pile cut-off whichever is lower to preclude air circulation inside the pile.

If gravel slurry is used for the backfilling of holes with steel pipe/timber piles, then the hole should be filled with fresh water to about 30 percent of the pile embedment. The pile should then be lowered in the hole, and the pile-hole annulus should be filled up with the gravel (5 mm to 7 mm minus crushed gravel) and fresh water to the ground surface. The inside of the pile (for steel section) should be filled up with gravel to 1 m below the final ground elevation or pile cut-off whichever is lower to preclude air circulation inside the pile.

Sika 100 Arctic grout is recommended if grout will be used for backfilling either steel pipe/timber piles or micropiles.

Freeze-back around the piles may be expected to occur in about one to two months if the piles are installed during late winter or early spring. Freeze-back may take longer to develop the full

capacity of the piles if the piles are installed in later summer. It is recommended that field monitoring of freezing back rate be performed in selected piles using thermistor cables.

Difficult drilling in the frozen sand and gravel containing cobbles/boulders should be expected. A piling rig should have sufficient capability to remove the obstructions and advance through hard material.

In spite of coating the upper portion of the piles with arctic heavy grease and wrapping with polyethylene sheets, the frost heave stress of 110 kPa should be considered as unfactored ultimate force and applied to the thickness of the active layer (Table 3-3). In general, frost heave stress within the influence zone must be resisted by the minimum structural load on the pile plus the shaft resistance within non-heaving founding strata. For assessment of the geotechnical resistance of the adfreeze pile at the Ultimate Limit State, frost heave forces are not considered to be additive to other tension loads and should consider several separate structural load cases. The pile should be designed for the most critical of these cases.

For the assessment of pile displacement (Serviceability Limit State design), the structural designer should check that the displacements due to the applied forces are within acceptable limits. Under Serviceability Limit State conditions, the frost heave forces (110 kPa) should be additive to structural tension loads, and this combination should be assessed. Based on this load combination, the pile settlement or uplift under applicable compression loading should be checked.

We can carry out lateral pile analysis at your request, however, such is additional to the present scope of work.

The existing theatre building is founded on driven timber piles which are believed to be based in the sand and gravel unit. In our opinion, most of these piles are in operational condition and should continue to be used for foundation support of the building. Their depth has not been reported in available records, but is expected to be in the order of 6 to 8m, where the timbers could have met refusal on dense cobble/boulder layers. Some of the piles may have reached refusal at more shallow depth, which can be speculated to explain the performance of some piles.

Two methods of driven timber pile installation might have been used in 1962. The first method involved the drilling of pilot holes, with diameter smaller than the pile, into the sand and gravel using a downhole hammer or tri-cone bit. The second method involved steaming of frozen peat and silt to the top of the sand and gravel. If the first method was used, then the pile embedment is likely slightly greater than the pre-drilled depth and consistent with the range of depths noted above. If steaming was used, the minimum pile embedment is likely 4 m, and likely seated on the sand/gravel layer.

The following parameters should be used to estimate the capacity of the existing timber piles:

- A minimum pile embedment depth of 4m (using the worst case described above);
- An end bearing resistance of 350 kPa in serviceability limit state and 1500 kPa in unfactored ultimate limit state;
- The adfreeze bond values provided in Table 5-1.

Piles that do not meet requirements for location and/or plumbness, or are rotted in more than 10% of their diameter should be cut off at ground level.

#### 5.4 Seismic Considerations

The NBCC requires that structures be designed to resist collapse when subjected to “strong shaking”, defined as ground motions with a return period of 1 in 2,475 years (or two percent probability of exceedance in 50 years).

A secondary objective of the code is to limit damage to buildings caused by low to moderate shaking. NBCC has adopted the use of foundation factors dependent on analysis of ground motion histories adjusted for local site conditions, characterized based on the average shear wave velocity and relative density of the earth materials in the uppermost 30 m. Based on the presence of compact to dense sand and gravel below 4 m of ice rich peat and silt, the site should be classified as **Site Class D** in conformance with Table 4.1.8.4 A of the 2010 NBCC.

The geotechnical characterization of seismic site response is based on published ground motions and assumed subsurface stratigraphy and does not take into account potential focusing effects of topography. If it is found that seismic forces govern the design and small changes in the values used significantly alter the design requirements, site specific analysis may be warranted.

Peak Ground Acceleration (PGA) of 0.20 g should be used for Dawson City.

The sand and gravel is not expected to be liquefiable during the design earthquake. The upper materials could liquefy when thawed under both static and design seismic conditions. The recommended drainage, ventilation and insulation measures to reduce seasonal thaw will also enhance seismic performance. The site is relatively flat such that large lateral displacements due to the design earthquake are not anticipated.

#### 6.0 FURTHER WORK

The following further work is underway or recommended in order to finalize the design:

- Discussion with the structural engineer and design team in order to determine the specific location of new piles. Access to these foundations will be an important consideration in the building renovation.
- Discuss with the structural engineer and design team locations of shallow holes to monitor ground temperature with thermistor cables. More details on equipment and

design of the holes will be provided if a decision on implementing of the monitoring study will be made.

- Review/discussion of the ventilation plan for the renovated structure.
- Discussion on pile types and equipment best suited for the site.

## **7.0 LIMITATIONS AND CLOSURE**

The recommendations presented herein are based on a geotechnical evaluation of the findings of the site exploration and other information deemed relevant to the assessment. The material in this report reflects Amec Foster Wheeler's judgement in light of the information available to Amec Foster Wheeler at the time of preparation of the report.

If conditions other than those are noted during subsequent phases of the project, Amec Foster Wheeler should be notified and given the opportunity to review and revise the current recommendations, if necessary. Recommendations presented herein may not be valid if an adequate level of field review is not provided during construction or if relevant code requirements are not met.

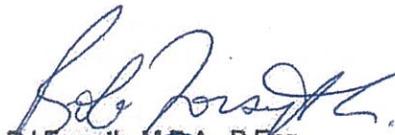
This report has been prepared for the exclusive use of Public Works and Government Services Canada for the specific application to the development described within this report. Any use which a third party makes of this report, or any reliance on or decisions made based on it are the responsibility of such third parties. Amec Foster Wheeler accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report. It has been prepared in accordance with general accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.



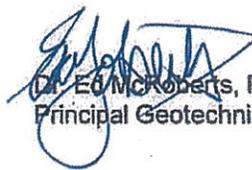
Amec Foster Wheeler trusts this meets your immediate requirements. If you have any questions or require further information, please contact us.

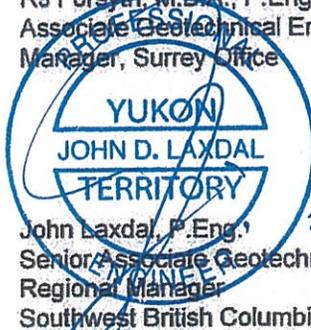
Respectfully submitted,

**Amec Foster Wheeler Environment & Infrastructure,  
a division of Amec Foster Wheeler Americas Limited**

  
R.J. Forsyth, M.B.A., P.Eng.  
Associate Geotechnical Engineer  
Manager, Surrey Office

Reviewed by

  
Dr. Ed McRoberts, P.Eng.  
Principal Geotechnical Engineer

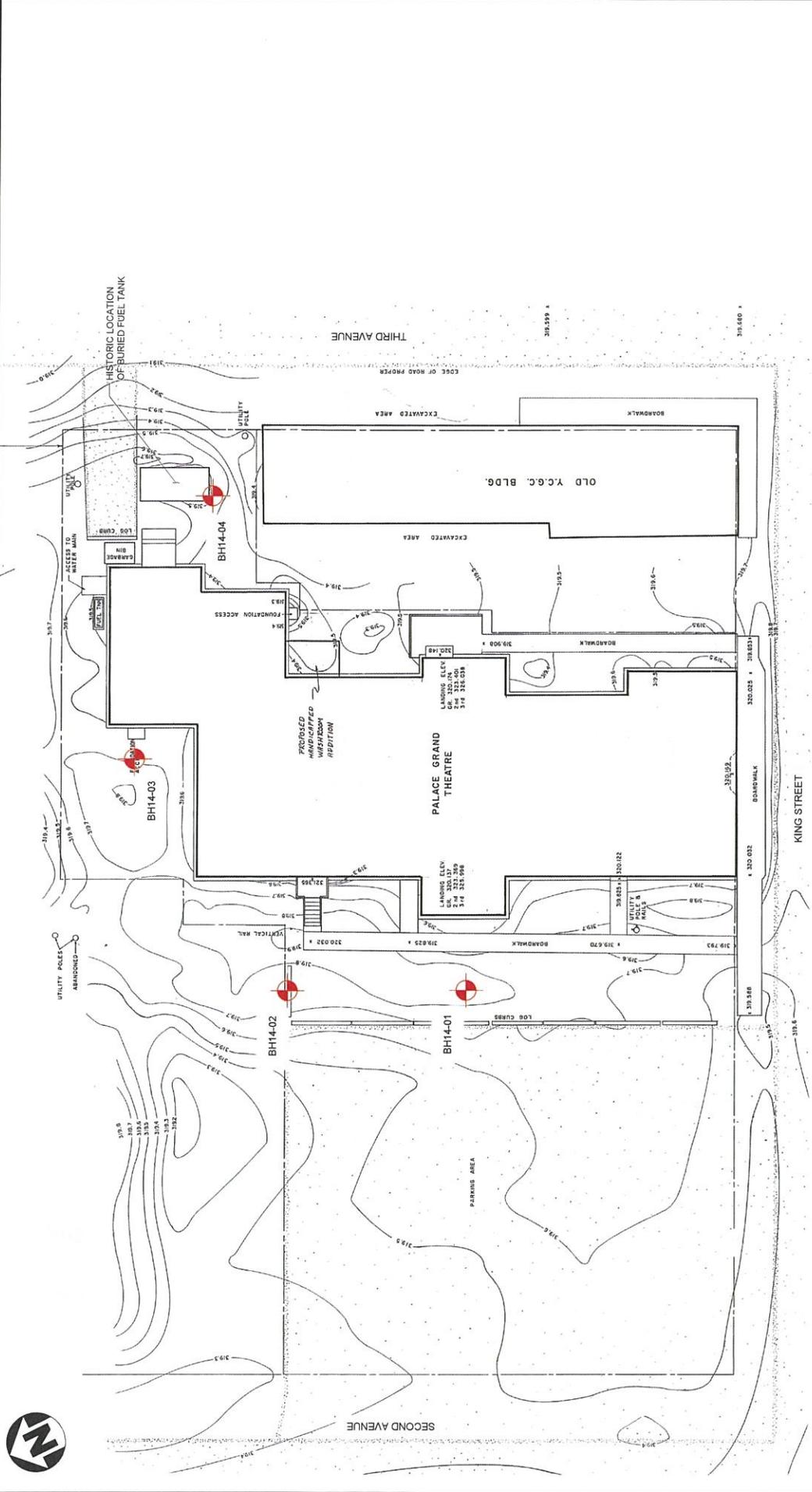
  
YUKON  
JOHN D. LAXDAL  
TERRITORY  
John Laxdal, P.Eng.  
Senior Associate Geotechnical Engineer  
Regional Manager  
Southwest British Columbia

2015-02-23.

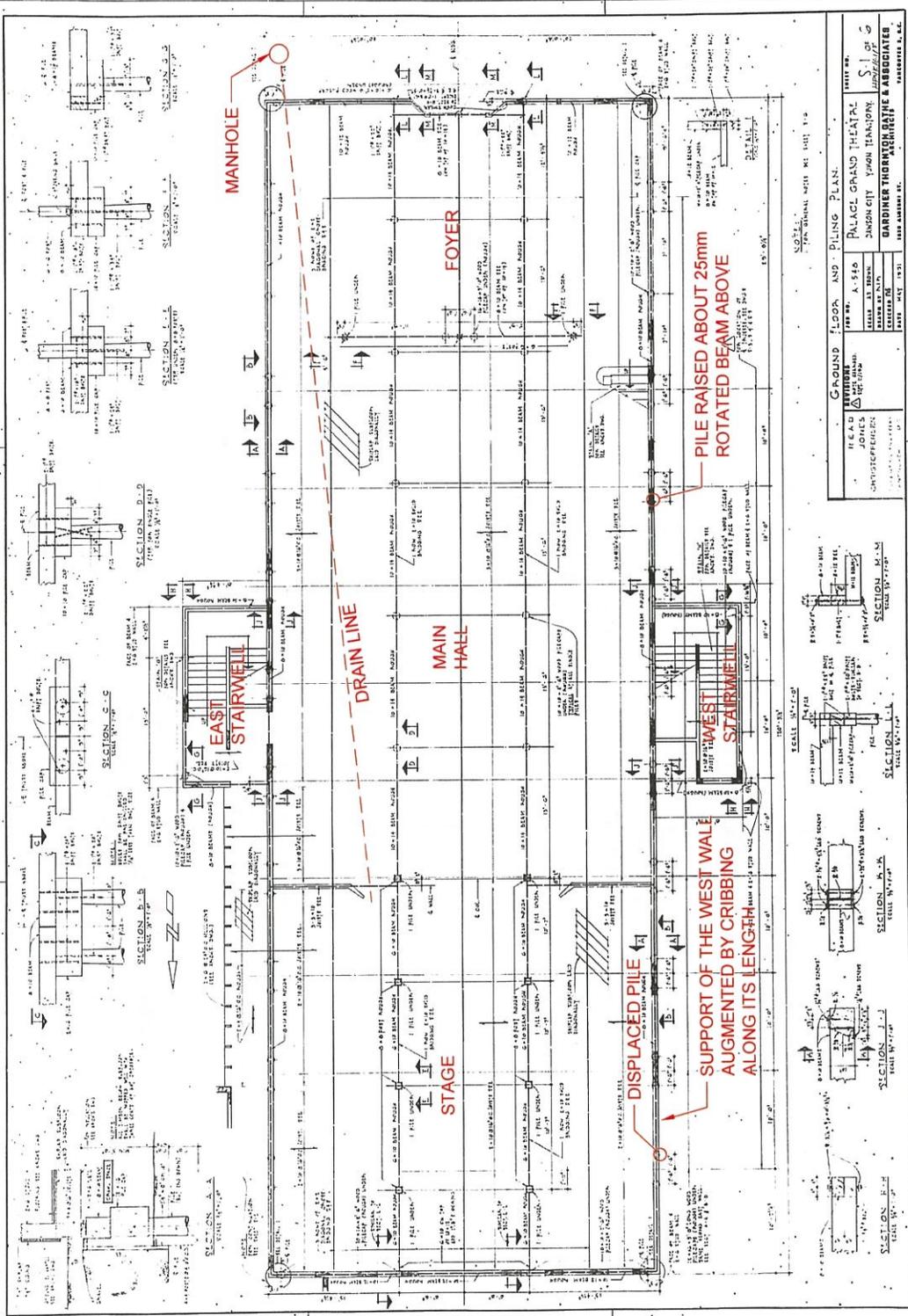
  
February 18, 2015  
Dr. Alexandre Tchekhovski, P. Eng.,  
Senior Associate Geotechnical and  
Permafrost Engineer

## FIGURES





<b>NOTE:</b> <b>LEGEND</b> APPROXIMATE BOREHOLE LOCATION MAP SOURCE: PARKS CANADA DRAWING HPKHS 90-P5 SHT 1, REV 1 DETAILS SHOWN ARE APPROXIMATE ONLY.	 <b>Amec Foster Wheeler</b> Environment & Infrastructure	 Public Works and Government Services Canada Travaux publics et Services gouvernementaux Canada	<b>CLIENT AND LOGO</b>	<b>EDS</b> CHKD BY: BF DATUM: NAD 83 PROJECTION: UTM Zone 7N SCALE: 1:250	<b>PROJECT:</b> GEOTECHNICAL ASSESSMENT PALACE GRAND THEATRE DAWSON CITY, YT	DATE: JAN 2015 PROJECT NO: K421109 REV. NO: A FIGURE NO: 001
			<b>TITLE:</b> BOREHOLE LOCATION PLAN			



DATE:	JAN 2015
PROJECT NO.:	KA21109
REV. NO.:	A
FIGURE NO.:	003

PROJECT: **GEOTECHNICAL ASSESSMENT**  
**PALACE GRAND THEATRE**  
**DAWSON CITY, YT**

TITLE:  
**MARK-UP OF 1962 FOUNDATION PLAN**

DWN BY: EDS  
 CHKD BY: BF  
 DATUM: NAD 83  
 PROJECTION: UTM Zone 7N  
 SCALE: 1:200

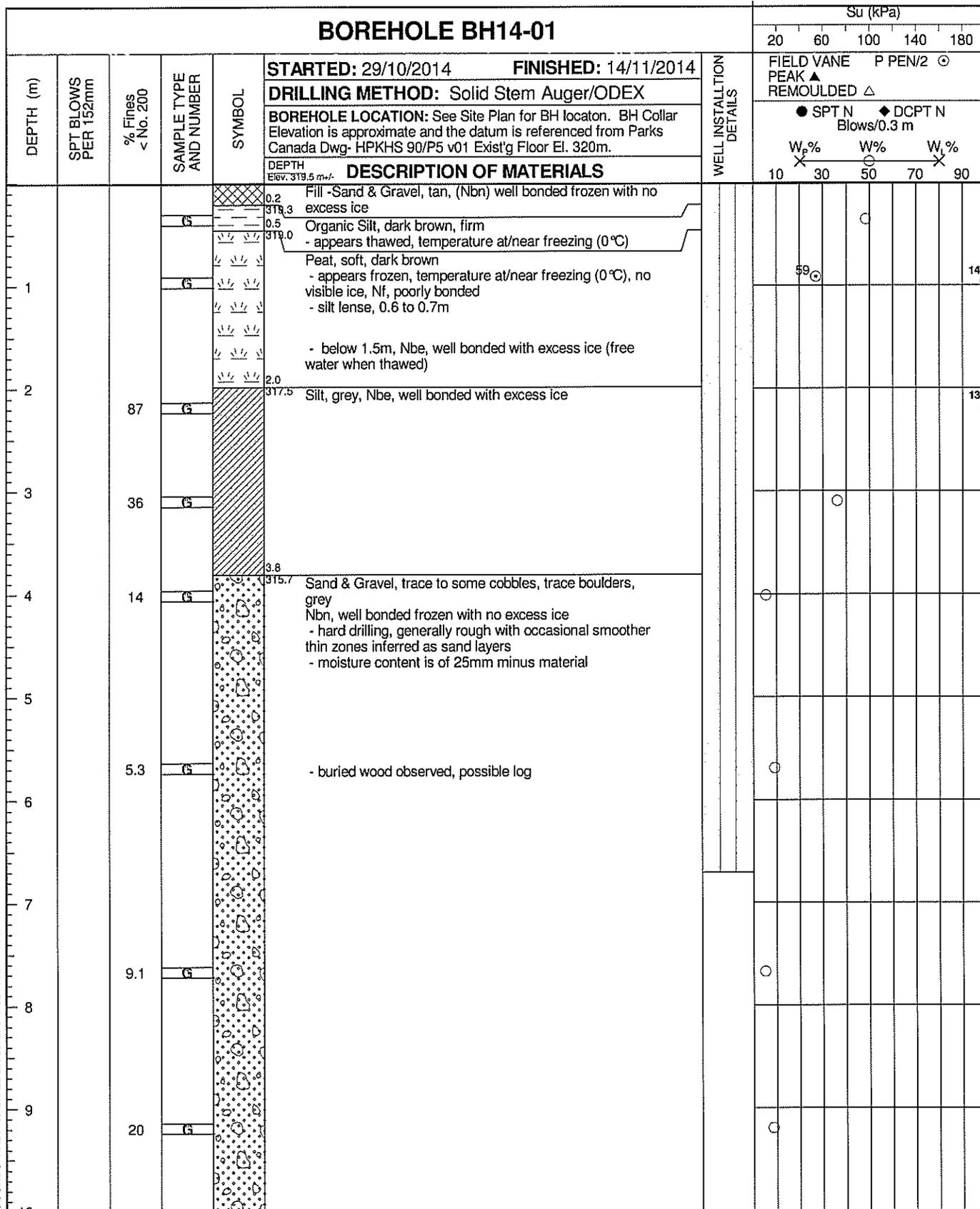
CLIENT AND LOGO:  
  
 Public Works and Government Services Canada  
 Travaux publics et Services gouvernementaux Canada

Amec Foster Wheeler  
 Environment & Infrastructure  
 Unit 110, 18568 - 96 Avenue, Surrey, BC V4N 3P9  
 Tel. 604-295-8657 Fax 604-295-8658



**APPENDIX A**  
**Borehole Logs**

# BOREHOLE BH14-01



N-GEO-CONVERT-NO COORDS KA21109 BH LOG.V00.GPJ ALL-1.GDT 12/8/14



**AMEC Environment & Infrastructure**  
 18568 - 96 Avenue, Unit 110  
 Surrey, B.C. V4N 3P9

<b>PROJECT NO.:</b> KA21109	
<b>PROJECT:</b> Palace Grand Theater	
<b>LOCATION:</b> Dawson City, YT	
<b>LOGGED BY:</b> EDS	<b>REVIEWED BY:</b> BF
<b>SHEET 1 OF 2</b>	<b>BOREHOLE No. BH14-01</b>

# BOREHOLE BH14-01

Su (kPa)

20 60 100 140 180

DEPTH (m)	SPT BLOWS PER 152mm	% Fines < No. 200	SAMPLE TYPE AND NUMBER	SYMBOL	DESCRIPTION OF MATERIALS	WELL INSTALLATION DETAILS	FIELD VANE	P PEN/2
					<b>STARTED: 29/10/2014      FINISHED: 14/11/2014</b> <b>DRILLING METHOD: Solid Stem Auger/ODEX</b> <b>BOREHOLE LOCATION: See Site Plan for BH location. BH Collar Elevation is approximate and the datum is referenced from Parks Canada Dwg- HPKHS 90/P5 v01 Exist'g Floor El. 320m.</b> DEPTH Elev. 319.5 m +/-		PEAK ▲ REMOULDED △ ● SPT N      ◆ DCPT N Blows/0.3 m W <sub>p</sub> %      W%      W <sub>p</sub> % X      ○      X 10      30      50      70      90	
9.4			G	G		○		
10.7				G		○		
10.7 308.8				G	Sand & Gravel, cobbly, trace boulders - very hard drilling auger lead section and two drill bits damaged, lead auger sections hot from advancement - moisture content is of 25mm minus material - refusal with auger, switch to ODEX	○		
11				G		○		
12		13		G		○		
13				G		○		
13.1				G		○		
13.1 306.4				G	End of Borehole - refusal, ODEX damaged - hole collapsed at completion, thermistor installed to bottom of open hole (6.7m) - moisture content of coarser material is of on 25mm minus material only.	○		
14				G		○		
15				G		○		
16				G		○		
17				G		○		
18				G		○		
19				G		○		
20				G		○		

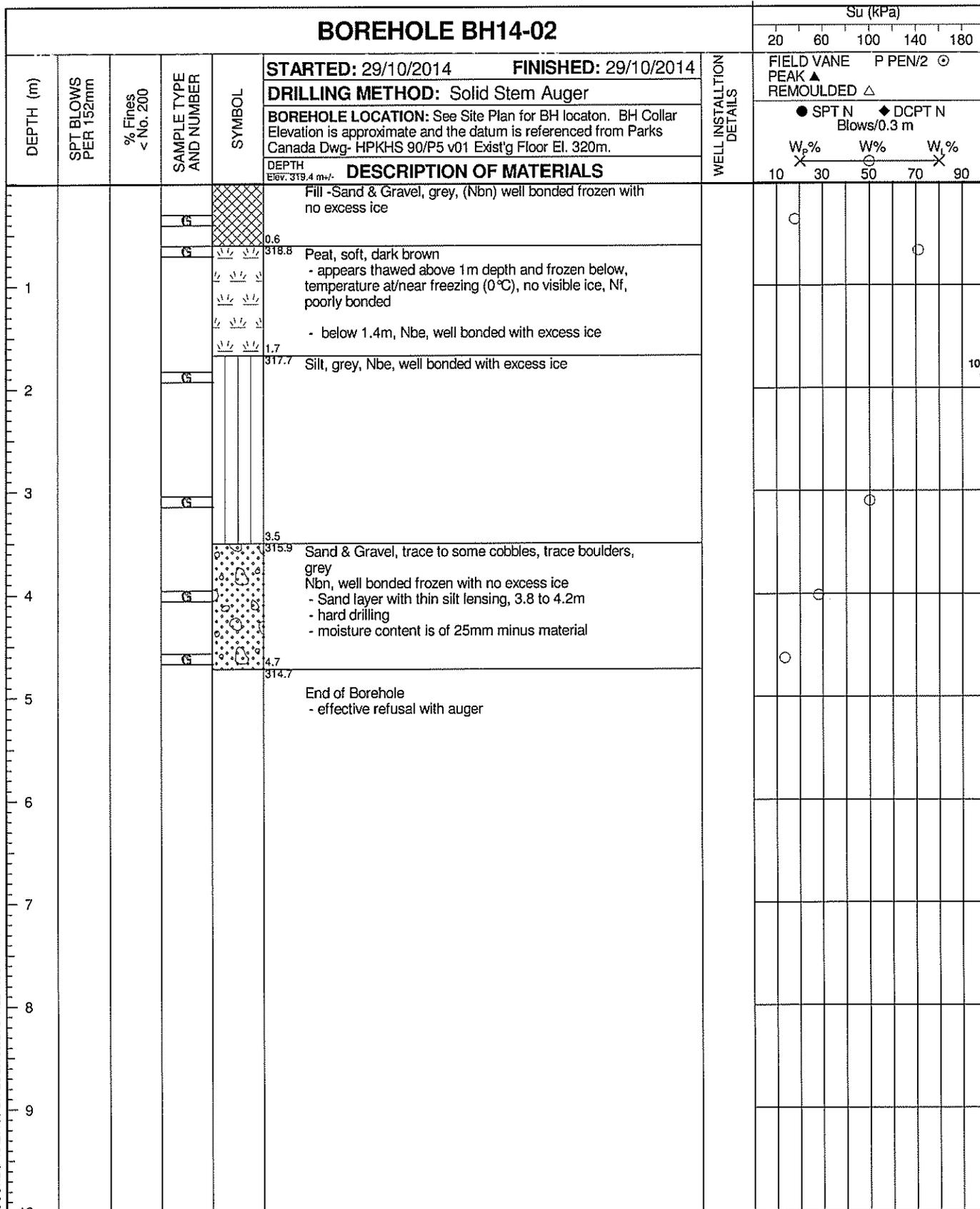
N-GEO-CONVERT-NO COORDS KA21109 BH LOG.V00.GPJ ALL-1.GDT 12/8/14



**AMEC Environment & Infrastructure**  
 18568 - 96 Avenue, Unit 110  
 Surrey, B.C. V4N 3P9

<b>PROJECT NO.:</b> KA21109	
<b>PROJECT:</b> Palace Grand Theater	
<b>LOCATION:</b> Dawson City, YT	
<b>LOGGED BY:</b> EDS	<b>REVIEWED BY:</b> BF
<b>SHEET 2 OF 2</b>	<b>BOREHOLE No. BH14-01</b>

# BOREHOLE BH14-02



N-GEO-CONVERT-NO COORDS KA21109 BH LOG.V00.GPJ ALL-I.GDT 12/8/14



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18568 - 96 Avenue, Unit 110  
Surrey, B.C. V4N 3P9

<b>PROJECT NO.:</b> KA21109	
<b>PROJECT:</b> Palace Grand Theater	
<b>LOCATION:</b> Dawson City, YT	
<b>LOGGED BY:</b> EDS	<b>REVIEWED BY:</b> BF
<b>SHEET 1 OF 1</b>	<b>BOREHOLE No. BH14-02</b>

# BOREHOLE BH14-03

Su (kPa)

20    60    100    140    180

DEPTH (m)	SPT BLOWS PER 152mm	% Fines < No. 200	SAMPLE TYPE AND NUMBER	SYMBOL	DESCRIPTION OF MATERIALS	WELL INSTALLATION DETAILS	FIELD VANE P PEN/2 PEAK ▲ REMOULDED △
					<b>STARTED: 29/10/2014      FINISHED: 29/10/2014</b> <b>DRILLING METHOD: Solid Stem Auger</b> <b>BOREHOLE LOCATION:</b> See Site Plan for BH location. BH Collar Elevation is approximate and the datum is referenced from Parks Canada Dwg- HPKHS 90/P5 v01 Exist'g Floor El. 320m. DEPTH Elev. 319.5 m +/-	● SPT N    ◆ DCPT N Blows/0.3 m W <sub>p</sub> %    W%    W <sub>p</sub> % X    X    X	
1				GS	0.6 318.9 1.5 318.0 1.8 317.7 3.4 316.1 4.1 315.4 4.6 314.9		
					Fill - Sand & Gravel, grey, (Nbn) well bonded frozen with no excess ice  Fill - Mixed Peat with some silt/sand/gravel, dark brown/grey, very soft - appears thawed above 1m depth and frozen below, temperature at/near freezing (0°C), no visible ice, Nf, poorly bonded  Peat/Silt, lensed, dark brown-grey, frozen, Nbe, free water present when sampled thawed  Silt, grey, Nbe, free water present when sampled thawed     Silt/Sand, trace gravel, grey Nbe, free water present when sampled thawed  Sand & Gravel, trace to some cobbles, trace boulders, grey Nbn, well bonded frozen with no excess ice - hard/rough drilling End of Borehole - effective auger refusal - Hole redrilled Nov 14-2014 for thermistor installation, ice encountered from 3.3 to 4.6m.		
2				GS			130
3				GS			
4				GS			
5				GS			
6				GS			
7				GS			
8				GS			
9				GS			
10				GS			

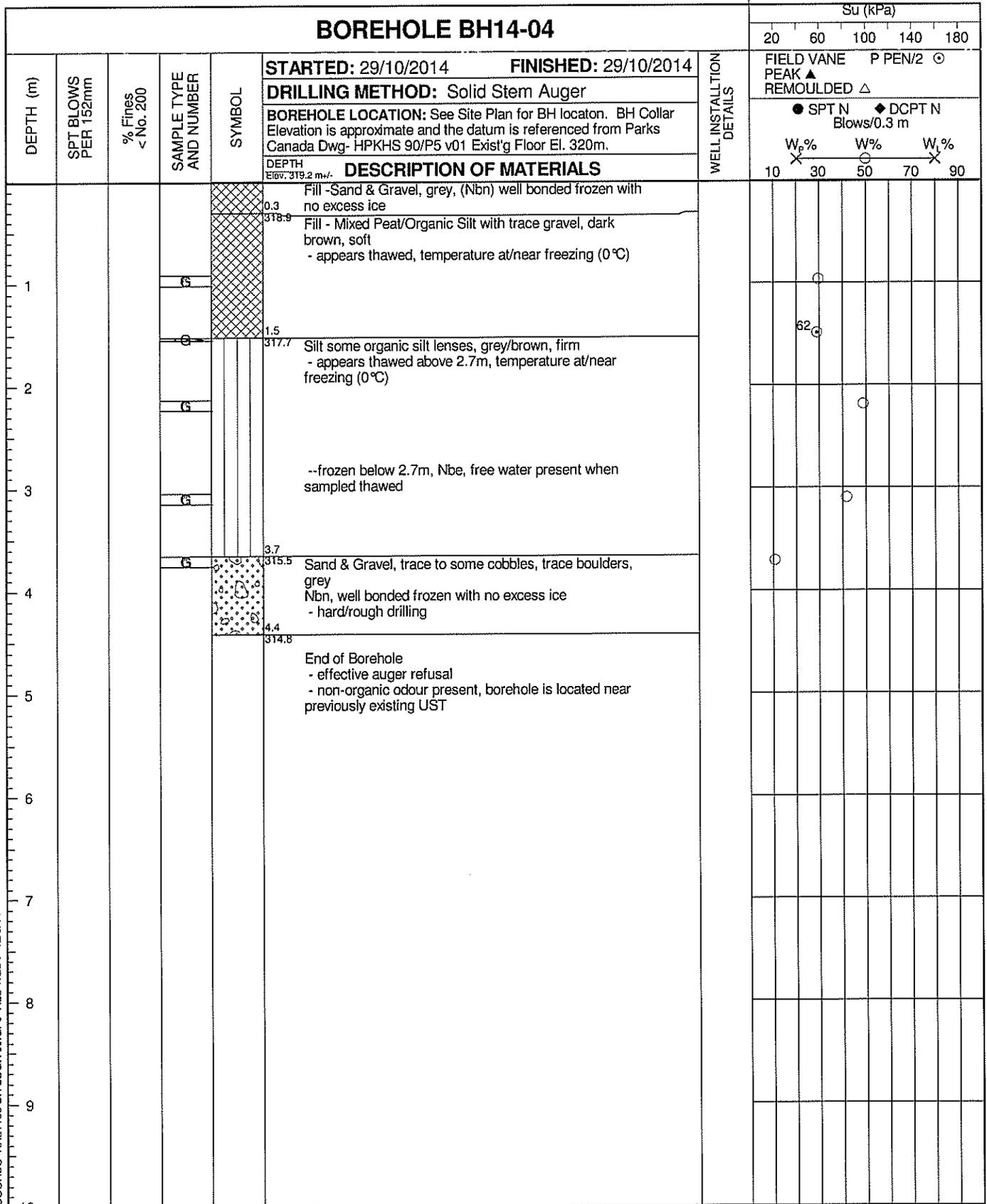
N-GEO-CONVERT-NO COORDS KA21109 BH LOG.V00.GPJ ALL-1.GDT 12/8/14



**AMEC Environment & Infrastructure**  
 18568 - 96 Avenue, Unit 110  
 Surrey, B.C. V4N 3P9

<b>PROJECT NO.:</b> KA21109	
<b>PROJECT:</b> Palace Grand Theater	
<b>LOCATION:</b> Dawson City, YT	
<b>LOGGED BY:</b> EDS	<b>REVIEWED BY:</b> BF
<b>SHEET 1 OF 1</b>	<b>BOREHOLE No. BH14-03</b>

# BOREHOLE BH14-04



N-GEO-CONVERT-NO COORDS KA21109 BH LOG.V00.GPJ ALL-1.GDT 12/8/14



**AMEC Environment & Infrastructure**  
18568 - 96 Avenue, Unit 110  
Surrey, B.C. V4N 3P9

<b>PROJECT NO.:</b> KA21109	
<b>PROJECT:</b> Palace Grand Theater	
<b>LOCATION:</b> Dawson City, YT	
<b>LOGGED BY:</b> EDS	<b>REVIEWED BY:</b> BF
<b>SHEET 1 OF 1</b>	<b>BOREHOLE No. BH14-04</b>

17 April 2015

Amec Foster Wheeler File: KA21109



Professional and Technical Services  
PWGSC - Operations, Pacific Region  
#641 – 800 Burrard Street  
Vancouver, BC V6A 2V8

Attention: Mr. David Chang, P.Eng.

Dear Sir,

Reference: Lateral Pile Analysis  
Proposed Renovation of Palace Grand Theatre  
Dawson City, YT

As requested, and further to our letter of April 8, 2015 and email of April 10, 2015, we have carried out lateral pile analysis for proposed pipe piles to be installed beneath the Palace Grand Theatre in Dawson City, YT.

Inputs into the analysis were:

Vertical load: 150 kN  
Lateral load: 50 kN  
Pile Diameter: 300 mm and 350 mm  
Pile Wall Thickness: 10 mm

Soil conditions beneath the theatre were assumed to be: 0.6 m from crawl space floor to the connection at the top of the pile, 1.2 m active layer and permanently frozen ground below the active layer. We also analysed for one case with a 1.0 m crawl space and 1.5 m thick active layer.

It is assumed that the active layer provides only a modest 12 kPa lateral load resistance. It is also assumed that there is no moment transfer at the top of the piles.

We analysed for piles filled with 25 MPa concrete and five 20M steel bars and piles filled with adfreeze and no reinforcing steel.

We analysed for long term (20 years) and short term displacement (30 days).

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[www.amecfw.com](http://www.amecfw.com)

We also analysed the same configurations to determine the lateral load which resulted in a displacement of 25 mm. The results of lateral pile analysis are tabulated below:

**Table 1: Displacement under a lateral load of 50 kN**

Case	Pile / fill configuration	Pile diameter (mm)	Displacement (mm)	Figure No.
Short term (30 day load duration) Free length plus active layer = 1.8 m	25 MPa Concrete and 5- 20M steel bars	350	15	1
		300	24	1
	Adfreeze	350	18	2
		300	29	2
Long term (20 year) load. Free length plus active layer = 1.8 m	25MPa Concrete and 5-20M steel bars	350	31	3
		300	51	3
	Adfreeze	350	39	4
		300	60	4
Long term load. Free length plus active layer = 2.5 m	25 MPa Concrete and 5-20M steel bars	350	50	5
		300	82	5

**Table 2: Lateral load resulting in a displacement of 25 mm**

Case	Pile/fill configuration	Pile diameter (mm)	Load (kN)	Figure No.
Short term (30 day load duration) Free length plus active layer = 1.8 m	25 MPa concrete plus steel bars	350	70	6
		300	51	7
	Adfreeze	350	62	8
		300	46	9
Long term (20 year) load. Free length plus active layer = 1.8 m	25 MPa concrete plus steel bars	350	43	10
		300	32	11
	Adfreeze	350	38	12
		300	28	13

Note that increasing the free length / active layer from 1.8 m to 2.5 m has a large effect on the lateral displacement. The displacement is almost doubled for the 350 mm diameter pile.

As further requested by the structural engineer, we analyzed more cases, presented in Table 3 and Table 4. These cases determined maximum lateral loads for both long term and short term scenarios while limiting lateral displacement to 8 mm. The free lengths of pile were assumed to be 0.75 m and 0.1 m.

**Table 3: Lateral load resulting in a displacement of 8 mm for Short Term (30 Days)**

Shear Strength of Active Layer	Thickness of Active Layer		Figure No.
	1.5 m	1.8 m	
	Maximum Lateral Load		
12 kPa	26 kN	23 kN	14 & 15
6 kPa	24 kN	21 kN	16 & 17
0 kPa	22 kN	18 kN	18 & 19

Note: Free length of pile is assumed to be 0.75 m in Table 3.

**Table 4: Lateral load resulting in a displacement of 8 mm for Long Term (20 Years)**

Shear Strength of Active Layer	Thickness of Active Layer		Figure No.
	1.5 m	1.8 m	
	Maximum Lateral Load		
12 kPa	27 kN	25 kN	20 & 21
6 kPa	23 kN	21 kN	22 & 23
0 kPa	17 kN	15 kN	24 & 25

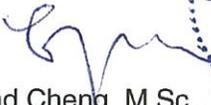
Note: Free length of pile is assumed to be 0.1 m in Table 4.

Individual L-Pile graphs are appended.

If you have questions regarding the above or require additional information, please contact our office at your convenience.

Yours truly,

**Amec Foster Wheeler Environment & Infrastructure,  
 a division of Amec Foster Wheeler Americas Limited**




April 17, 2015

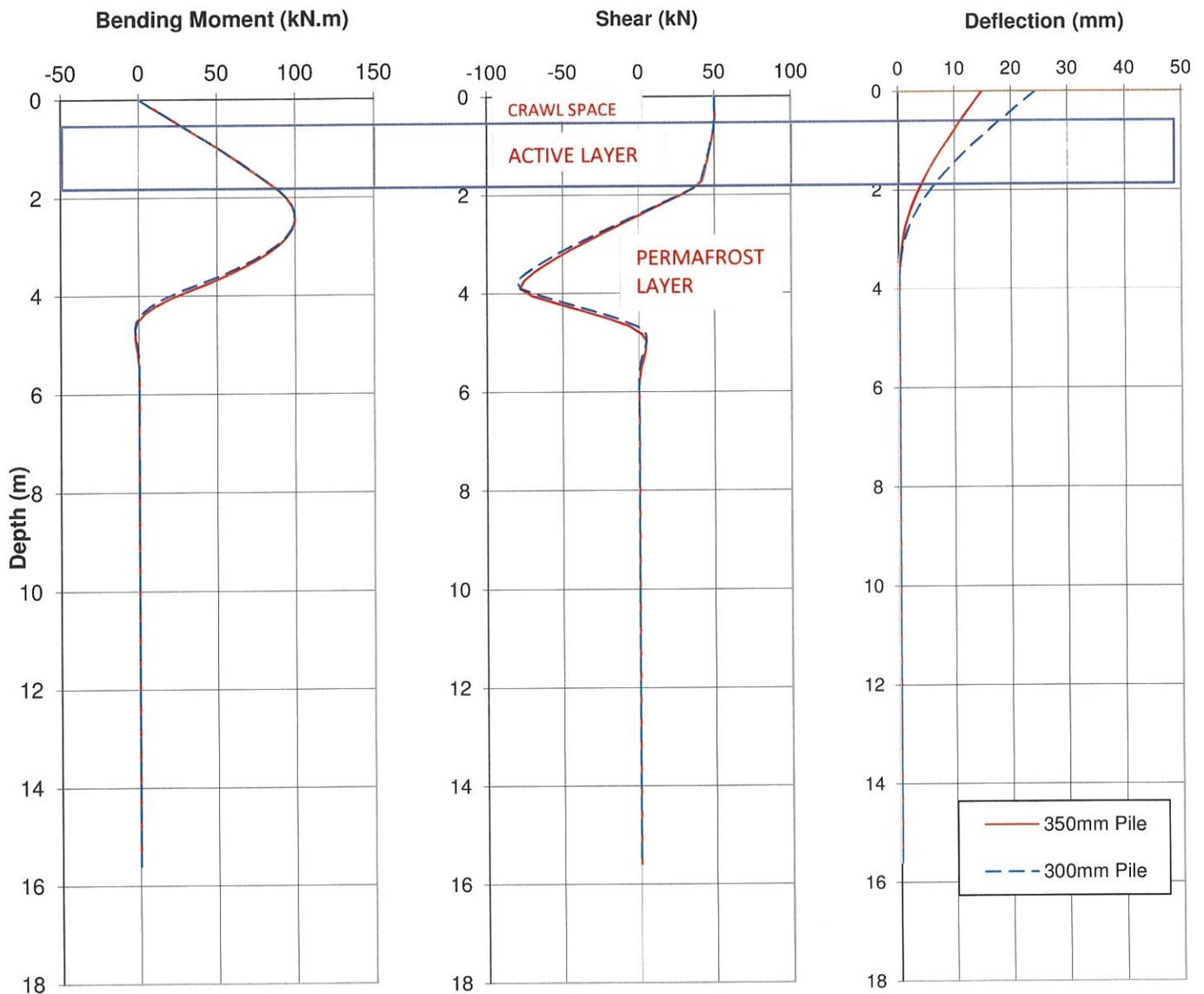
Brad Cheng, M.Sc., P.Eng., P.E.  
 Geotechnical Engineer

Reviewed by:



Forsyth, M.B.A., P.Eng.  
 Associate Geotechnical Engineer  
 Manager, Surrey Office

**Figure 1: L-Pile Analysis (30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

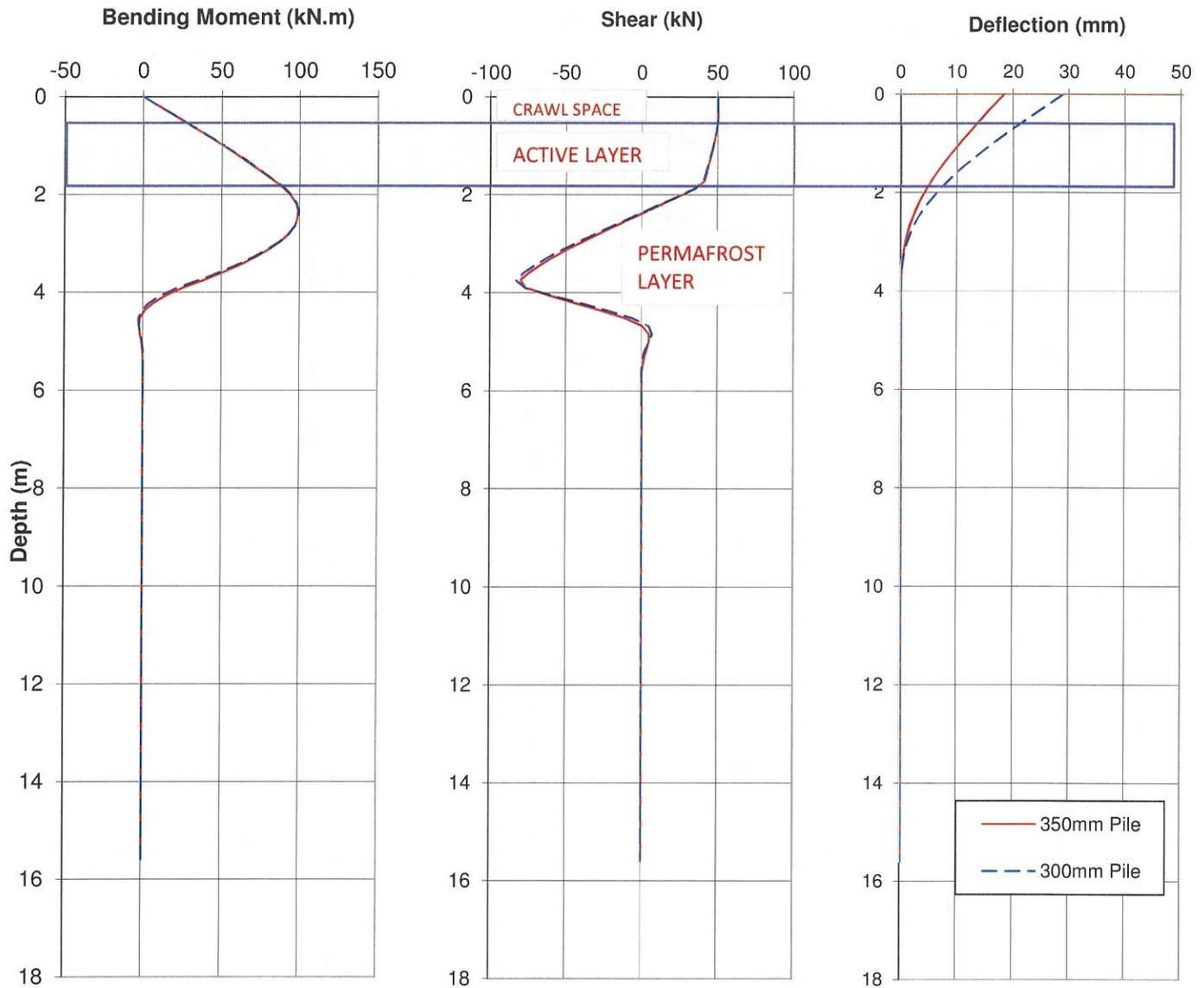
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 50 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 2: L-Pile Analysis (30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and open ended.

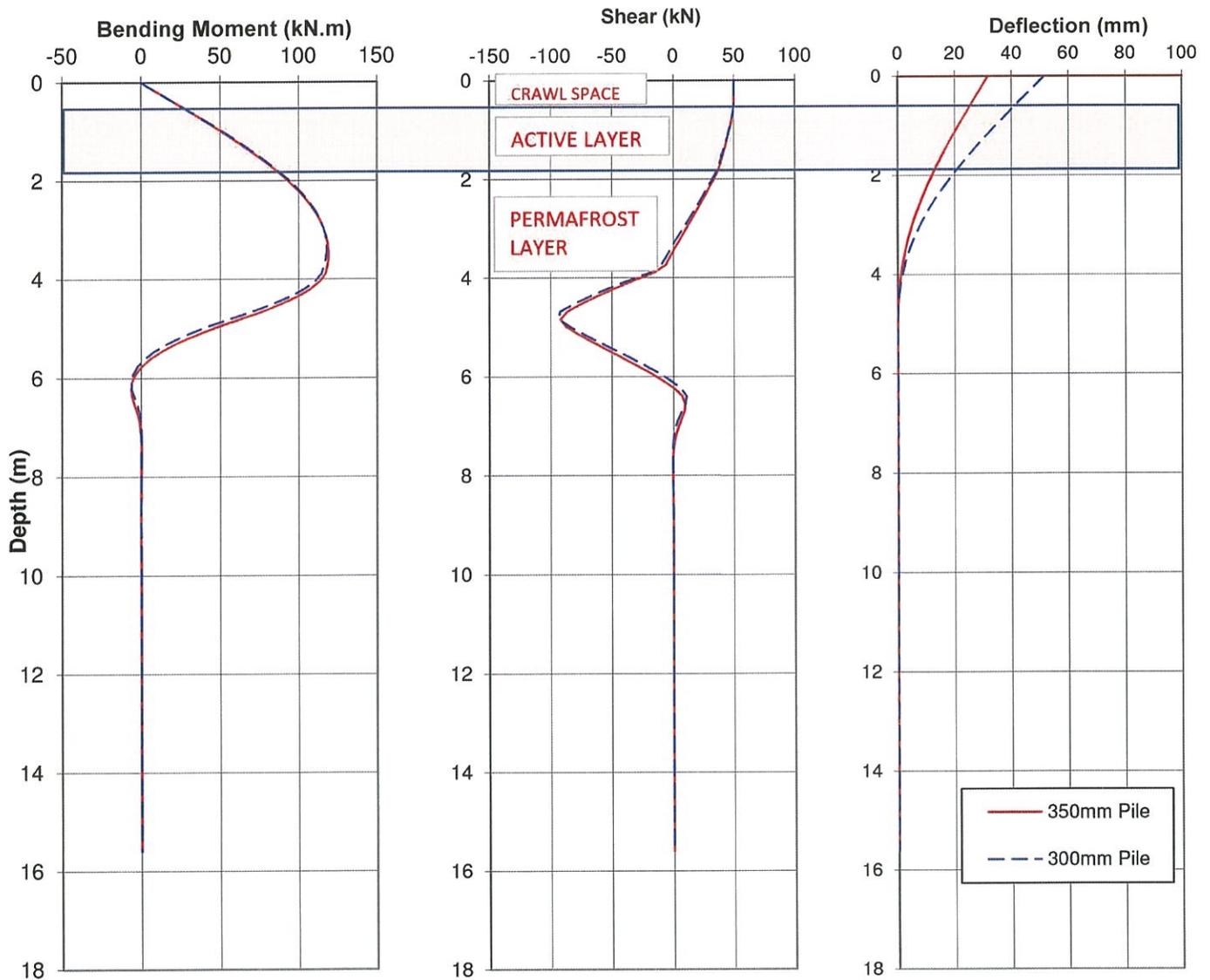
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 50 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 3: L-Pile Analysis (Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

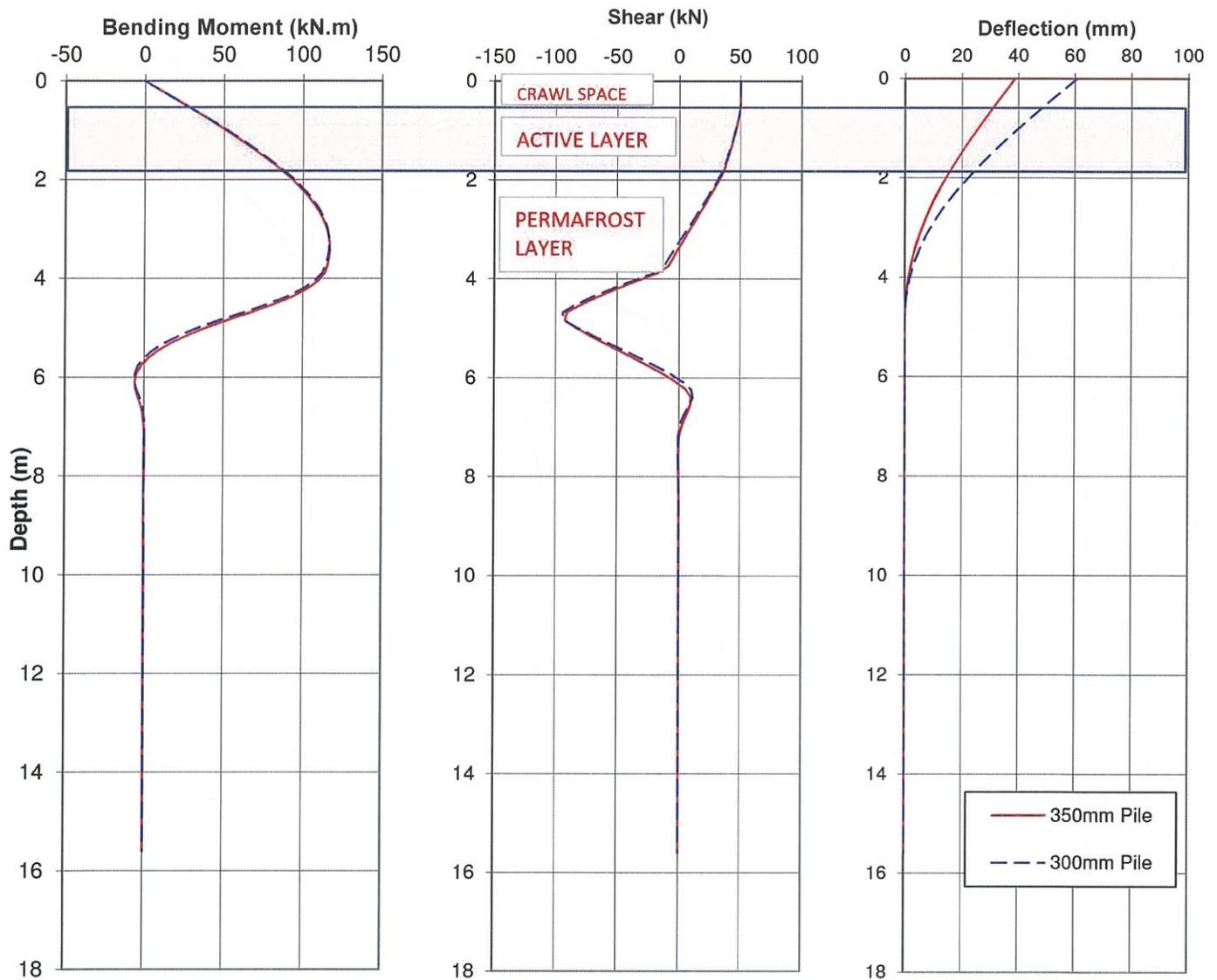
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 50 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 4: L-Pile Analysis (Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and open ended.

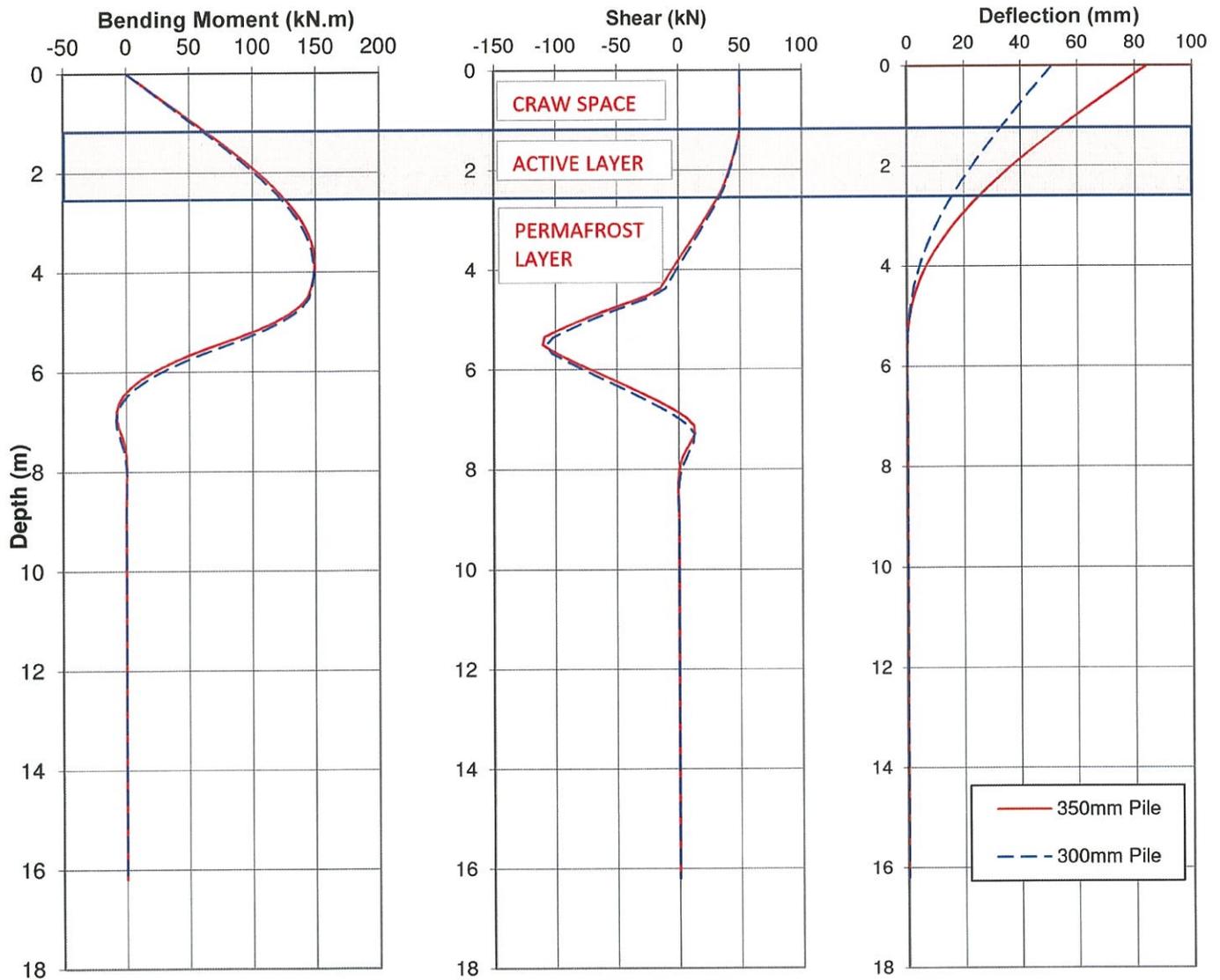
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 50 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 5: L-Pile Analysis (Long Term)**



The depth taken from the top of steel pile, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

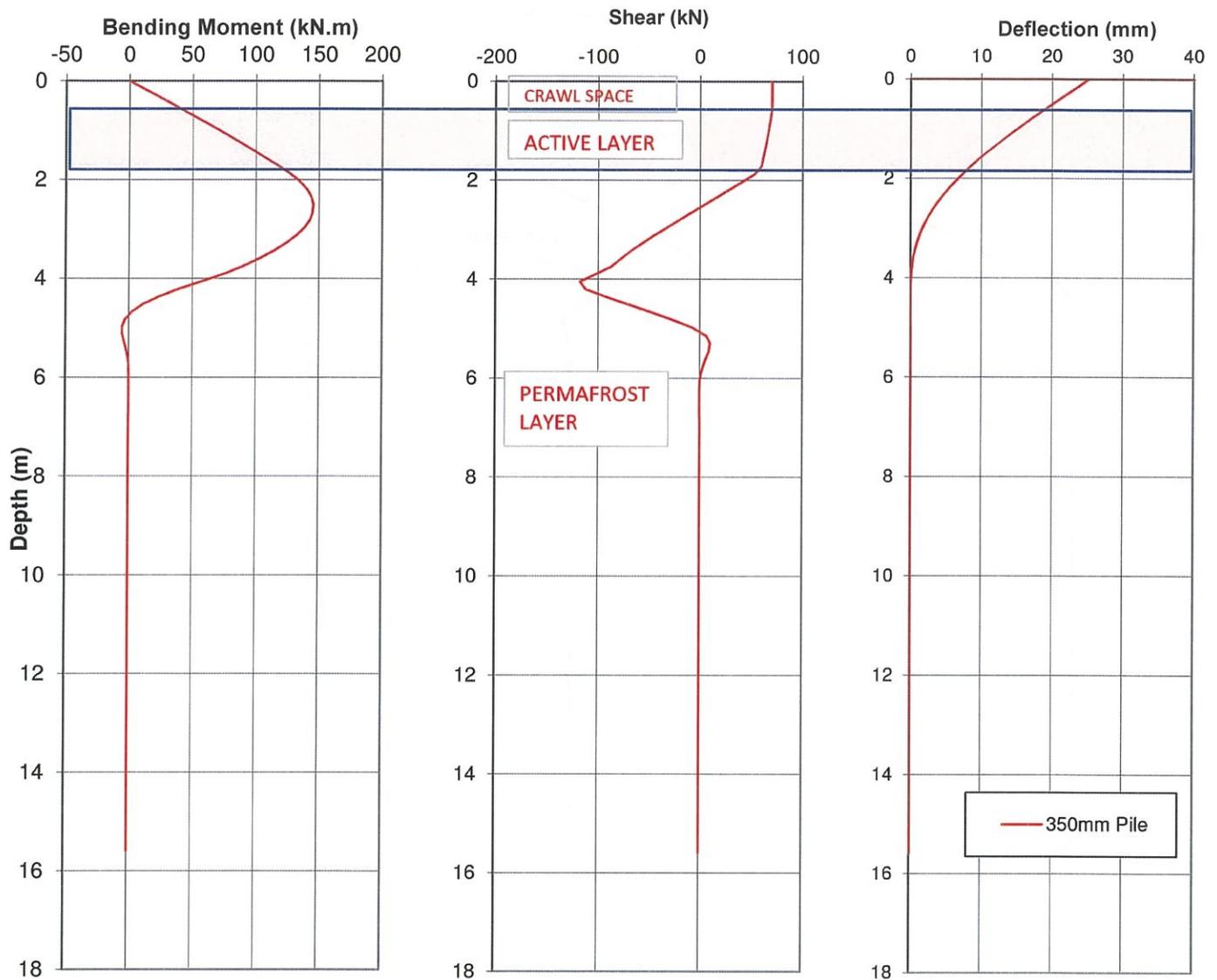
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 50 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 6: L-Pile Analysis (350mm Pile, 30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

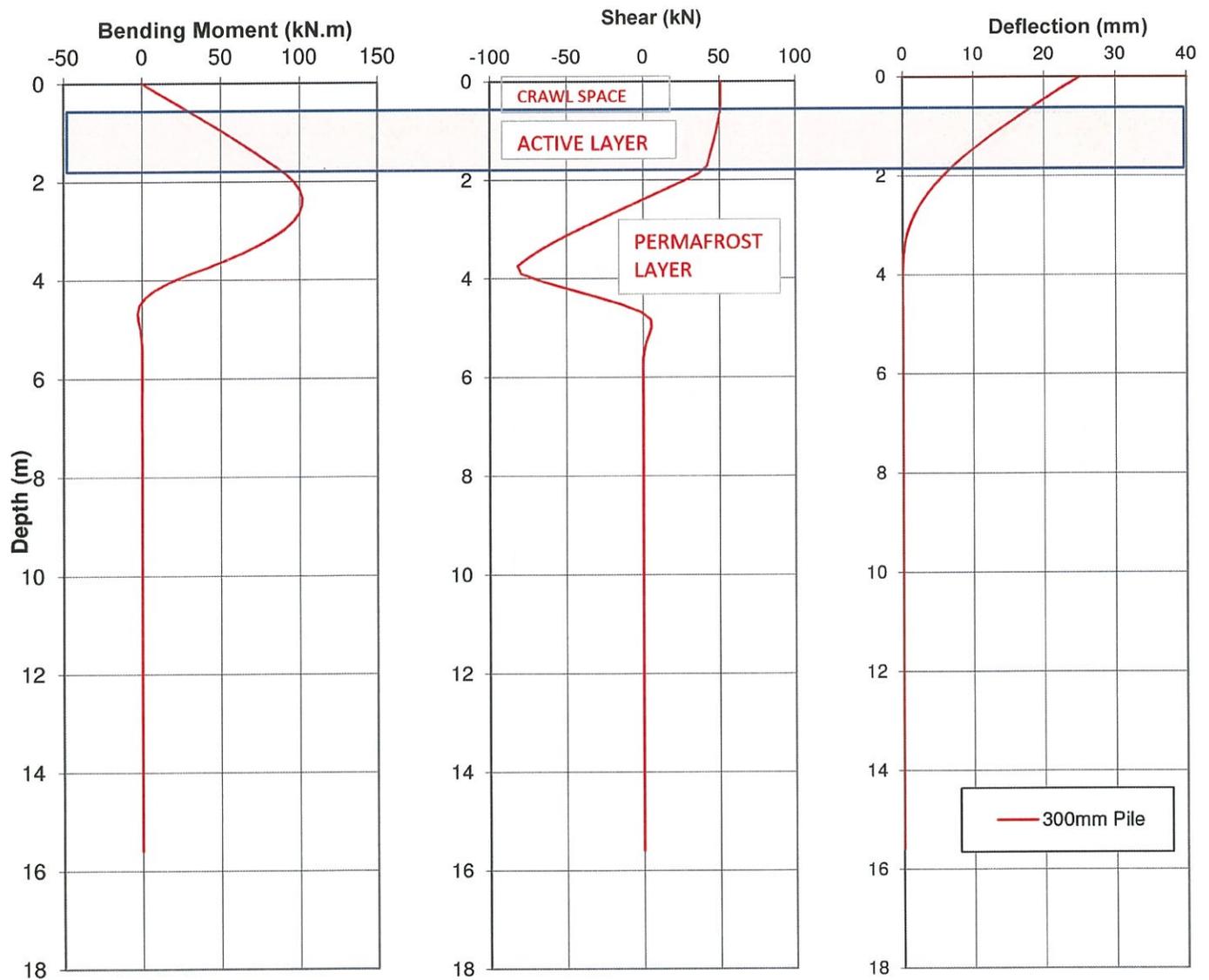
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 70 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 7: LPile Analysis (300mm Pile, 30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

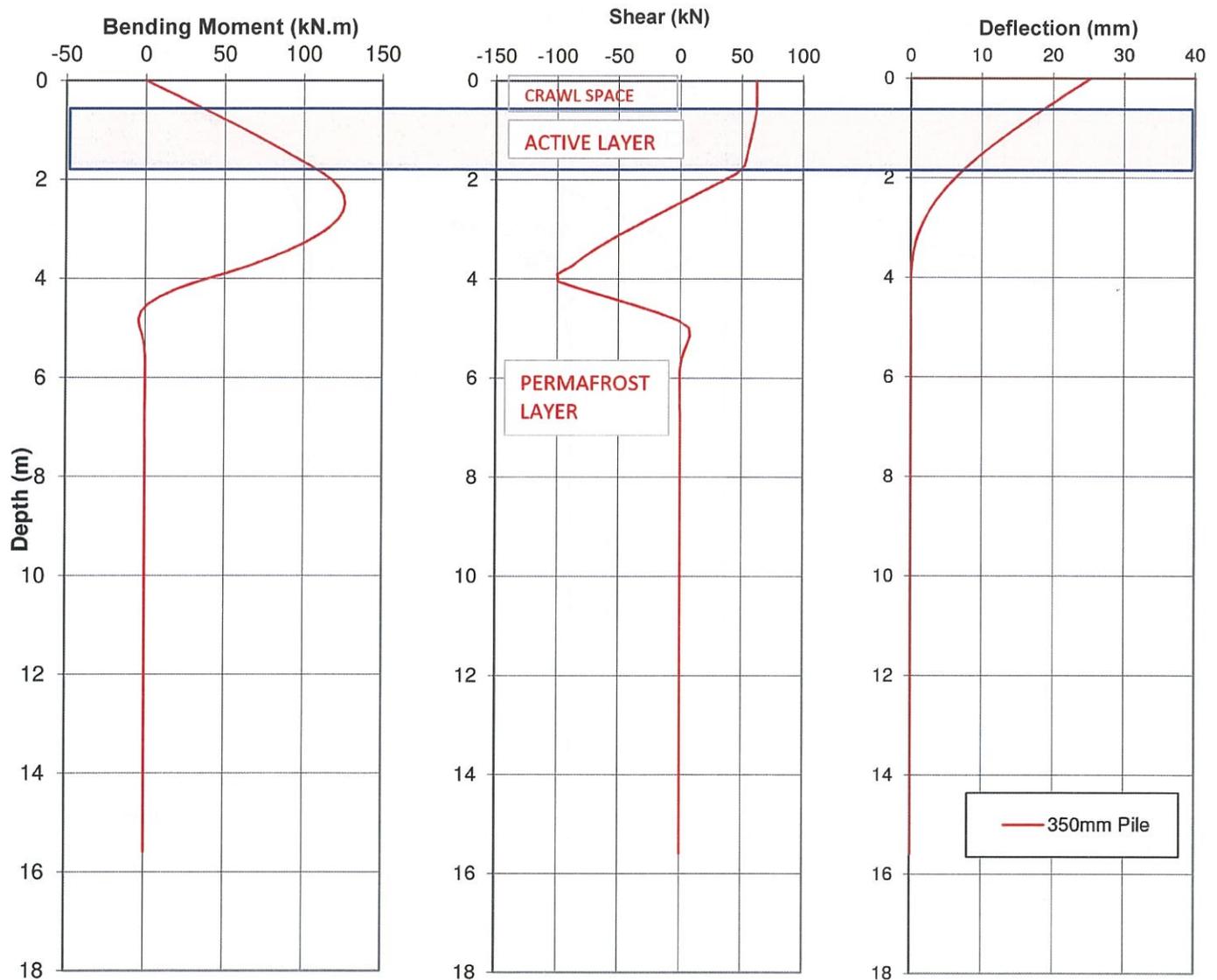
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 51 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 8: L-Pile Analysis (350mm Pile, 30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and open ended.

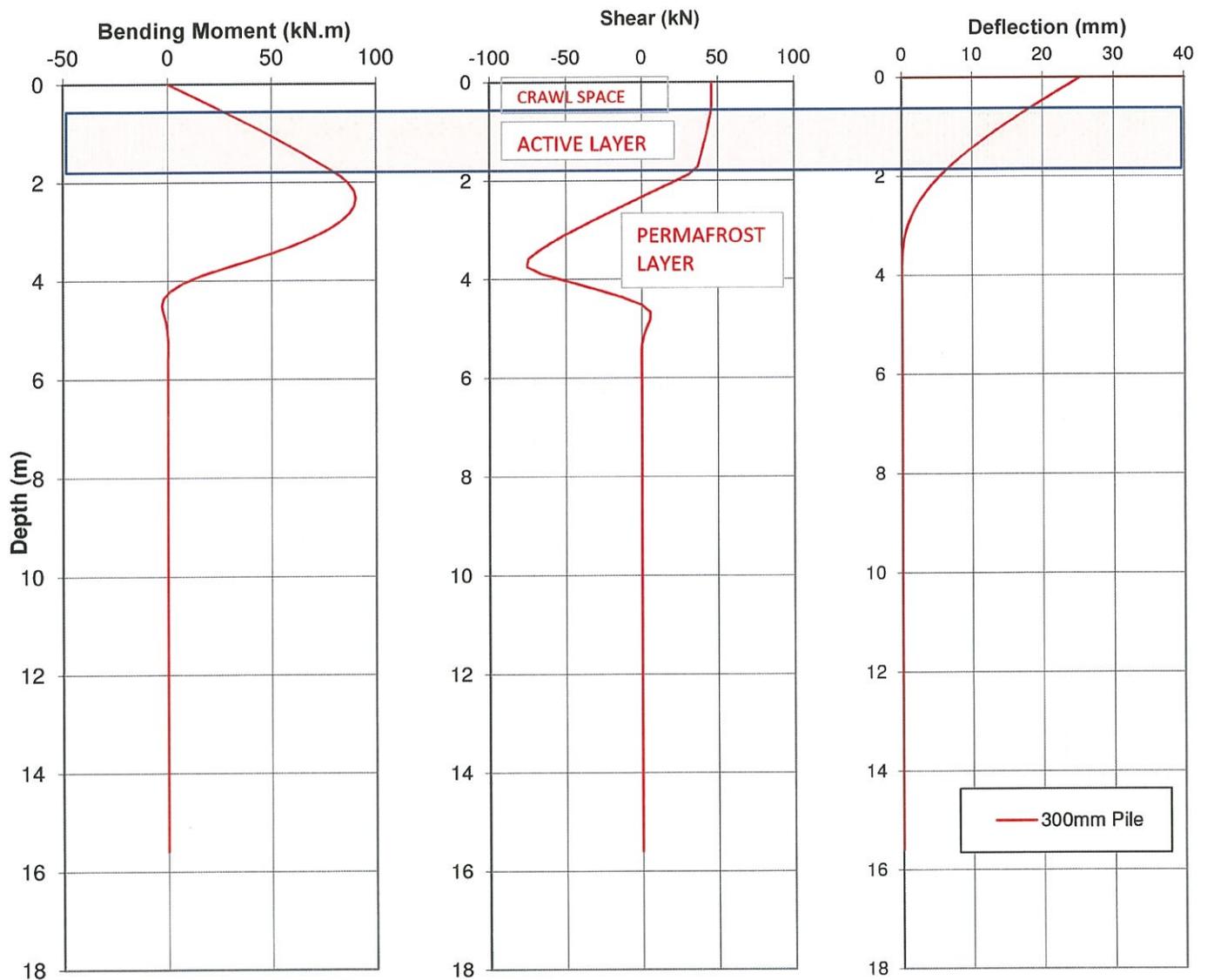
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 62 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 9: L-Pile Analysis (300mm Pile, 30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and open ended.

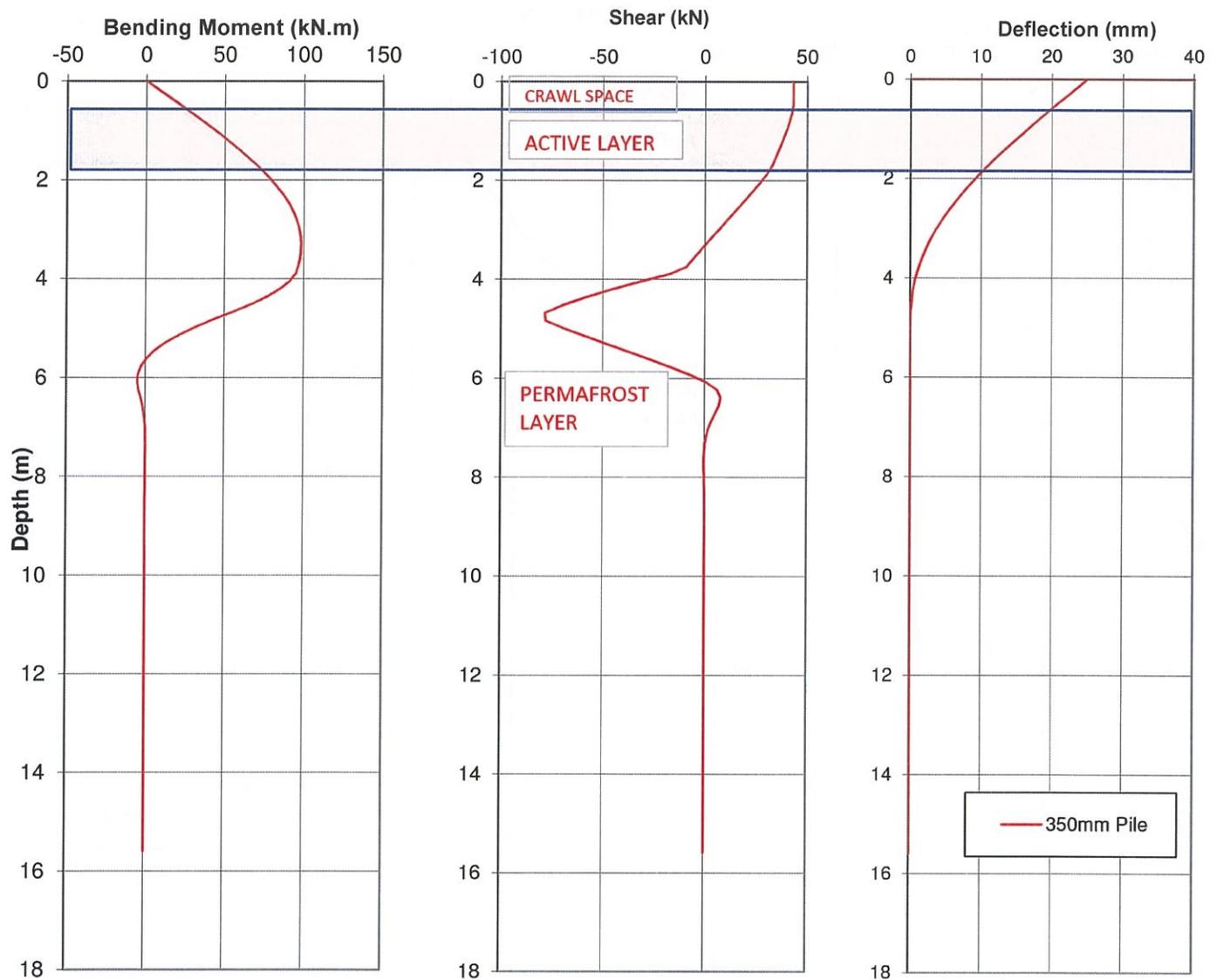
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 46 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 10: L-Pile Analysis (350mm Pile, Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

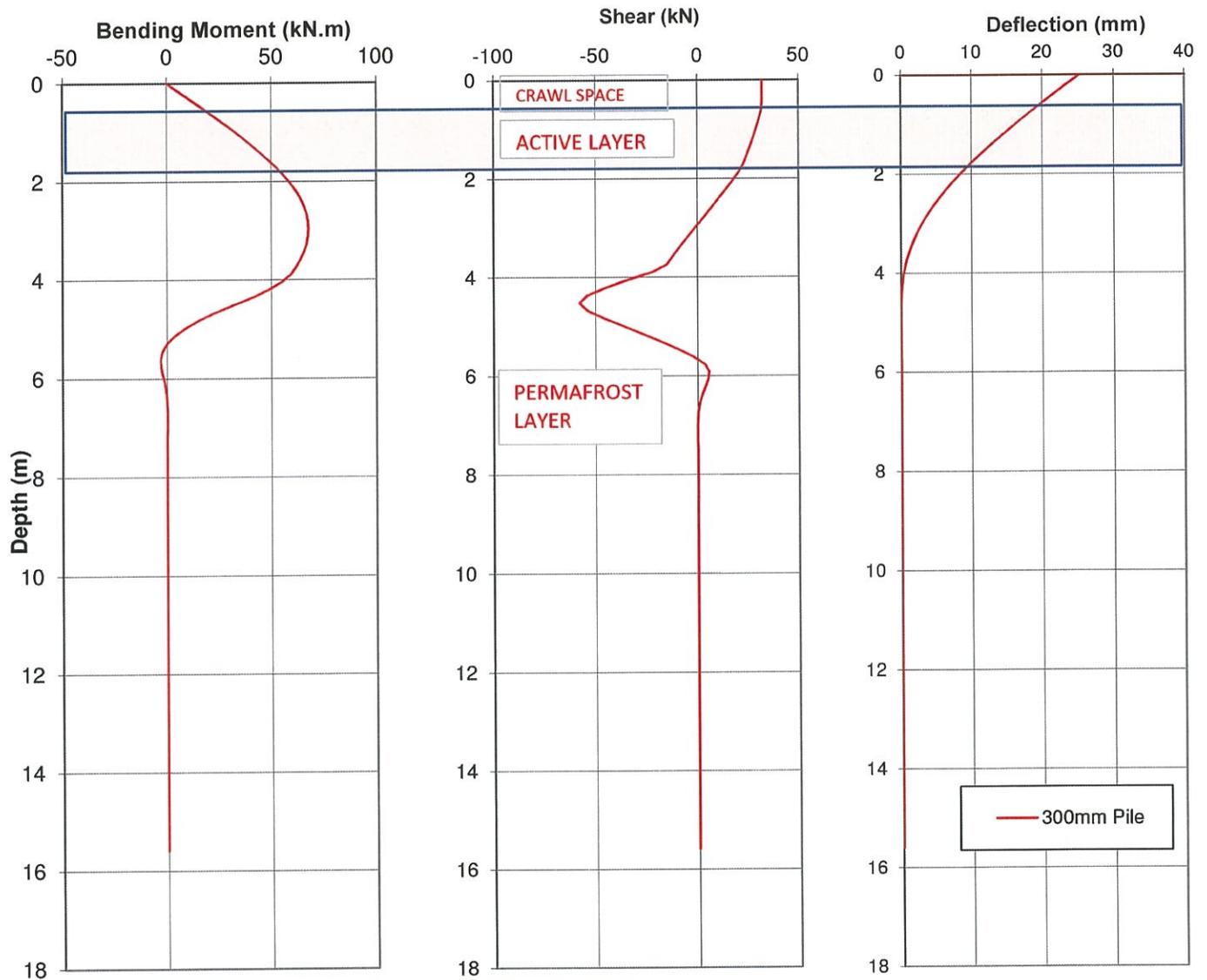
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 43 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 11: L-Pile Analysis (300mm Pile, Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

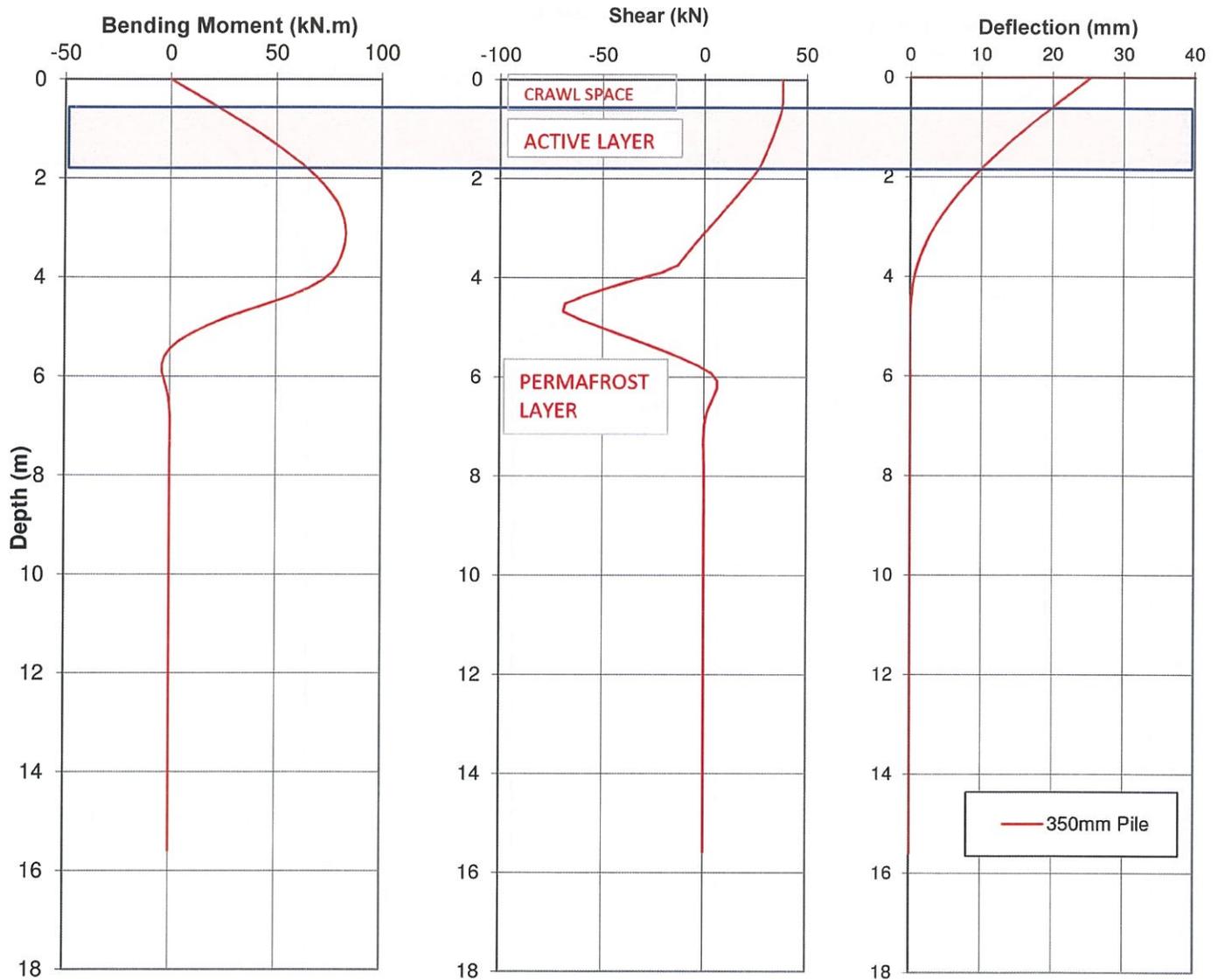
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 32 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 12: L-Pile Analysis (350mm Pile, Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and open ended.

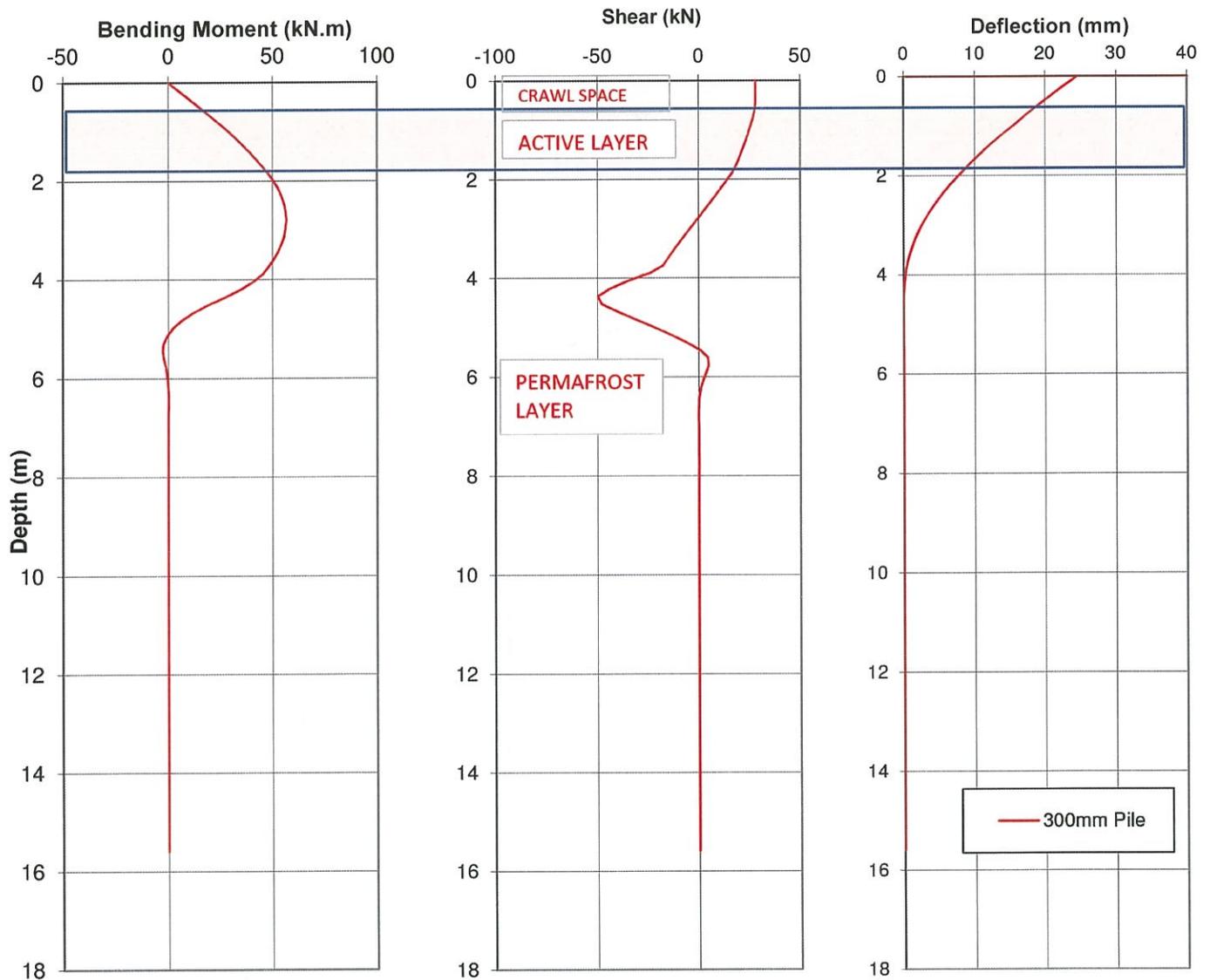
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 38 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 13: L-Pile Analysis (300mm Pile, Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and open ended.

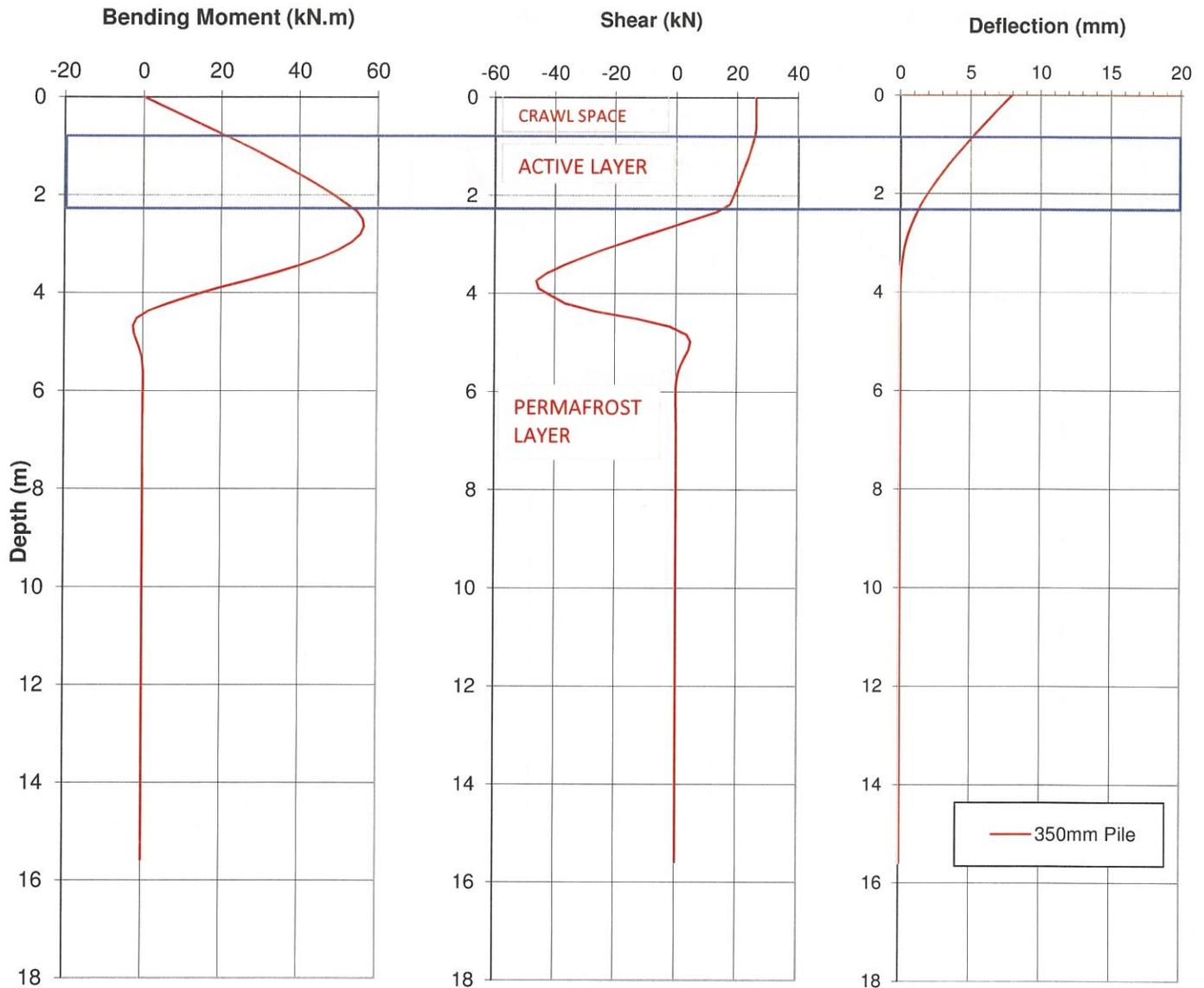
Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 28 kN

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 14: LPile Analysis (350mm Pile, 30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

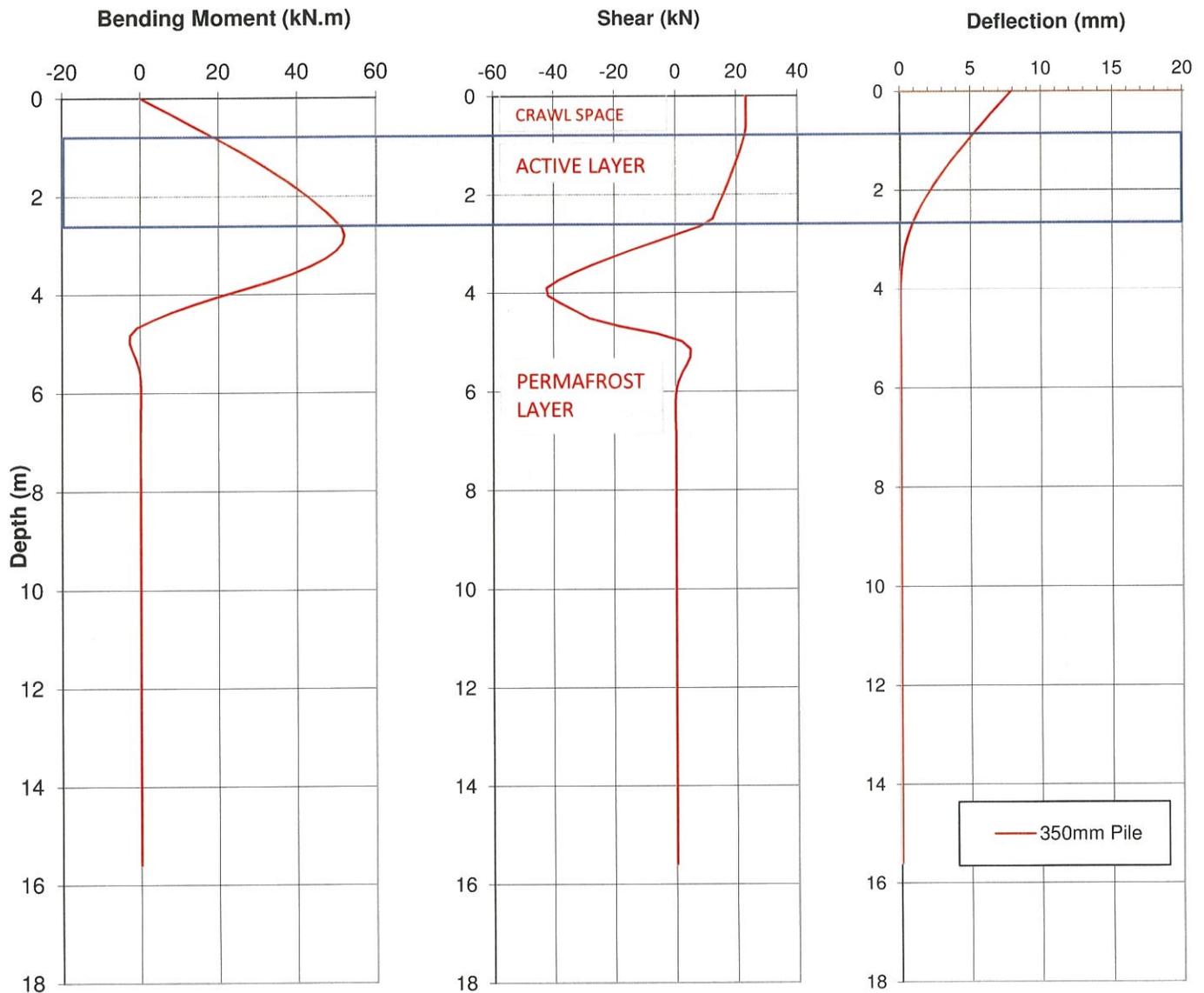
**Factored Loads:**

Max Vertical Compression = 150 kN  
Max Lateral Force = 26 kN

Free Length of Pile = 0.75 m  
Thickness of Active Layer = 1.5 m  
Shear Strength of Active Layer = 12 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 15: LPile Analysis (350mm Pile, 30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 23 kN

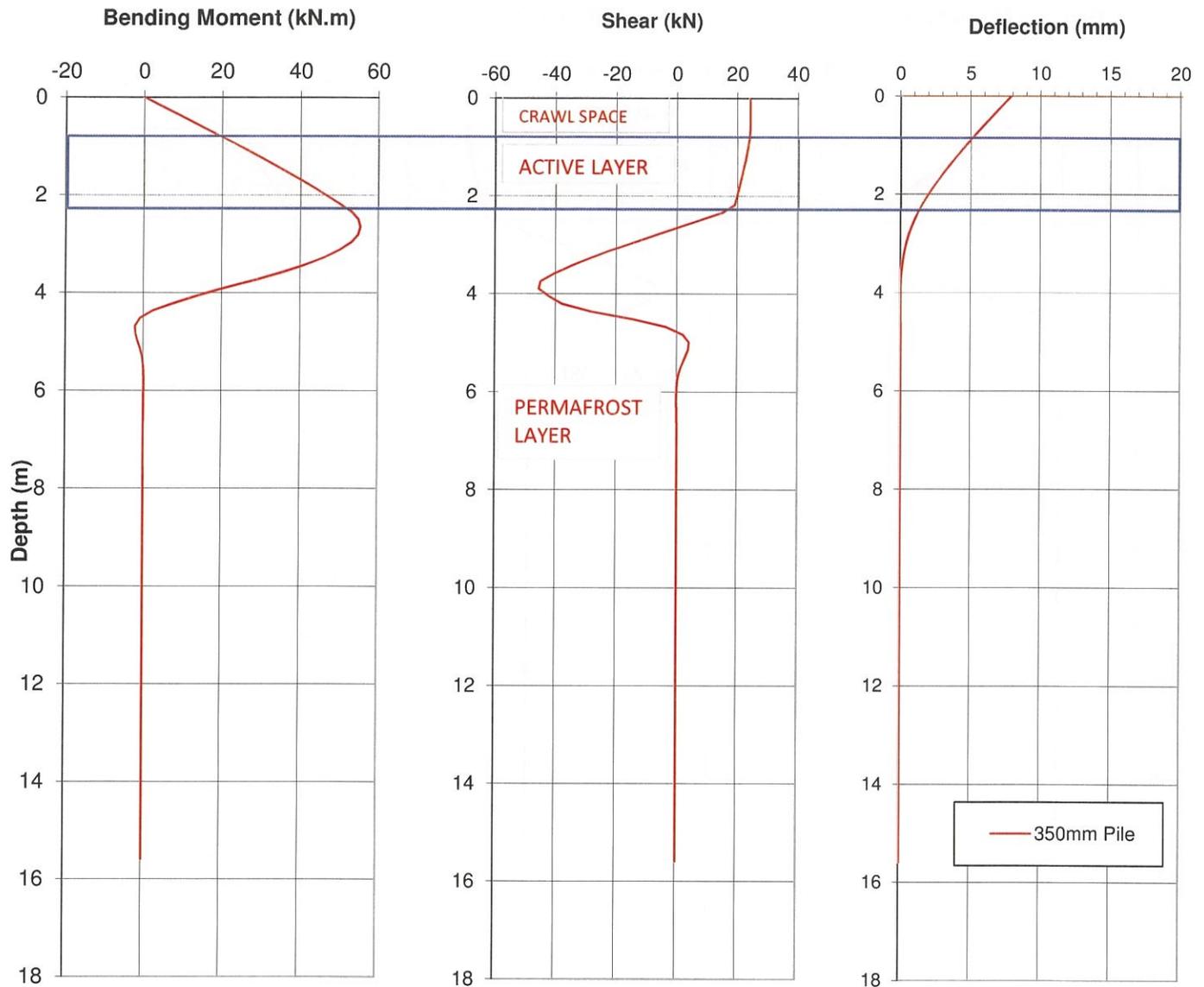
Free Length of Pile = 0.75 m

Thickness of Active Layer = 1.8 m

Shear Strength of Active Layer = 12 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 16: LPile Analysis (350mm Pile, 30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 24 kN

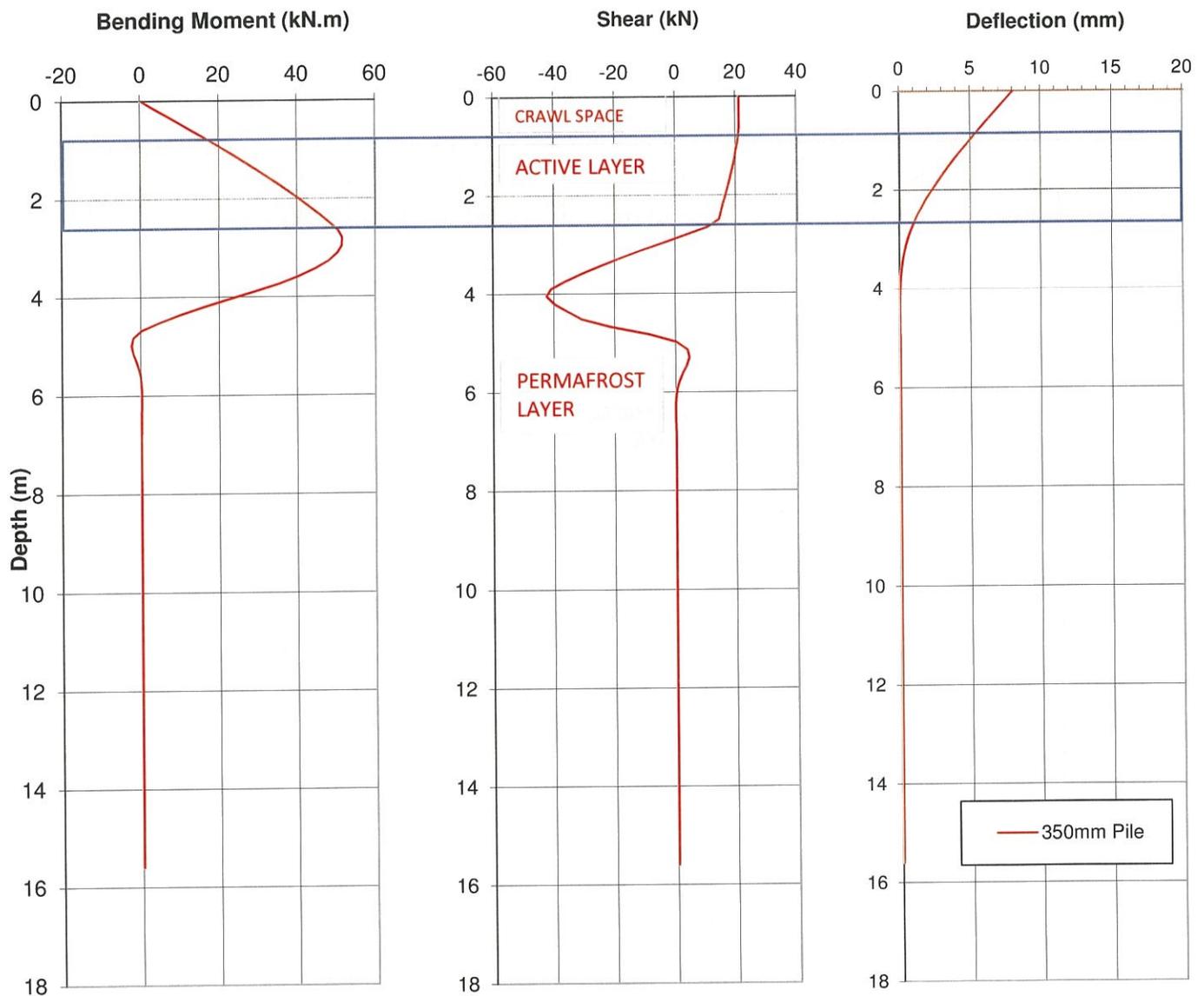
Free Length of Pile = 0.75 m

Thickness of Active Layer = 1.5 m

Shear Strength of Active Layer = 6 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 17: L-Pile Analysis (350mm Pile, 30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 21 kN

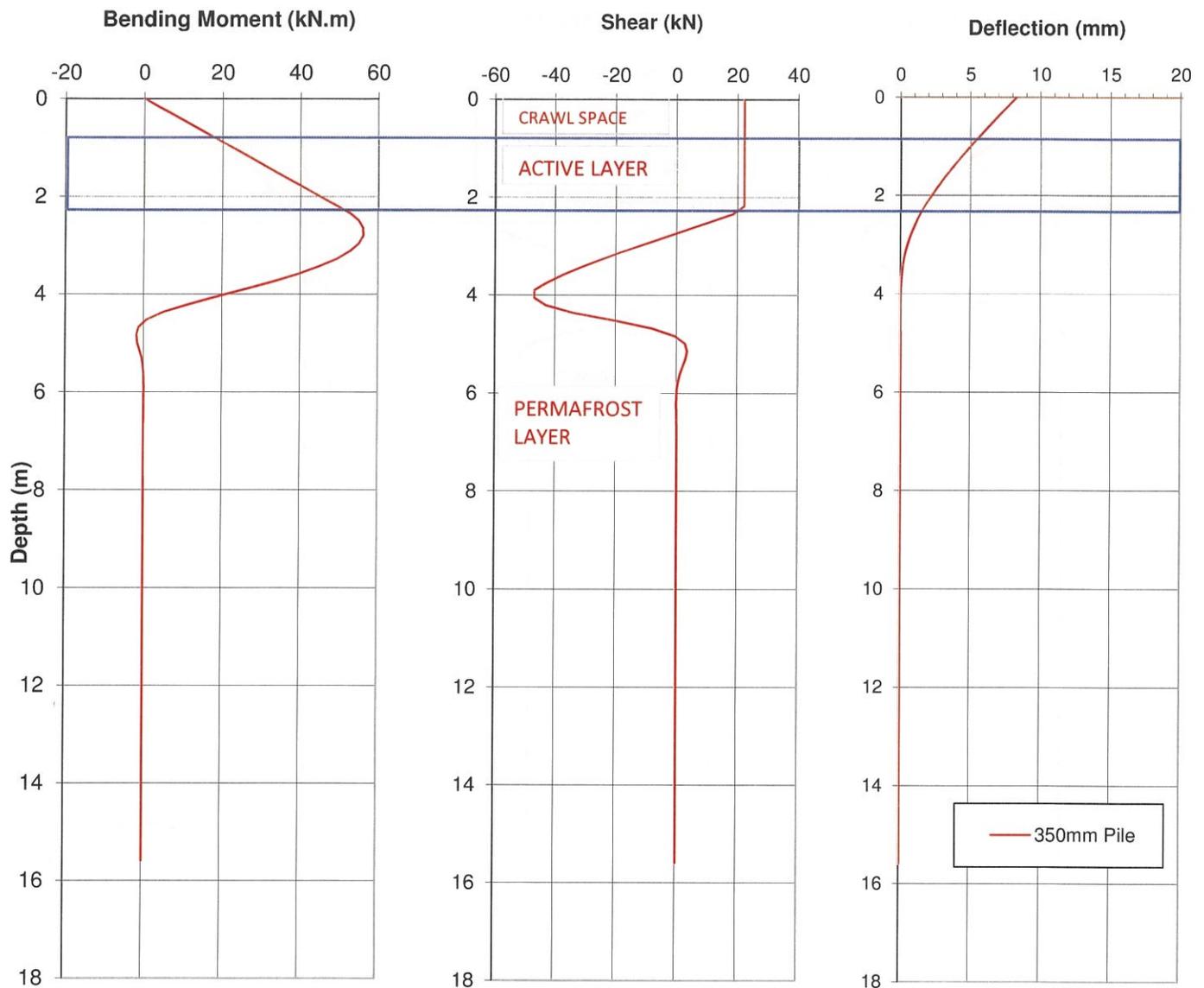
Free Length of Pile = 0.75 m

Thickness of Active Layer = 1.8 m

Shear Strength of Active Layer = 6 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 18: L-Pile Analysis (350mm Pile, 30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 22 kN

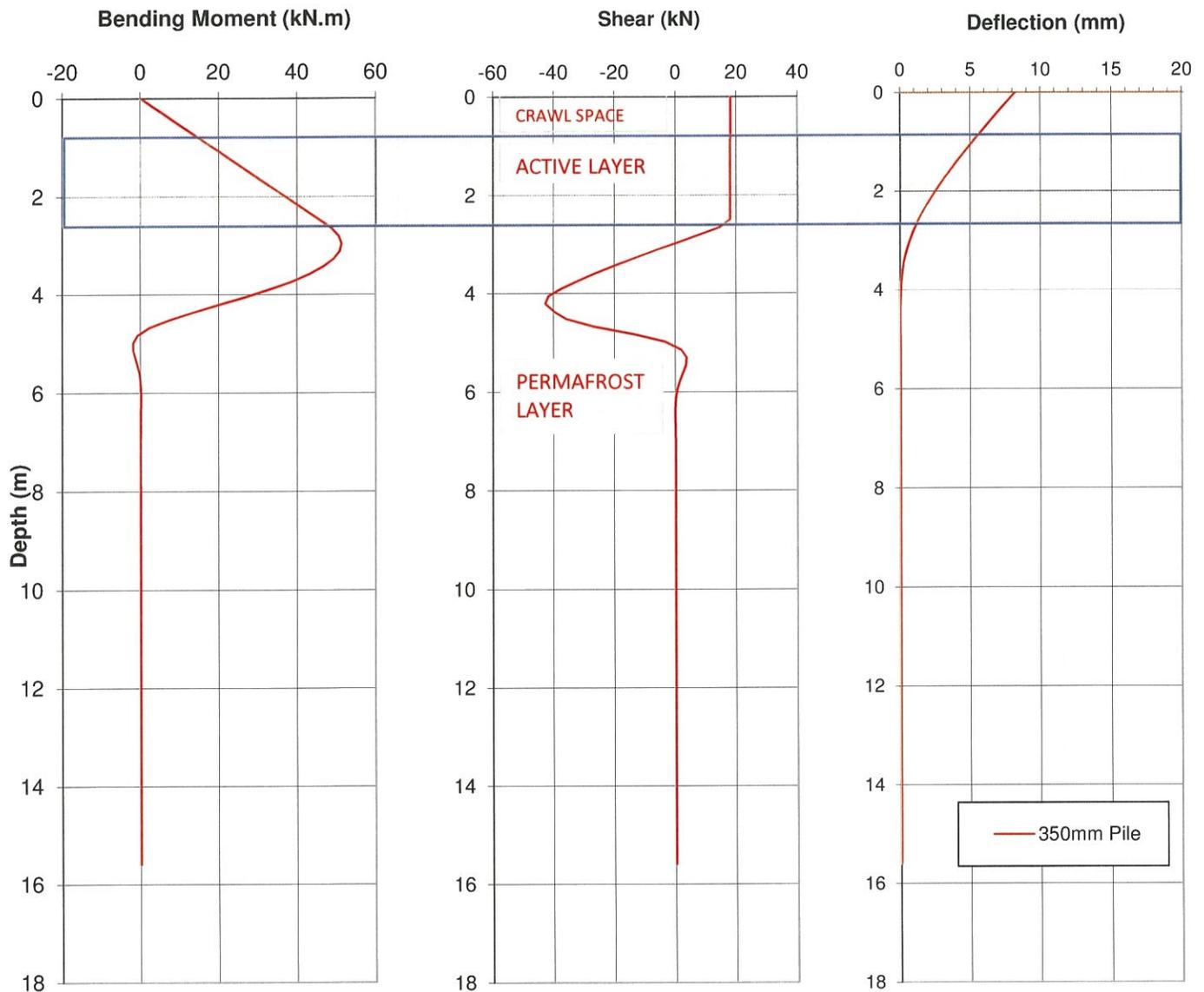
Free Length of Pile = 0.75 m

Thickness of Active Layer = 1.5 m

Shear Strength of Active Layer = 0 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 19: L-Pile Analysis (350mm Pile, 30 Day Load Duration)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 18 kN

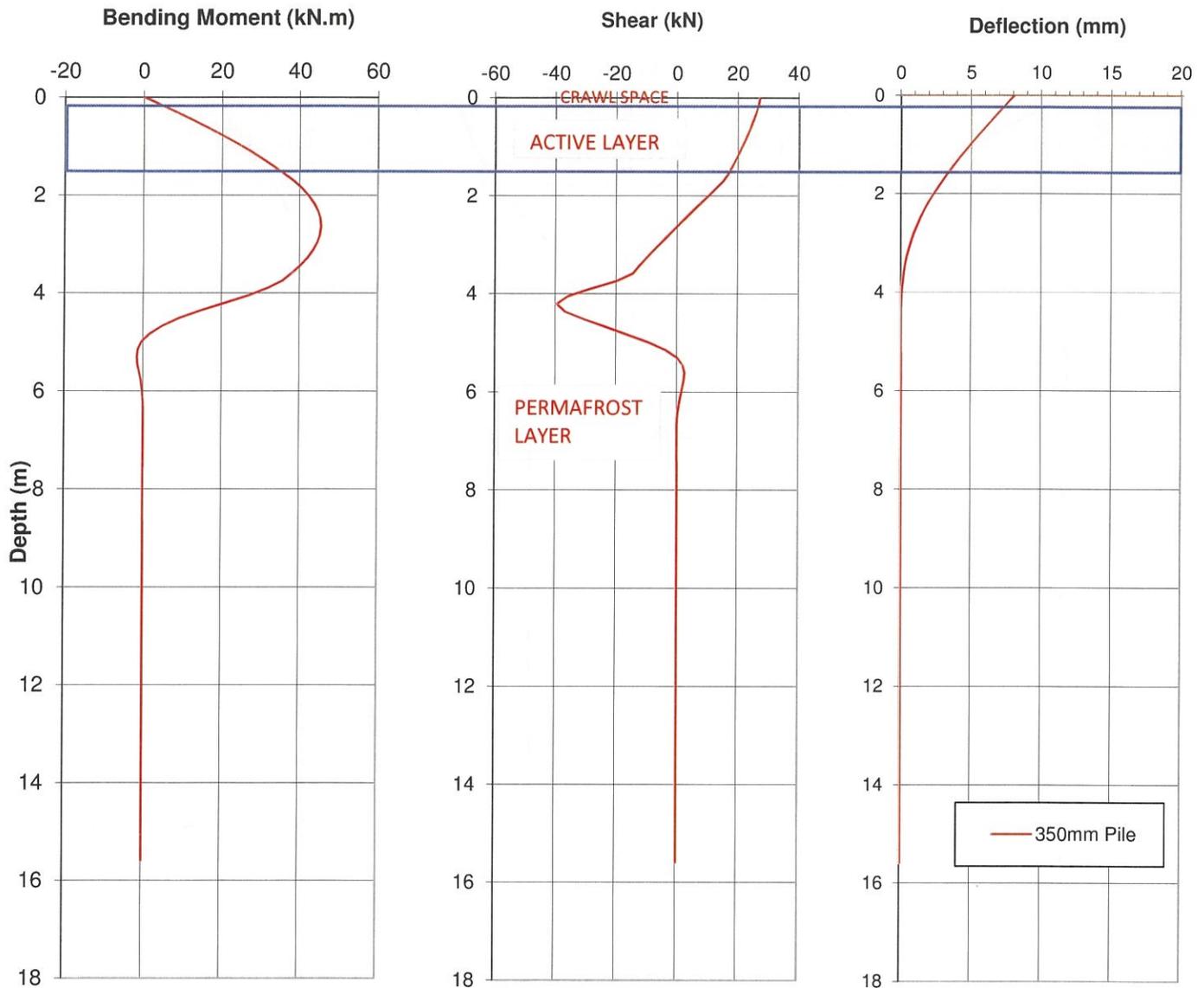
Free Length of Pile = 0.75 m

Thickness of Active Layer = 1.8 m

Shear Strength of Active Layer = 0 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 20: LPile Analysis (350mm Pile, Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 27 kN

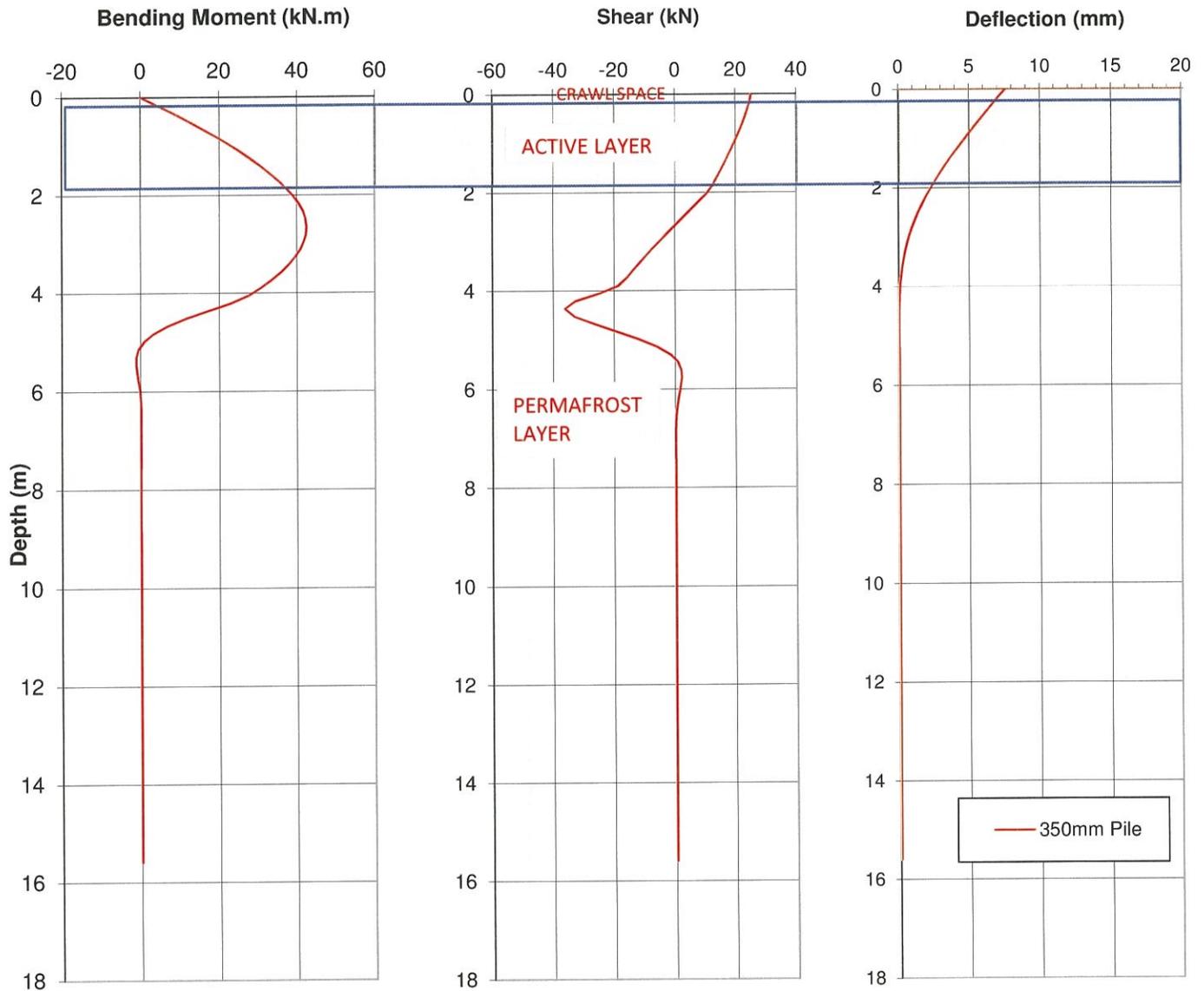
Free Length of Pile = 0.1 m

Thickness of Active Layer = 1.5 m

Shear Strength of Active Layer = 12 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 21: L-Pile Analysis (350mm Pile, Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 25 kN

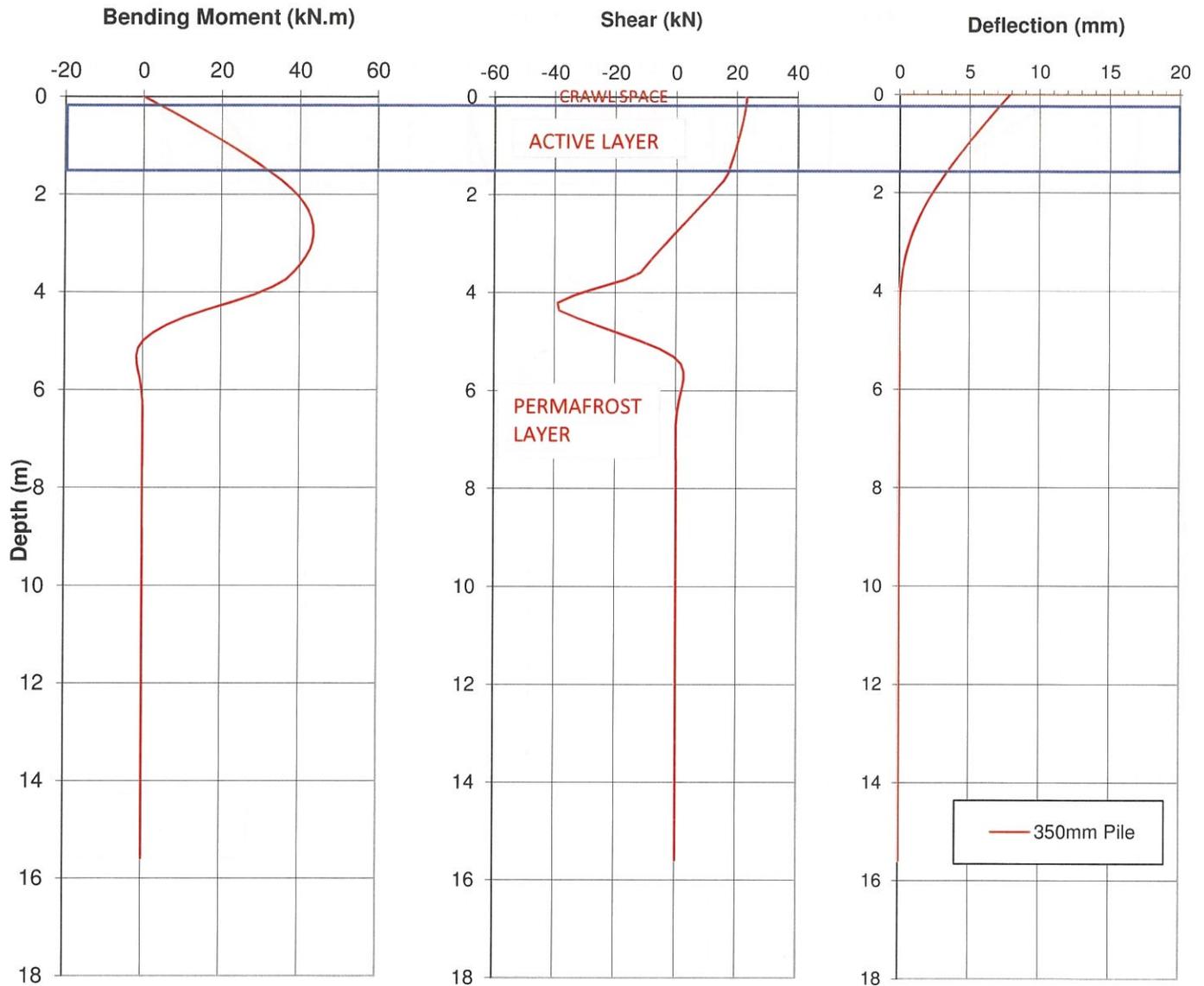
Free Length of Pile = 0.1 m

Thickness of Active Layer = 1.8 m

Shear Strength of Active Layer = 12 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 22: LPile Analysis (350mm Pile, Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 23 kN

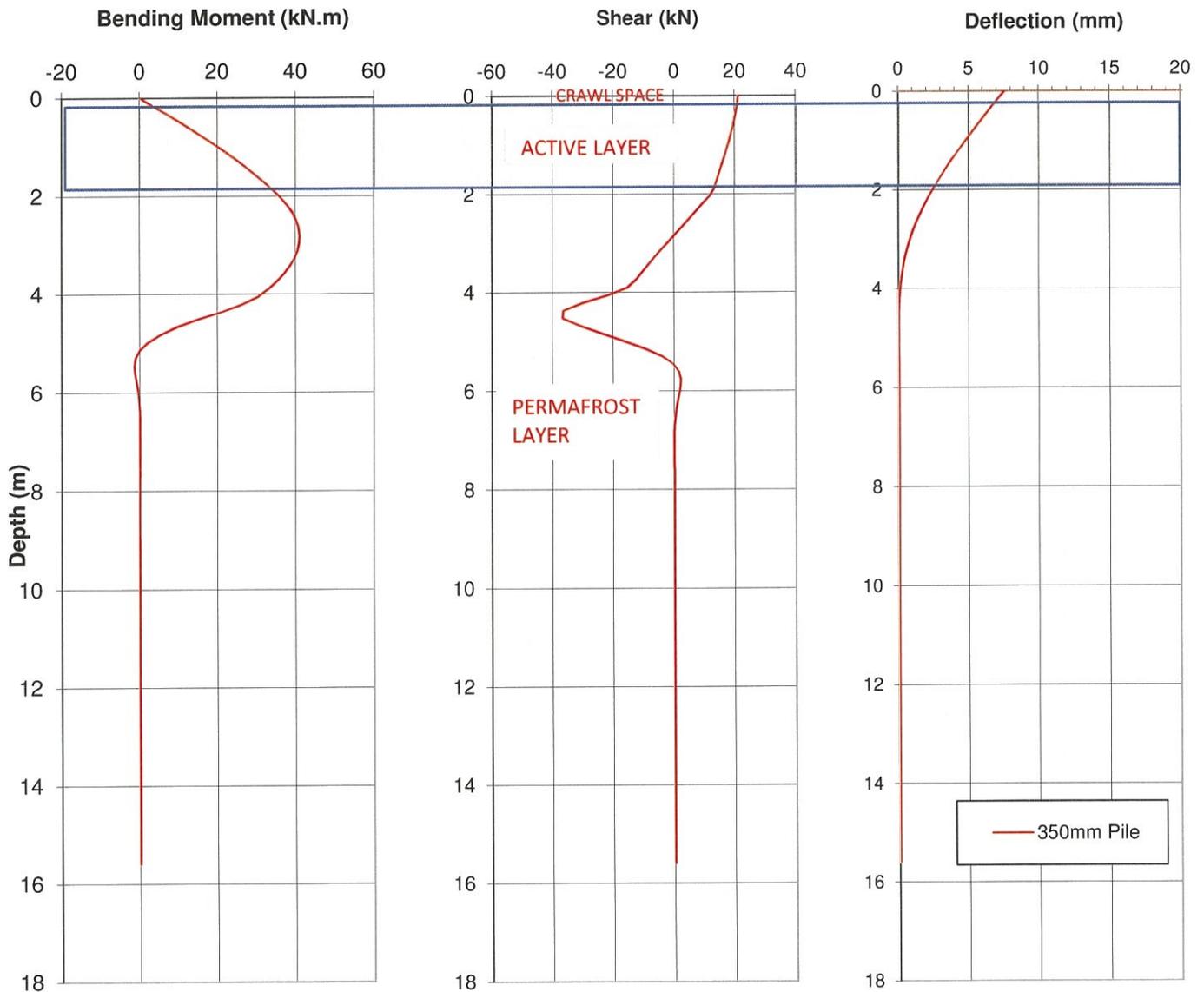
Free Length of Pile = 0.1 m

Thickness of Active Layer = 1.5 m

Shear Strength of Active Layer = 6 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 23: LPile Analysis (350mm Pile, Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 21 kN

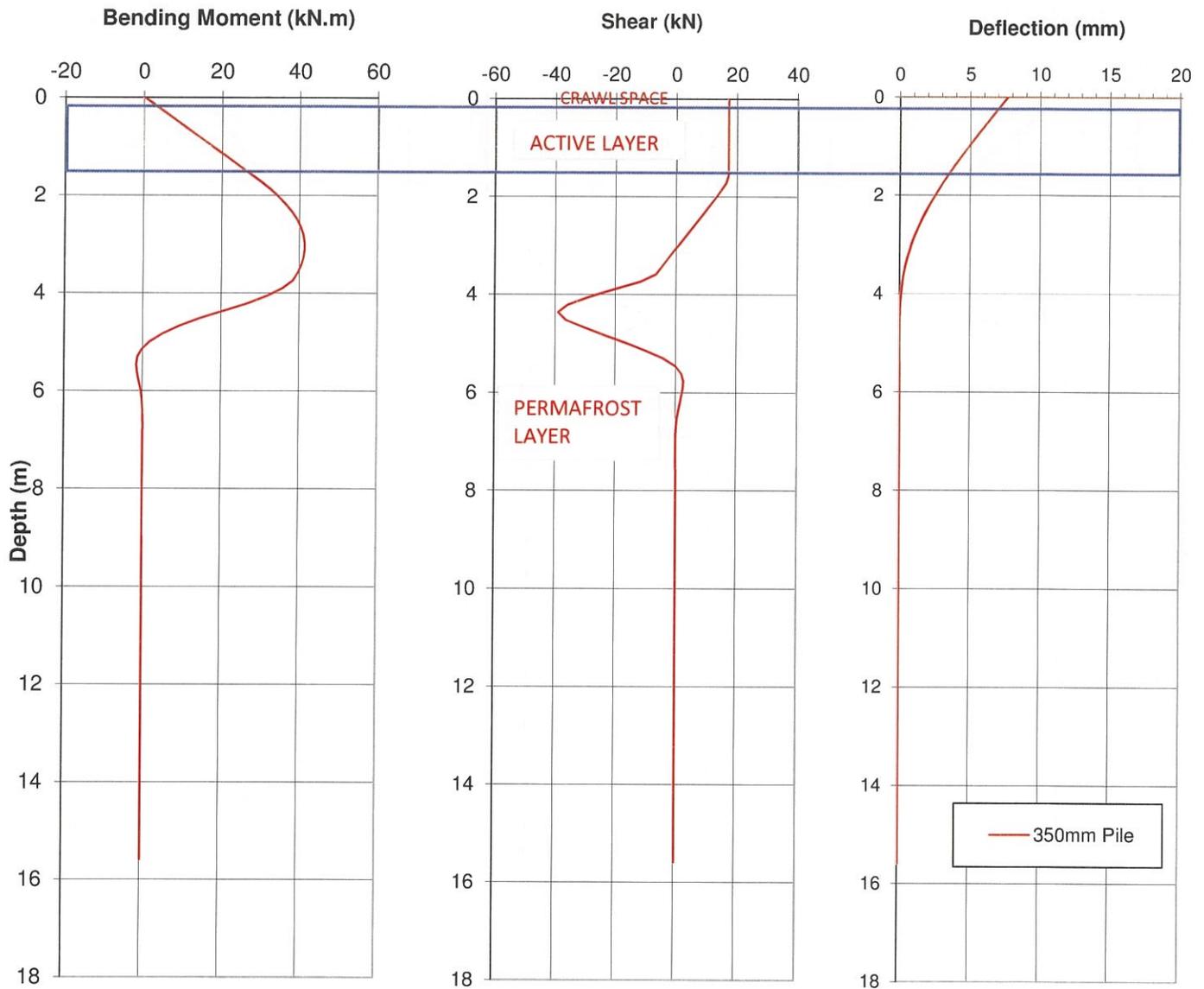
Free Length of Pile = 0.1 m

Thickness of Active Layer = 1.8 m

Shear Strength of Active Layer = 6 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 24: LPile Analysis (350mm Pile, Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 17 kN

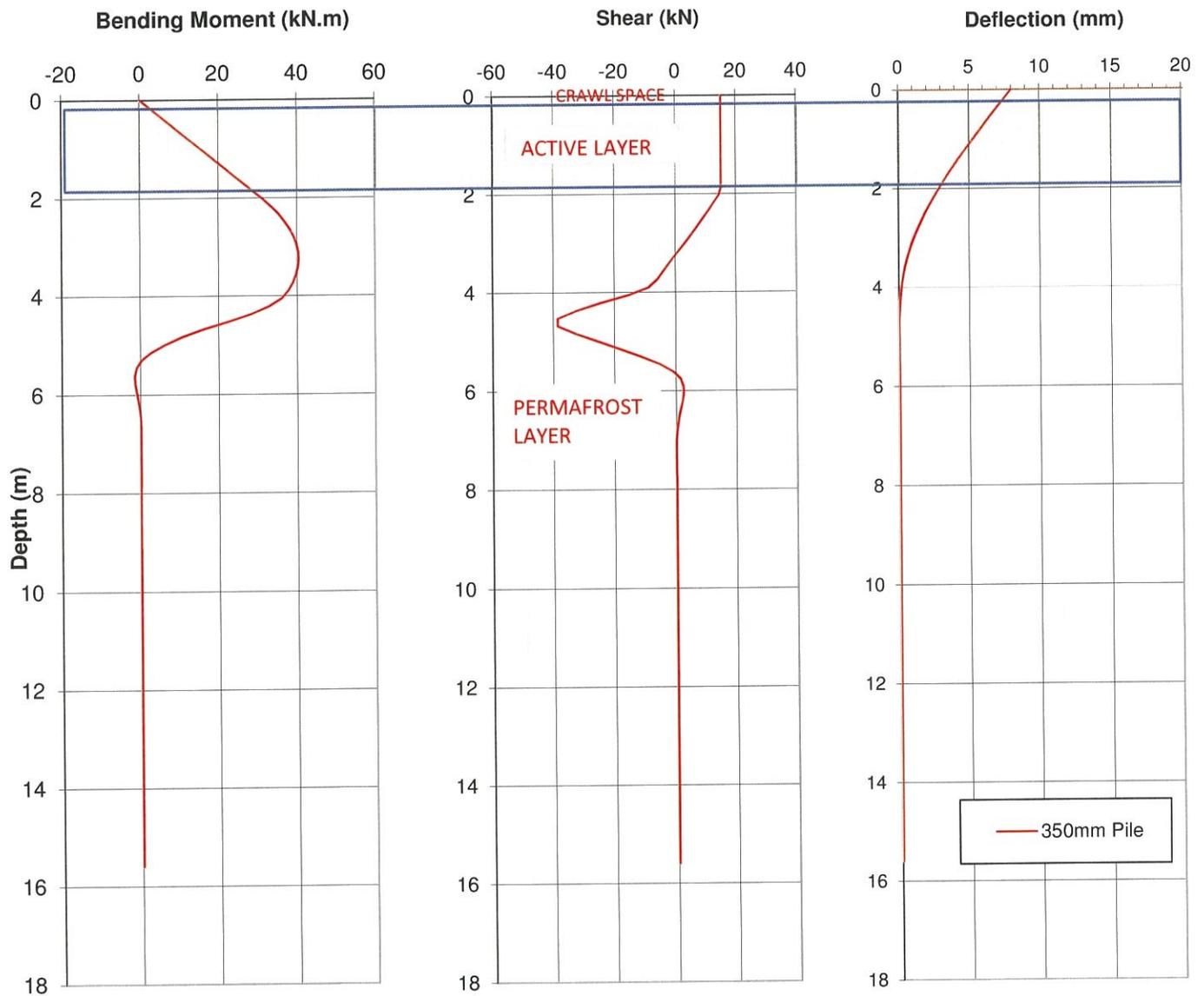
Free Length of Pile = 0.1 m

Thickness of Active Layer = 1.5 m

Shear Strength of Active Layer = 0 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

**Figure 25: LPile Analysis (350mm Pile, Long Term)**



The depth taken from the top of steel pile head, which is 10mm thick and filled with 25MPa concrete and 5-20M bars.

Factored Loads:

Max Vertical Compression = 150 kN

Max Lateral Force = 15 kN

Free Length of Pile = 0.1 m

Thickness of Active Layer = 1.8 m

Shear Strength of Active Layer = 0 kPa

Ref: G. S. Crowther (2014), "Lateral Pile Analysis Frozen Soil Strength Criteria", ASCE J. Cold Reg. Eng.

## **APPENDIX B**

**The following in this Appendix B will have been removed under separate contract, prior to completion of the Work outlined in this contract:**

- 1. Asbestos-containing vermiculite insulation from the main floor joist space/crawlspace.**
- 2. Asbestos-containing white pipe wrap on two domestic water lines from the southwest corner of the Mechanical Room and Rooms 116 (women's washroom), 117 (janitor's room) and 118 (men's washroom).**

## **Hazardous Building Materials Assessments**

Palace Grand Theatre  
Dawson City, YT



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Project No.: 123220212

March 18, 2015

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## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

### Executive Summary

Stantec Consulting Ltd. (Stantec) was retained by Public Works and Government Services Canada (PWGSC) to conduct a hazardous building materials assessments within the Palace Grand Theatre located in Dawson City, YT (subject building).

The purpose of the assessment was to check for potential hazardous building materials that may require special attention for ongoing operations and/or during renovations in accordance with the requirements of the Canada Labour Code, Part II (Canada Labour Code), the Yukon Workers' Compensation Health and Safety Board (WCB) and the current version of the Yukon Territory *Occupational Health and Safety Act and Regulations* (YT OHS Reg.).

The hazardous building materials considered included asbestos-containing materials (ACMs), lead, including lead-containing paints (LCPs), polychlorinated biphenyls (PCBs), mercury-containing items, ozone-depleting substances (ODSs), mould-impacted building materials and silica.

Based on Stantec's review of previous documentation regarding hazardous building materials as well as our current visual assessment and the laboratory analyses performed on samples collected, hazardous building materials were identified within the subject building.

A summary of our findings and recommendations is presented below. Recommendations pertaining to the handling, removal, transportation and disposal of identified hazardous materials are provided in Section 6 of this report.

It should be noted that this summary is subject to the same restrictions and limitations as presented in Section 4.0 (Assessment Limitations) and Section 7.0 (Closure). The information provided is to be read in conjunction with the remainder of this report.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

<b>Summary of Identified Hazardous Building Materials</b>
<p><b>Identified ACMs</b></p> <ul style="list-style-type: none"> <li>• Vermiculite insulation present between the floor joists throughout the ground floor (analytical results for samples collected by others were reviewed on-site).               <ul style="list-style-type: none"> <li>– Vermiculite debris observed in joist spaces of perimeter walls in the crawlspace (joist spaces themselves are insulated with fiberglass batt) – expected to be releasing from the floor joist spaces.</li> </ul> </li> <li>• Exterior cement panels present on the walls of the Mechanical Room and the emergency stairwells (east and west, and building paper materials directly behind those cement wall panels).</li> <li>• White woven flex duct connectors found in the Mechanical Room, between the main furnace units and primary furnace ducting (one on each of the four furnaces).</li> <li>• White fibrous liner/gasket found in mechanical room on circular furnace hatches (one on each of the four furnaces).</li> <li>• White furnace gasket found in Mechanical Room between furnace and red burner box.</li> <li>• White pipe wrap found in the southwest corner of the Mechanical Room and on two domestic water lines running through rooms 116 (women's washroom), 117 (janitor's room) and 118 (men's washroom).               <ul style="list-style-type: none"> <li>– This material may be present in concealed spaces in locations throughout the building. However, limited domestic piping was observed</li> </ul> </li> <li>• Joint compound on gypsum walls and ceilings (where present) throughout.</li> <li>• Fibrous (paper like) mechanical insulation debris found in the crawl space               <ul style="list-style-type: none"> <li>– One piece of debris was found directly beneath the hatch under the stage. The entire piece of debris was collected as our sample</li> <li>– Similar debris was not observed elsewhere, but not all areas of crawlspace were accessible.</li> </ul> </li> </ul> <p>Unless otherwise noted, the materials listed above were observed to be in good condition. The following building materials were observed to be present but not sampled to preserve their integrity, and are listed as presumed asbestos-containing materials (PACMs):</p> <ul style="list-style-type: none"> <li>• Roofing materials</li> <li>• Insulation inside fire rated doors</li> <li>• Fire curtain (indicated on drawings reviewed)</li> </ul>
<p><b>Lead</b></p> <ul style="list-style-type: none"> <li>• Grey paint on furnace ducts in the mechanical room is lead-containing.</li> <li>• Grey paint on mechanical room walls and ceiling (gypsum board and/or plywood) is lead-containing.</li> </ul> <p>In addition to paint, lead is present/may be present in the following materials throughout the subject building:</p> <ul style="list-style-type: none"> <li>• Lead-acid batteries used in emergency lighting</li> <li>• Older electrical wiring materials and sheathing</li> <li>• Solder used on domestic water lines, in bell fittings for cast iron pipes and in electrical equipment</li> <li>• Vent and pipe flashings</li> </ul>
<p><b>PCBs</b></p> <ul style="list-style-type: none"> <li>• One fluorescent light fixture was observed in the mechanical room. Based on the construction date of the subject building and the apparent vintage of the fixture, the ballast within this fixture may contain PCBs.</li> </ul>
<p><b>Mercury</b></p> <ul style="list-style-type: none"> <li>• One (1) mercury-containing thermostat was observed in the mechanical room.</li> <li>• Mercury vapour is expected be present in the fluorescent light tubes in one fixture observed in the mechanical room.</li> </ul>
<p><b>Mould</b></p> <ul style="list-style-type: none"> <li>• Frost and ice was observed on drywall walls and around window frames in various locations throughout the building. When this melts, the resulting moisture that will impact porous materials in the areas (e.g. paper facings of drywall) can create conditions conducive to mould growth.</li> </ul>

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Summary of Identified Hazardous Building Materials
<b>Ozone-Depleting Substances</b> <ul style="list-style-type: none"><li>The roof was not accessed as part of this assessment due to snow cover and lack of safe access. It was reported by site personnel that there is one HVAC unit located on the roof of the mechanical room that contains the ODS refrigerant R-22.</li></ul>
<b>Silica</b> <ul style="list-style-type: none"><li>Silica is expected to be present in ceramic tiles, concrete, cement and masonry block and interior wall finishes observed in various locations.</li></ul>

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

### Abbreviations

AAS	Atomic Absorption Spectrometry
ACGIH	American Conference of Governmental Industrial Hygienists
ACM	asbestos-containing material
AIHA	American Industrial Hygiene Association
AMP	Asbestos Management Plan
CFC	chlorofluorocarbon
EMSL	EMSL Canada Inc.
EPA	Environmental Protection Agency
FHR	<i>Federal Halocarbon Regulations</i>
HVAC	heating, ventilation and air conditioning
kg	kilogram
LCP	lead-containing paint
m <sup>3</sup>	cubic metre
mg	milligram
NVLAP	National Voluntary Laboratory Accreditation Program
ODS	ozone-depleting substance
OEL	occupational exposure limit
PACM	presumed asbestos-containing material
PCB	polychlorinated biphenyl
PLM	polarized light microscopy
ppm	parts per million

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

PWGSC	Public Works and Government Services Canada
Stantec	Stantec Consulting Ltd.
SWP	Safe Work Practice
WCB	Yukon Workers' Compensation Health and Safety Board
YT OHS Reg.	Yukon Territory <i>Occupational Health and Safety Act and Regulations</i>

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Introduction  
March 18, 2015

### 1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by Public Works and Government Services Canada (PWGSC) to conduct a hazardous building materials assessments within the Palace Grand Theatre, Dawson City, YT (subject building).

The purpose of the assessment was to check for potential hazardous building materials that may require special attention for ongoing operations and/or during renovations in accordance with the requirements of the Canada Labour Code, Part II (Canada Labour Code), the Yukon Workers' Compensation Health and Safety Board (WCB) and the current version of the Yukon Territory *Occupational Health and Safety Act and Regulations* (YT OHS Reg.).

The hazardous building materials considered included asbestos-containing materials (ACMs), lead, including lead-containing paints (LCPs), polychlorinated biphenyls (PCBs), mercury-containing items, ozone-depleting substances (ODSs), mould-impacted building materials and silica.

The site work was conducted by Keith Irwin of Stantec on January 21 and 22, 2015.

### 2.0 BACKGROUND

The subject building was reportedly constructed in 1962 as a replica of an original building that was constructed in 1899. This time period (1962) is consistent with those dates when hazardous building materials were commonly used in construction and/or may be present including, but not limited to ACMs, LCPs, PCBs, mould, mercury, ODSs, and silica.

In addition, Stantec understands that although various sampling records were on-file that indicated the presence of asbestos-containing cement products and asbestos-containing vermiculite within the building, comprehensive documentation and/or reports regarding hazardous building materials were not on file.

Stantec further understands that PWGSC is planning renovations within the subject building. As a measure of diligence in updating records while maintaining compliance with the requirements of the Canada Labour Code, the WCB and the current version of the YT OHS Reg. pertaining to the identification of hazardous materials for ongoing operations and management as well as prior to planned renovation activities, PWGSC retained Stantec to conduct this assessment.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Scope and Methodology  
March 18, 2015

### 3.0 SCOPE AND METHODOLOGY

Keith Irwin of Stantec conducted a visual assessment within the subject building on January 21 and 22, 2015. Site work was conducted in general compliance with the requirements of the Canada Labour Code, the WCB, the current version of the YT OHS Reg. and Stantec's safe work practices (SWPs).

Mechanical systems, structures and finishes of the subject building were visually examined to determine the suspected presence of ACMs, lead including LCPs, PCBs, mercury, ODSs, mould, and silica. Where building materials were suspected but not confirmed to contain asbestos, lead (in paint), or mould samples were collected for analysis to confirm or deny the presence of these hazardous materials. Based on analytical results, visually similar materials were referenced to specific analyzed samples to reduce the number of samples collected.

Additional background information and the methodology used for the determination of presence or absence of each specific hazardous material considered in this assessment are outlined in the following sections.

#### 3.1 ASBESTOS

The common use of friable (materials which, when dry, can be easily crumbled or powdered by hand pressure) ACMs in construction generally ceased voluntarily in the mid-1970s but was only banned through legislation by the late 1980s. Friable asbestos was used in many building products, primarily high temperature insulations, spray-applied structural fireproofing, and a material known as vermiculite that was commonly used as block wall insulation and may be contaminated with asbestos fibres. Asbestos was also used in many non-friable manufactured products such as floor tiles, ceiling tiles, Transite cement products, and various other construction materials. Some cement products currently used in the construction of buildings may still contain asbestos.

The presence of asbestos in federal workplaces, and pertaining to federally regulated workers is governed by the Canada Labour Code. The presence of asbestos in the workplace in the Yukon pertaining to territorially regulated workers is governed by the WCB, with provisions published in the current version of the YT OHS Reg. As both federally regulated workers and territorially regulated workers (e.g., contractors) are expected to carry out work activities within the subject building, and as the territorial regulations are generally more prescriptive pertaining to asbestos (and generally include the requirements noted in the Canada Labour Code), this assessment was conducted to meet the requirements of the current version of the YT OHS Reg.

According to current version of the YT OHS Reg., ACM means any material which is found to contain any asbestos.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Scope and Methodology  
March 18, 2015

Based on this criterion, a visual assessment of accessible areas was undertaken in order to check for the presence of materials suspected of containing asbestos. Locations to collect discrete bulk asbestos samples of suspect building materials were identified. Samples of representative materials were then collected at these locations.

Multiple samples were collected from each "homogenous application" of observed suspected ACMs (materials suspected to contain asbestos that are uniform in material type, colour, texture application and estimated installation date) and submitted to EMSL Canada Inc. (EMSL) in Mississauga, Ontario for analysis of asbestos content using polarized light microscopy (PLM) with dispersion staining, in accordance with the United States Environmental Protection Agency (EPA) 600/R-93/116 method.

The number of samples to be collected for each homogenous application of a suspected ACM was based on accepted occupational hygiene standards and protocols, along with the assessor's experience and understanding of the consistency of that building material's application.

EMSL's analytical laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

### 3.1.1 Sample Results Interpretation

When asbestos is detected in any concentration in one of the samples within a set that was collected to represent a "homogenous application" of a particular material, the entire sample set and the entire application of that material is then considered to be an ACM.

In addition to the above, a "positive stop" option was used during the laboratory analysis of the building material samples submitted for asbestos analysis. The "positive stop" option is utilized by the laboratory when asbestos is detected in any concentration in one of the samples within a set that was collected to represent a "homogenous application" of that material. At this point, further analysis of subsequent samples within the set is deemed to be unnecessary (as the entire set will be considered an ACM, per above), and the remainder of the samples within the set are not analyzed.

### 3.1.2 Potential Asbestos-Containing Vermiculite Insulation

As part of the assessment, Stantec assessed the subject building for areas where vermiculite insulation, a potential ACM, would likely be present. This included making note of and assessing attic spaces, floor cavities and masonry or brick walls, which are typical areas where vermiculite is found.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Scope and Methodology  
March 18, 2015

### 3.1.3 Asbestos Sampling Quality Assurance/Quality Control

Sampling activities pertaining to asbestos were conducted in accordance with Stantec's SWPs, which take into account current territorial regulations pertaining to such work (i.e., sampling procedures, required number of samples, and laboratory analytical procedures).

Representative bulk samples were collected of accessible suspect ACMs in sufficient quantities for laboratory analyses. Suspect ACM samples were sealed in polyethylene zip-lock bags labeled with the sample number, suspect material description, and sample location. As part of sampling procedures, sampling tools were cleaned between sample collection events to avoid the potential for cross-contamination of samples.

Sample bags were compiled in order and placed into a single container accompanied with a Chain of Custody form outlining the project information, date, building location, number of samples, and sample description. Samples were submitted to the analytical laboratory in a sealed container via courier.

## 3.2 LEAD

Lead may be used in its pure metallic form or combined chemically with other elements to form lead compounds. Metallic lead is used to make products such as electric storage batteries, ammunition, lead solder, radiation shields, pipes, and sheaths for electric cables. Metallic lead is sometimes combined with other metals such as copper, tin, and antimony as lead alloys for use in the manufacture of a variety of metal products. Lead is commonly found in buildings in the solder used on copper domestic pipes, in the caulking on bell fittings of cast iron drainage pipes and in electrical equipment.

The presence of lead-containing materials (other than paint) was assessed through visual means.

With respect to paint, the lead content of interior paint was limited to 0.5% by weight (equivalent to 5,000 mg/kg or ppm) in 1976 under the *Federal Hazardous Products Act*, which governs the import, export and distribution of hazardous products in Canada. In 2005, the *Hazardous Products Act* had reduced the criteria for surface coatings (including paint) to 600 mg/kg (600 ppm) to define them as "lead-containing". This criterion has since (2010) been reduced to 90 ppm.

However, with respect to potential lead exposures associated with disturbance to surfaces coated with lead-containing products, various occupational health and safety administrations have indicated that working with materials coated with paint that has a lead content that exceeds 600 ppm can lead to exposures in excess of 50% of the occupational exposure limit (OEL) for lead, when the OEL is 0.05 mg/m<sup>3</sup> (the OEL for lead in the Yukon, according to the current version of the YT OHS Reg., is 0.15 mg/m<sup>3</sup>).

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Scope and Methodology  
March 18, 2015

Prior to disposal, Yukon Environment recommends that analytical results for building materials should be compared to the territorial soil guideline value of 1,000 ppm as found in the *Contaminated Sites Regulations*. As such, and given that the OEL for lead in the Yukon is three times that of jurisdictions that reference 600 ppm as lead-containing, Stantec will reference the 1,000 ppm value in defining paints as "lead-containing" as the most applicable criteria.

Based on this criterion, samples of suspected LCPs were collected from major paint applications, and were collected to substrate, where possible, in sufficient quantity to conduct analyses for total lead content. Samples collected were placed into separate, sealed, and labeled polyethylene bags, and submitted to EMSL for analyses of total lead content using Flame Atomic Absorption Spectrometry (AAS) (SW 846 3050B\*/7000B).

EMSL's analytical laboratory is also accredited by the American Industrial Hygiene Association (AIHA) Environmental Lead Laboratory Approval Program.

### 3.3 POLYCHLORINATED BIPHENYLS

PCBs were used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. In fluorescent fixtures, PCBs were usually found within the small capacitors inside the ballast that controls the lamp. The *Federal Chlorobiphenyls Regulation SOR/91-152*, prohibited the use of PCBs in electrical equipment manufactured after July 1, 1980.

The presence of PCB-containing equipment was assessed through visual means. With respect to fluorescent lamp ballasts, due to the risk of electrical shock associated with dismantling operating fixtures, fluorescent lamp ballasts were not removed to view identification numbers/information.

The total number of fluorescent lamp ballasts that may contain PCBs within the subject building was approximated.

Suspected PCB-containing electrical equipment can be visually inspected and compared to the Environment Canada reference guide entitled "*Identification of Lamp Ballasts Containing PCBs, Report EPS 2/CC/2*", dated August 1991 (PCB Guide).

### 3.4 MERCURY

Mercury is commonly found in buildings as mercury vapour lighting, thermostats/thermometers with mercury-containing glass ampoules, electrical switches and can also be found in minor amounts in fluorescent lamp tubes and vapour bulbs and may be present in stable forms in adhesives. Exposure to mercury in workplaces is governed by the WCB.

The presence of mercury and mercury-containing equipment was assessed through visual means.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

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March 18, 2015

### 3.5 MOULD

Moist building materials may provide suitable conditions for mould growth, and the removal of building materials impacted by mould growth may require workers with specific training and experience using work procedures that have been developed to protect workers and work areas from exposure to elevated concentrations of airborne mould.

The presence of suspect visible mould was assessed through visual means. Material observed with dark-colored staining and/or a textured and discolored appearance is described as "suspect mould". Mould identified visually is defined as "suspect mould" unless it is confirmed as mould by laboratory analysis.

#### 3.5.1 Mould Reference Guidelines

With respect to mould and/or moisture, the visual assessment procedures utilized during this project were based on the recommendations provided in the documents listed below:

- Standard Construction Document CCA 82 *Mould Guidelines for the Canadian Construction Industry*, Canadian Construction Association, 2004 (referred to as CCA 82).
- *Guidelines on Assessment and Remediation of Fungi in Indoor Environment*, New York City Department of Health, Bureau of Environmental and Occupational Disease Epidemiology, April 2000 (referred to as the NYC Guidelines).
- *Fungal Contamination in Public Buildings: Health Effects and Investigation Methods*, Federal-Provincial Committee on Environmental and Occupational Health, 2004 (referred to as the Health Canada Guide).
- *Indoor Air Quality in Office Buildings: A Technical Guide*, Report of the Federal-Provincial Advisory Committee on Environmental and Occupational Health, 1995 (referred to as the IAQ Guide).
- *Bioaerosols: Assessment and Control*, American Conference of Governmental Industrial Hygienists (ACGIH), 1999 (referred to as the ACGIH Report).

### 3.6 OZONE-DEPLETING SUBSTANCES

Chlorofluorocarbons (CFCs) and other ODSs are often found in refrigeration units associated with air-conditioning or other refrigeration equipment. In September 1987, 47 countries agreed to the Montreal Protocol on Substances that Deplete the Ozone Layer. Disposal of ODSs are regulated in the Yukon by the Yukon Government's *Special Waste Regulations* (2010) and the *Federal Halocarbon Regulations*, 2003 (FHR 2003).

The presence of ODSs and equipment containing these materials was assessed through visual means.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Assessment Limitations  
March 18, 2015

### 3.7 SILICA

Silica, also referred to as free crystalline silica, is found in concrete, cement, mortar, ceramic wall and floor tiles, stucco finishes and acoustic ceiling tiles. Prolonged exposure to, and inhalation of free crystalline silica, may result in respiratory disease known as silicosis, which is characterized by progressive fibrosis of the inner lung tissue and marked shortness of breath or impaired lung function.

Exposure to silica dust is governed by the WCB, with applicable exposure limits indicated in the current version of the YT OHS Reg., depending on the type of silica to be considered (quartz, cristobalite or tridymite).

The presence of silica was assessed through visual means.

### 4.0 ASSESSMENT LIMITATIONS

This report has been prepared for the exclusive use of the PWGSC for the purpose of assessing general conditions in the subject building. Any use that a third party makes this report, or reliance on, or decisions to be made on it, are the responsibility of such third parties. Stantec accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

In preparation of this report, Stantec used professional judgment based on experience. The work was conducted in accordance with generally accepted professional standards. Stantec relied on information gathered during the site investigation and laboratory analytical reports.

This report reflects the observations made within accessed areas of the subject building and the results of analyses performed on specific materials sampled during the assessment. Analytical results reflect the sampled materials at the specific sample locations.

Sampling was conducted pertaining to suspected ACMs and suspected LCPs only. The assessment for the presence of other hazardous building materials was visual in nature, and was conducted pertaining to readily visible surfaces within accessible spaces only. Concealed spaces were inspected via existing access panels, where present.

As safe access was not possible due to snow cover, the roof of the subject building was not included in this assessment. Limited comments will be made regarding materials present on the roof and any comments made will be based on information reported to Stantec by site personnel.

Due to limitations on the agreed to scope of work for this project as well as physical limitations in accessing concealed areas and limitations associated with working in occupied/operational spaces, there are specific limitations to the information that can be provided to each hazardous building material considered in this assessment, as outlined below.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Assessment Limitations  
March 18, 2015

### 4.1 ASBESTOS

Suspected ACMs that were not sampled include, but are not limited to, the following (where present, based on building construction or as otherwise noted):

- Roofing materials and materials/equipment present on the roof
- Sub-grade materials
- Interior components of mechanical equipment (e.g., inner linings or gaskets in boilers)
- Interior components of heating, ventilation and air conditioning (HVAC) units
- Heat protection materials inside mechanical installations (e.g., gaskets) and light fixtures (e.g., paper backing in sealed incandescent fixtures)
- Flooring material concealed beneath ceramic tile, brickwork, hardwood flooring, and/or concealed beneath existing sub-floors
- Drywall and/or wall plaster and associated finish materials concealed behind new and/or additional walls or ceilings
- Woven tape inside duct connection joints or inner ducting insulation
- Materials within wall cavities, hard ceiling cavities or crawlspaces
- Insulation materials inside fire doors

If encountered during demolition or other activities, any suspected ACMs not identified within this report should be presumed to contain asbestos and handled as such until otherwise proven, through analytical testing.

### 4.2 LEAD

Assessment for the presence of lead or lead-containing materials was visual in nature, and was conducted pertaining to readily visible surfaces within accessible spaces of the subject building only. The presence of lead or lead-containing materials in inaccessible areas not assessed included, but was not limited to: ceiling spaces, wall cavities, crawlspaces, and buried materials.

With respect to paint, samples of suspected LCPs were collected within the subject building only from surfaces of major paint applications where visually different paint colours and/or types were identified. Although the surfaces where samples were collected may be covered with more than one coat of paint, the paint samples are described by the surface (visible) colour only.

Attempts were made to represent all layers of paint in the samples collected. As analytical results are referenced to the surface paint colour only, the lead content of all painted surfaces similar to that represented by the surface paint colour will be presumed to be the same, regardless of differing sub surface paints, if any.

## **HAZARDOUS BUILDING MATERIALS ASSESSMENTS**

Assessment Limitations  
March 18, 2015

### **4.3 POLYCHLORINATED BIPHENYLS**

Due to height restrictions and the risk of electrical shock in handling operational light fixtures, the ballasts present in the fixtures observed within the subject building were not removed for comparison to the PCB Guide.

Conclusions and recommendations regarding the presence of PCBs within the subject building are based on Stantec's limited observations in combination with information provided by staff regarding lighting renovations (where requested by Stantec based on observations) and is presented to provide guidance regarding the likelihood that PCB-containing equipment is or is not present within the subject building. The exact extent and/or number of fluorescent lamp ballasts containing PCBs, if any, within the subject building will not be commented on.

### **4.4 MERCURY**

Visual assessment for the presence of mercury-containing equipment within the subject building was conducted in accessible areas only. The presence of mercury or mercury-containing equipment in inaccessible areas includes, but is not limited to: ceiling spaces, wall cavities, and crawlspaces, or as internal parts of HVAC mechanisms.

### **4.5 MOULD**

Visual assessment for the presence of suspected visible mould and/or suitable conditions for mould growth (e.g., moist and/or water-stained building materials) were conducted in accessed portions of the subject building only. The assessment was not intrusive in nature and included visual assessment of exposed surfaces and closer inspection of known problem areas.

The conclusions made in this report provide description(s) of the potential source(s) of moisture within the subject building that may have led to suitable conditions for mould growth, only in those cases where potential source(s) of moisture were identified. These conclusions will not necessarily identify all sources of moisture leading to suitable conditions for mould growth within the subject building or within the impacted area(s).

This assessment does not constitute a building envelope/building systems assessment for any of the subject building, which would include an intrusive investigation to assess the internal condition, potential moisture sources, and expected remaining service life of the various components and systems comprising the envelope of a building.

### **4.6 OZONE DEPLETING SUBSTANCES**

Visual assessment for the presence of ODSs within the subject building was conducted in accessible areas only. The presence of ODS-containing equipment in inaccessible areas including, but not limited to, ceiling spaces, wall cavities and crawlspaces, was not assessed. In addition, portable equipment that may contain ODSs (refrigerators, drink coolers, etc.) was not considered as part of this assessment.



## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Findings  
March 18, 2015

### 4.7 SILICA

Visual assessment for the presence of silica-containing materials within the subject building was conducted in accessible areas only. The presence of potential silica-containing materials in inaccessible areas including, but not limited to, ceiling spaces, wall cavities and crawlspaces was not assessed.

### 5.0 FINDINGS

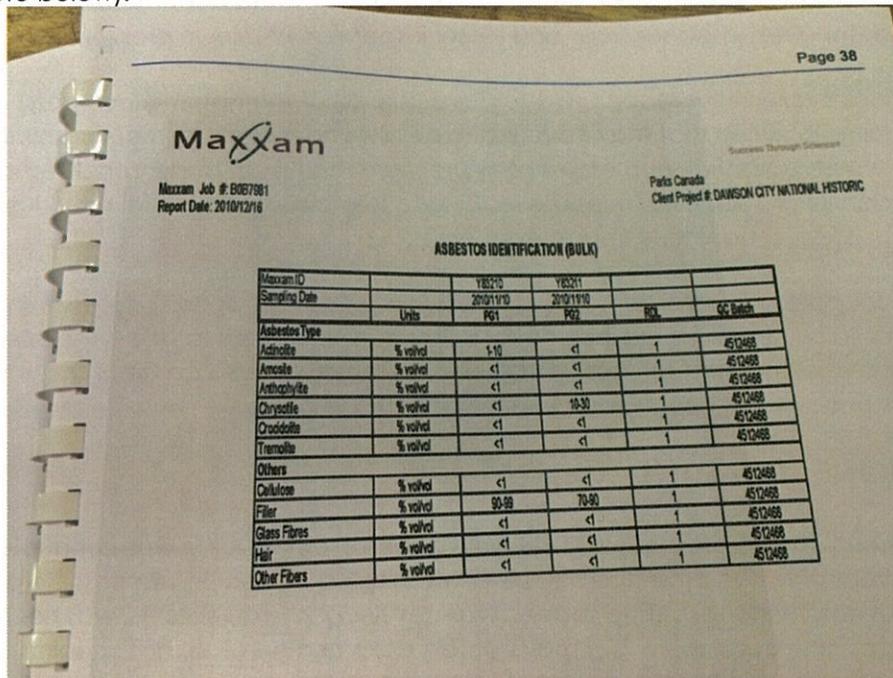
Floor plans showing bulk sample locations and locations of identified hazardous materials (where practical) are provided in Appendix A.

The results of the assessment for each of the considered hazardous materials are provided in the following sub-sections.

#### 5.1 ASBESTOS

Visual observations and/or records provided to Stantec on-site indicated that the following materials were previously identified as asbestos-containing:

- Vermiculite insulation present between the floor joists throughout the ground floor
  - Analytical results from Maxxam Analytics for samples collected by others were reviewed on-site, and indicated this material to be asbestos-containing (see sample PG1 in the photo below).



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Maxxam

Maxxam Job #: 6067061  
Report Date: 2010/12/16

Parks Canada  
Client Project #: DANFON CITY NATIONAL HISTORIC

ASBESTOS IDENTIFICATION (BULK)

Maxxam ID		Y8210	Y8211		
Sampling Date	Units	20101110	20101110		
Asbestos Type		PG1	PG2	PG3	GC Batch
Actinolite	% vol/vol	1-10	<1	1	4512488
Amosite	% vol/vol	<1	<1	1	4512488
Anthophyllite	% vol/vol	<1	<1	1	4512488
Chrysotile	% vol/vol	<1	10-30	1	4512488
Crocidolite	% vol/vol	<1	<1	1	4512488
Tremolite	% vol/vol	<1	<1	1	4512488
Others					
Cellulose	% vol/vol	<1	<1	1	4512488
Filter	% vol/vol	90-99	70-90	1	4512488
Glass Fibres	% vol/vol	<1	<1	1	4512488
Hair	% vol/vol	<1	<1	1	4512488
Other Fibers	% vol/vol	<1	<1	1	4512488

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Findings  
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As part of the current assessment, Stantec collected representative samples of various suspected ACMs. The materials sampled by Stantec included the following:

- Exterior cement panel
- Woven flex duct connector
- Fibrous liner
- Head shield
- Furnace gasket
- Pipe wrap
- Duct wrap
- Duct mastic
- Building paper
- Mechanical gasket
- Ceramic tile grout
- Sheet flooring
- Dry wall joint compound
- Fibrous debris

Sixty-seven samples of the above-noted suspected ACMs were collected within the subject building and submitted to EMSL for analysis of asbestos content and nature. A summary of the sample types, locations and analytical results is presented in Appendix B. Copies of the certificates of analysis provided by EMSL for the suspected ACM samples submitted are included in Appendix C.

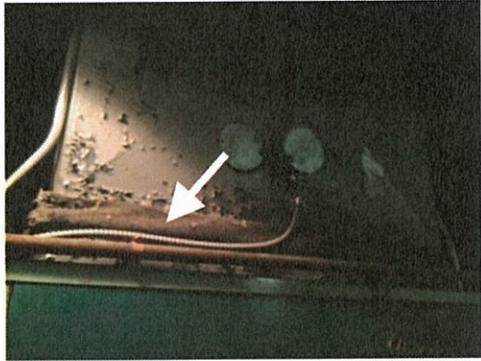
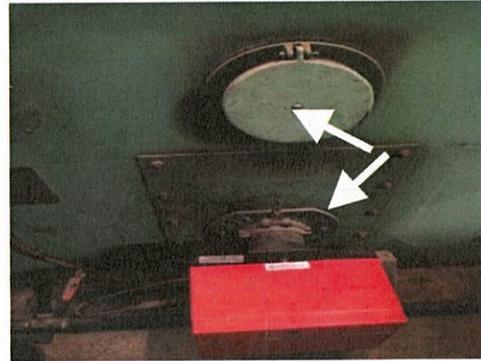
Based on our observations of building construction (estimated vintage of interior finishes and uniformity of building material use) and on our interpretations of the results of suspected ACM samples collected during this assessment, the materials presented in Table 1, below were identified as ACMs within the subject building.

**Table 1 Summary of Identified ACMs, Palace Grand Theatre, Dawson City, YT**

Identified ACM Description		Photo
Vermiculite insulation present between the floor joists throughout the ground floor.		
Condition	Good where concealed within floor space. Vermiculite debris (poor condition) observed in joist spaces of perimeter walls in the crawlspace (joist spaces themselves are insulated with fiberglass batt) – expected to be releasing from the floor joist spaces.	
% Type	1-10% Actinolite (according to Maxxam Analytics record reviewed on-site)	
Friability	Friable	

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Findings  
March 18, 2015

Identified ACM Description		Photo
Exterior cement panels present on the walls of the Mechanical Room and the emergency stairwells (east and west), and building paper behind those cement wall panels		
Condition	Good	
% Type	15% Chrysotile in cement board; Trace (<0.25% Chrysotile) in building paper	
Friability	Non-friable	
White woven flex duct connectors found in the Mechanical Room between the main furnace units and primary furnace ducting (one on each of the four furnaces)		
Condition	Good	
% Type	60% Chrysotile	
Friability	Non-friable	
White fibrous liner/gasket found in mechanical room on circular furnace hatches (one on each of the four furnaces)		
Condition	Good	
% Type	50% Chrysotile	
Friability	Friable	
White furnace gasket found in Mechanical Room between furnace and red burner box		
Condition	Good	
% Type	1.3% Chrysotile	
Friability	Non-Friable	

**HAZARDOUS BUILDING MATERIALS ASSESSMENTS**

Findings  
 March 18, 2015

Identified ACM Description		Photo
White pipe wrap found in the southwest corner of the Mechanical Room and on two domestic water lines running through rooms 116 (women's washroom), 117 (janitor's room), 118 (men's washroom). May be present in concealed spaces in locations throughout the building. However, limited domestic piping was observed.		
Condition	Good	
% Type	20% Chrysotile	
Friability	Non-Friable	
Joint compound on gypsum walls and ceilings (where present) throughout		
Condition	Good	
% Type	2% Chrysotile	
Friability	Friable	

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Findings  
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Identified ACM Description		Photo
Fibrous (paper like) mechanical insulation debris found in the crawl space. NOTE: One piece of debris was found directly beneath the hatch under the stage. The entire piece of debris was collected as our sample		No Photo.
Condition	Debris	
% Type	50% Chrysotile	
Friability	Friable	

### 5.1.1 Assessment for Vermiculite Insulation

As part of the assessment, Stantec assessed the subject building for additional areas where vermiculite insulation, a potential ACM, would likely be present outside of the areas mentioned above (joist spaces of the ground floor and in the crawlspace as debris). This included making note of and assessing accessible attic spaces and floor cavities which are typical areas where vermiculite is found. No evidence of vermiculite was observed in the attic, and the other floors were constructed such that they did not appear to have a space where vermiculite would be present. However, floorboards were not destructively assessed on other floors to confirm.

### 5.1.2 Presumed Asbestos-Containing Materials

The following building materials were observed to be present but not sampled to maintain their integrity and/or due to lack of safe access, and are listed as presumed asbestos-containing materials (PACMs):

- Roofing materials
- Insulation materials in fire rated doors
- Fire curtain (indicated to be present in reports reviewed on-site)

These materials were observed to be in good condition. Sampling of these materials was not part of the scope of work as determined by Stantec's understanding of the Project. As these materials are known to have been manufactured with asbestos, they should be presumed to be asbestos-containing unless proven otherwise by laboratory analysis.

### 5.1.3 Materials with less than 0.25% Asbestos Detected

According to current version of the YT OHS Reg., ACM means any material which is found to contain any asbestos.

Less than 0.25% asbestos was detected in three samples of building paper collected from the exterior of the subject building. It should be noted that this material is present directly behind and in contact with identified asbestos-containing cement panels. The trace amounts of asbestos detected in the samples of the building paper are not likely indicative of the material itself containing asbestos, but are likely the result of contamination/transfer from the overlying

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Findings  
March 18, 2015

asbestos-containing cement panels. However, due to the presence of detectable concentrations of asbestos in the building paper samples collected, this material (building paper) should be considered as an ACM. However, this should only be the case in those locations where building paper is present directly behind asbestos-containing cement panels.

### 5.2 LEAD

Stantec collected five paint chip samples of suspected LCPs within the subject building and submitted the samples to EMSL for analysis of lead content. A summary of the sample types, locations and analytical results is presented in Table 2, below. A copy of the certificate of analysis provided by EMSL for the suspected LCP samples submitted is included in Appendix D.

**Table 2 Suspected LCP Sample Collection and Analysis Summary, Palace Grand Theatre, Dawson City, YT**

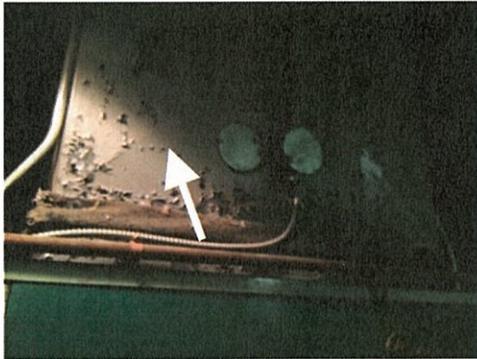
Sample Number	Paint Description	Location	Result (ppm Lead)	Lead Containing (Yes/No)
P-01	Grey	Furnace duct	3,600	Yes
P-02	Black	Stage walls	<90	No
P-03	White	Emergency stairwell	240	No
P-04	Grey	Mechanical room walls and ceiling	1,700	Yes
P-05	Grey	Exterior trim	90	No

Based on our observations and interpretations of previous reports as well as the results of suspected LCP samples collected as part of this assessment, the paint type presented in Table 3, below was identified as an LCP.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Findings  
March 18, 2015

**Table 3** Summary of Identified LCPs, Palace Grand Theatre, Dawson City, YT

Lead-Containing Material Description	Photo
<p>Grey paint on furnace ducts in the mechanical room This paint was observed to be in poor condition (flaking and peeling) in various locations.</p>	
<p>Grey paint on mechanical room walls and ceiling This paint was observed to be in good condition (minimal flaking, bubbling, and peeling)</p>	

In addition to paint, lead is present/may be present in the following materials throughout the subject building:

- Lead-acid batteries used in emergency lighting
- Older electrical wiring materials and sheathing
- Solder used on domestic water lines, in bell fittings for cast iron pipes and in electrical equipment
- Vent and pipe flashings

### 5.3 POLYCHLORINATED BIPHENYLS

One fluorescent light fixture was observed in the mechanical room. Based on the construction date of the subject building and the apparent vintage of the fixture, the ballast within this fixture may contain PCBs.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Findings  
March 18, 2015

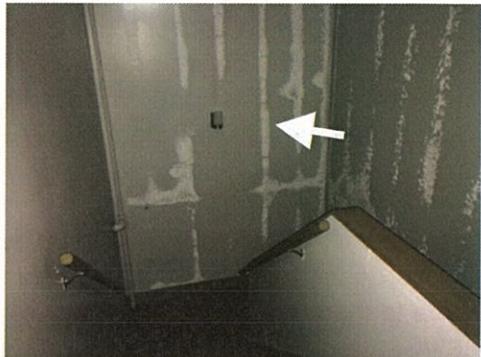
### 5.4 MERCURY

Mercury vapour is likely to be present in the fluorescent light tubes in the one fluorescent light fixture observed in the mechanical room. In addition, one mercury containing thermostat was also observed in the mechanical room as indicated on the floor plan drawings in Appendix A.

### 5.5 MOULD

Observations made by Stantec associated with mould and moisture impacted building materials are presented below in Table 4.

**Table 4 Summary of Microbial Contamination Observations, Palace Grand Theatre, Dawson City, YT**

Suspect Mould and/or Moisture Impacted Building Material Observed	Photo
Frost and ice was observed on drywall walls and around window frames in various locations throughout the building. When this melts, the resulting moisture that will impact porous materials in the areas (e.g. paper facings of drywall) can create conditions conducive to mould growth.	

### 5.6 OZONE DEPLETING SUBSTANCES

The roof was not accessed as part of this assessment.

It was reported by site personnel that there is one HVAC unit located on the roof of the mechanical room that contains the ODS refrigerant R-22.

### 5.7 SILICA

Silica is expected to be present in ceramic tiles, concrete, cement and masonry block and interior wall finishes observed in various locations.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Recommendations  
March 18, 2015

### 6.0 RECOMMENDATIONS

The recommendations pertaining to the requirements for each of the hazardous materials included in this assessment are presented in the sub-sections below.

#### 6.1 ASBESTOS

Based on the visual assessment and results of laboratory analyses and review of previous documentation, Stantec recommends the following with regards to ACMs in the subject building

- Identified ACMs in good condition can be managed in place. When they are to be impacted by planned renovation/demolition activities they should be removed prior to the onset of these activities, in accordance with the requirements of the Canada Labour Code, the WCB and the current version of the YT OHS Reg. It is expected that this will require the involvement of an experienced asbestos abatement contractor.
- Prior to renovation and/or demolition activities that would disturb them, undertake testing of PACMs that may be impacted to determine their asbestos content. Confirmed asbestos materials should be handled accordingly.
- Should a material suspected to contain asbestos fibres become uncovered during renovation/demolition activities, all work in the areas that may disturb the material should be stopped. Samples of the suspect material should be submitted for laboratory analysis to determine if asbestos fibres are present. Confirmed asbestos materials should be handled in accordance with applicable guidelines and regulations.
- Due to the confirmed presence of asbestos within the subject building, and in accordance with PWGSC requirements, an asbestos exposure control plan (also known as an Asbestos Management Plan [AMP] or asbestos operations and management plan) should be developed and implemented for the subject building. The AMP would serve to compile the available data, results and reports regarding the presence, extent, handling, removal, and disposal of ACMs within the subject building. The AMP would also provide sections for information regarding future sampling and analysis of suspected ACMs, if required, asbestos-abatement projects, if undertaken, and other information regarding the management of asbestos within the subject building.
- Suspected ACMs deemed visually similar to the ACMs identified in this report should be considered asbestos-containing and handled as such, unless proven otherwise, through analytical testing.
- Ensure asbestos containing waste is handled, stored, and disposed of in accordance with the requirements of the *Federal Transportation of Dangerous Goods Regulation* and Yukon *Environment Special Waste and Solid Waste Regulations* document entitled *Asbestos Disposal* (2010).

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Recommendations  
March 18, 2015

### 6.1.1 Vermiculite Debris

Asbestos-containing vermiculite debris is present within the crawlspace. Options to address this include the following:

- Sealing any air pathways between the main floor and the crawlspace (or operating the crawlspace under negative pressure with respect to the main floor area) and restricting access to the crawlspace area through locking the access hatchways and posting appropriate signage warning of the presence (and hazards) of asbestos and indicating that only authorized personnel (appropriately trained/qualified) with appropriate personal protective equipment may enter.
- Conducting an abatement project to remove debris within the crawlspace and to seal openings and/or pathways from which this material is being released. It is expected that this will require the involvement of an experienced asbestos abatement contractor.

## 6.2 LEAD

Lead-containing paint in poor condition should be cleaned-up and/or addressed to mitigate potential for loose paint chips to be released.

For LCPs and lead-containing materials that are to be disturbed and/or removed during renovation/demolition activities (or the above-noted clean-up) ensure compliance with the following:

- Occupational exposure control requirements of the Canada Labour Code and the WCB
- Disposal requirements of Yukon Environment – *Contaminated Sites Regulations* and the Yukon Government *Special Waste Regulations*
- Transportation requirements of the *Federal Transportation of Dangerous Goods Regulation*

Corrective action or remedial work on paint applications containing any concentration of lead should be undertaken in a manner so as to avoid generating fine particulate matter or dust (i.e., avoid sanding). Airborne lead dust or fumes should not exceed the WCB 8-hour OEL of 0.15 mg/m<sup>3</sup> during the removal of paints and products containing any concentration of lead. The use of personal protective equipment is recommended to reduce the potential for over-exposure to lead dust.

## 6.3 POLYCHLORINATED BIPHENYLS

For continued operations and maintenance, fluorescent lamp ballasts that may contain PCBs can be managed in place, where these items are operating and in good condition. No further action is currently required until 2025, when PCB-containing items will require removal and disposal.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Recommendations  
March 18, 2015

The provisions for PCBs that are indicated below would apply for either renovation or demolition:

- As fluorescent lamp ballasts may contain PCBs, if these items are removed from service, they should be assessed in reference to the PCB Guide.
- If PCB-containing items are identified and require removal, they should be handled, transported, stored and disposed of according to the *Federal Transportation of Dangerous Goods Regulation* and the PCB Regulations (SOR/2008-273).

### 6.4 MERCURY

For continued operations and maintenance, identified mercury-containing materials can be managed in place. Mercury vapour within light fixtures and/or liquid mercury in thermostat switches or thermometers pose no risk to workers or occupants provided the mercury containers remain intact and undisturbed. No further action is currently required.

For either renovation or demolition, if mercury-containing materials (e.g., thermostats, fluorescent light bulbs) are to be removed from service, ensure all mercury waste is handled, stored and disposed of in accordance with the requirements of the requirements of the Yukon Government *Special Waste Regulations* and the *Transportation of Dangerous Goods Regulation*.

### 6.5 MOULD

When renovation/demolition work proceeds mould and/or moisture-impacted building materials may be encountered during that process. If those impacted materials are to be removed by hand, demolition workers should be notified of the potential presence of mould and be provided with respiratory protection and/or other personal protective equipment as deemed necessary for the work that they will be conducting.

If significant mould contamination is identified in concealed locations, an experienced mould abatement contractor may be required to assist with removal in accordance with applicable guidelines and standards for such work.

When temperatures within the subject building rise to above freezing, care should be taken to remove any excess moisture or standing water and to avoid wetting of porous materials, which may lead to mould growth on those materials.

### 6.6 OZONE DEPLETING SUBSTANCES

Reported ODS-containing equipment within the building that is to remain operational (one HVAC unit located on the roof of the mechanical room that reportedly contains the ODS refrigerant R-22) can be managed in place and must be serviced by licensed refrigeration technicians (as defined in the FHR).

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Closure  
March 18, 2015

If ODS-containing equipment in the building is to be decommissioned, ODSs must be handled, recycled, stored, and/or disposed of in accordance with the requirements of with the requirements of the *Yukon's Ozone Depleting Substances Regulations* and the FHR 2003.

### 6.7 SILICA

For continued operations and maintenance, identified silica-containing materials can be managed in place.

For renovation or demolition activities, if silica-containing materials are to be disturbed, ensure dust control measures are employed such that airborne silica dust concentrations do not exceed the applicable exposure limits indicated in the current version of the YT OHS Reg. This would include, but not be limited to, the following:

- Providing workers with respiratory protection
- Wetting the surface of the materials to prevent dust emissions
- Providing workers with facilities to properly wash prior to exiting the work area
- Providing dust control to mitigate the potential for demolition dust to escape from the work area into public and/or adjacent areas

### 7.0 CLOSURE

This report has been prepared by Stantec Consulting Ltd. for the sole benefit of Public Works and Government Services Canada. Any use that a third party makes of this report, or any reliance on decisions to be made based on it, is the responsibility of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The conclusions presented represent the best judgment of the assessor based on current environmental standards and the site conditions observed on the dates cited within this report. This report is based on, and limited by, circumstances and conditions stated herein, and on information available at the time of preparation of the report. Due to the limited nature of the investigation and the limited data available, Stantec Consulting Ltd. cannot warrant against undiscovered environmental liabilities. It is possible that additional, concealed hazardous materials may become evident during renovation and/or demolition activities within the subject building.

If any conditions become apparent that differ significantly from our understanding of conditions as presented in this report, we request that we be notified immediately to reassess the conclusions provided herein.

## HAZARDOUS BUILDING MATERIALS ASSESSMENTS

Closure  
March 18, 2015

We trust that the report meets your current requirements. Should you have any questions or concerns regarding the above, please do not hesitate to contact the undersigned.

Respectfully submitted,

**STANTEC CONSULTING LTD.**

Reviewed by:

**Original Signed By**

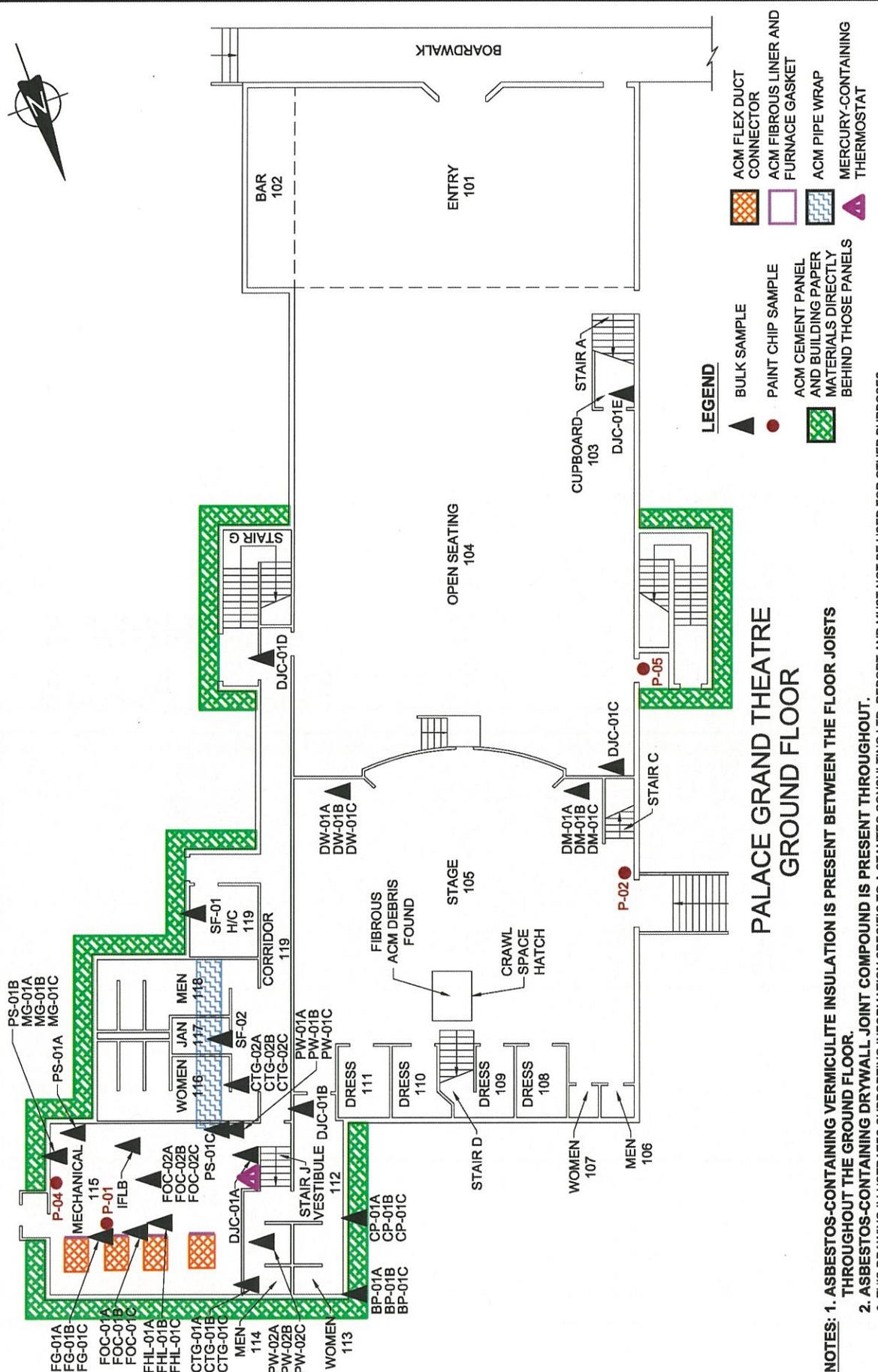
Keith Irwin Dipl. Tech.  
Environmental Technologist

KI/SB/tt

**Original Signed By**

Sean Brigden, B.Sc., P.B.Dipl., CRSP  
Project Manager

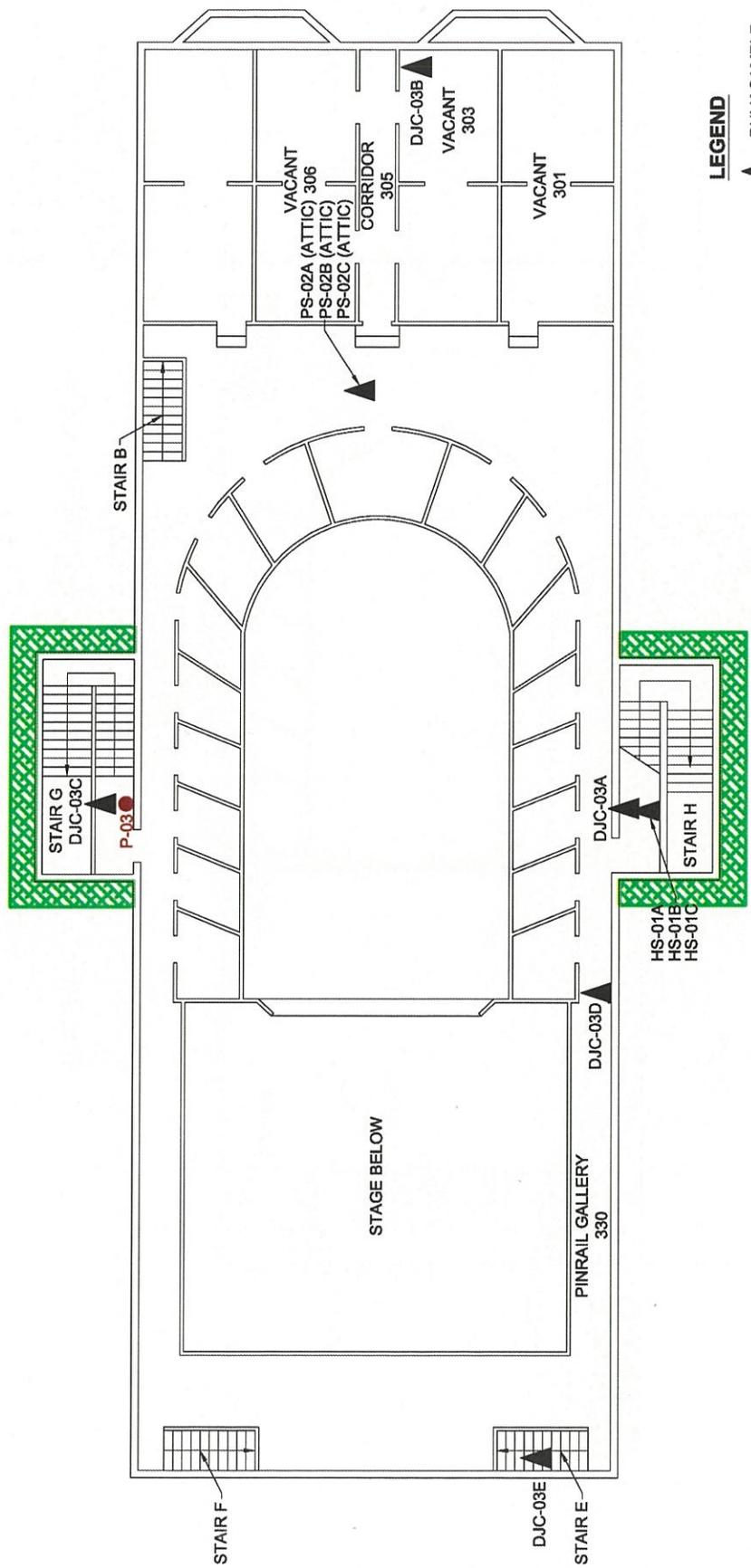
# **APPENDIX A FLOOR PLANS**



## PALACE GRAND THEATRE GROUND FLOOR

**NOTES:** 1. ASBESTOS-CONTAINING VERMICULITE INSULATION IS PRESENT BETWEEN THE FLOOR JOISTS THROUGHOUT THE GROUND FLOOR.  
 2. ASBESTOS-CONTAINING DRYWALL JOINT COMPOUND IS PRESENT THROUGHOUT.  
 3. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

<b>FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS</b>		<b>1</b>	
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA		Dwg. No.: 123220212	
App'd By: SB		Scale: N.T.S.	
Dwn. By: CD DMVM		Date: 15/02/27	
SL2015020108		Project No.: 123220212	

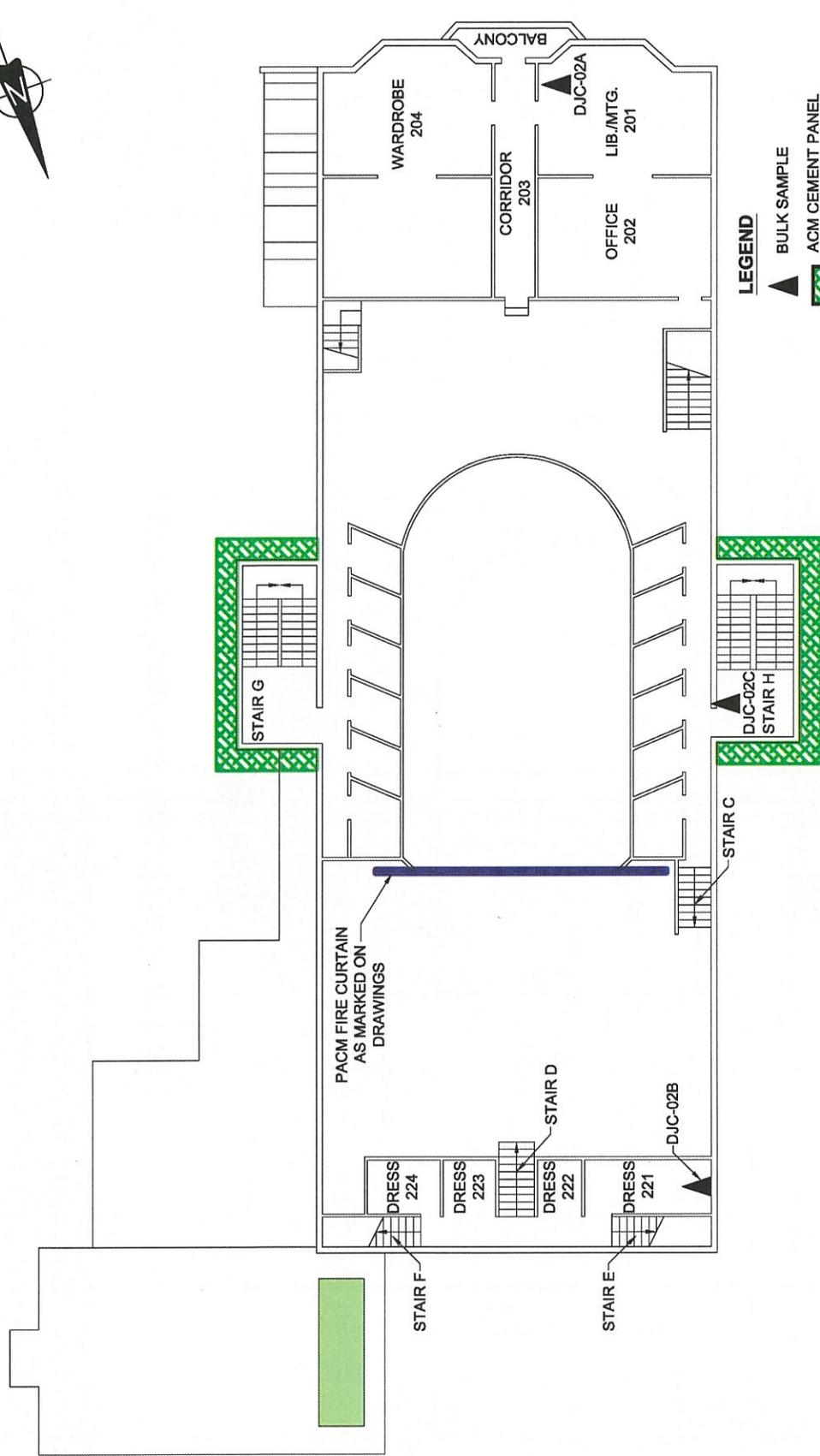


- LEGEND**
- ▲ BULK SAMPLE
  - PAINT CHIP SAMPLE
  - ACM CEMENT PANEL AND BUILDING PAPER MATERIALS DIRECTLY BEHIND THOSE PANELS

**PALACE GRAND THEATRE SECOND FLOOR**

**NOTE: 1. ASBESTOS-CONTAINING DRYWALL JOINT COMPOUND IS PRESENT THROUGHOUT.**  
 2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

<b>Project No.:</b> 123220212		<b>Dwg. No.:</b>
<b>Scale:</b> N.T.S.	2	
<b>Date:</b> 15/02/26		
<b>Dwn. By:</b> CD PKDM		
<b>App'd By:</b> SB		
<b>FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS</b>		
PALACE GRAND THEATRE - DAWSON CITY, YT		
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA		
<b>Client:</b>		



- LEGEND**
- ▲ BULK SAMPLE
  - ACM CEMENT PANEL AND BUILDING PAPER MATERIALS DIRECTLY BEHIND THOSE PANELS
  - REPORTED ODS-CONTAINING HVAC UNIT (R-22)
  - PRESUMED ASBESTOS-CONTAINING FIRE CURTAIN

### PALACE GRAND THEATRE MEZZANINE FLOOR

**NOTE: 1. ASBESTOS-CONTAINING DRYWALL JOINT COMPOUND IS PRESENT THROUGHOUT.**  
 2. THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD. REPORT AND MUST NOT BE USED FOR OTHER PURPOSES.

<b>FLOOR PLAN SHOWING HAZARDOUS BUILDING MATERIALS AND BULK SAMPLE LOCATIONS</b>		<b>3</b>		
Project No.: 123220212		Dwg. No.:		
Scale: N.T.S.				
Date: 15/02/26				
Dwn. By: CD PK/DM				
App'd By: SB				
Client: PUBLIC WORKS AND GOVERNMENT SERVICES CANADA				

**APPENDIX B**  
**SUMMARY OF SUSPECTED ACM BULK**  
**SAMPLES**

Sample Number	Material Description	Sample Location	Results (%/Type Asbestos)
CP-01A	Exterior Cement Panel	West Wall of Mechanical Room	15% Chrysotile
CP-01B	Exterior Cement Panel	West Wall of Mechanical Room	Stop Positive (Not Analyzed)
CP-01C	Exterior Cement Panel	West Wall of Mechanical Room	Stop Positive (Not Analyzed)
FDC-01A	White Woven Flex Duct Connector	Mechanical Room Between Furnaces and Furnace Ducting	60% Chrysotile
FDC-01B	White Woven Flex Duct Connector	Mechanical Room Between Furnaces and Furnace Ducting	Stop Positive (Not Analyzed)
FDC-01C	White Woven Flex Duct Connector	Mechanical Room Between Furnaces and Furnace Ducting	Stop Positive (Not Analyzed)
FDC-02A	Black Rubbery Flex Duct Connector	Mechanical Room on Emergency Generator Exhaust Duct	None Detected
FDC-02B	Black Rubbery Flex Duct Connector	Mechanical Room on Emergency Generator Exhaust Duct	None Detected
FDC-02C	Black Rubbery Flex Duct Connector	Mechanical Room on Emergency Generator Exhaust Duct	None Detected
FHL-01A	White Fibrous Liner	Mechanical Room on Back of Circular Furnace Hatches	50% Chrysotile
FHL-01B	White Fibrous Liner	Mechanical Room on Back of Circular Furnace Hatches	Stop Positive (Not Analyzed)
FHL-01C	White Fibrous Liner	Mechanical Room on Back of Circular Furnace Hatches	Stop Positive (Not Analyzed)
HS-01A	Heat Shield Inside Round Incandescent Light Fixtures	West Second Floor Emergency Stairwell Landing	None Detected
HS-01B	Heat Shield Inside Round Incandescent Light Fixtures	West Second Floor Emergency Stairwell Landing	None Detected
HS-01C	Heat Shield Inside Round Incandescent Light Fixtures	West Second Floor Emergency Stairwell Landing	None Detected
FG-01A	White Furnace Gasket	Mechanical Room on Between Furnace and Red Burner Box	1.3% chrysotile
FG-01B	White Furnace Gasket	Mechanical Room on Between Furnace and Red Burner Box	Stop Positive (Not Analyzed)
FG-01C	White Furnace Gasket	Mechanical Room on Between Furnace and Red Burner Box	Stop Positive (Not Analyzed)
PS-01A	Brown Pipe Sealant	East Corner of Mechanical Room on Piping	None Detected
PS-01B	Brown Pipe Sealant	East Corner of Mechanical Room on Piping	None Detected
PS-01C	Brown Pipe Sealant	East Corner of Mechanical Room on Piping	None Detected

Sample Number	Material Description	Sample Location	Results (%/Type Asbestos)
PS-02A	Light Blue Pipe Sealant	On 2" Sprinkler System in Attic Space	None Detected
PS-02B	Light Blue Pipe Sealant	On 2" Sprinkler System in Attic Space	None Detected
PS-02C	Light Blue Pipe Sealant	On 2" Sprinkler System in Attic Space	None Detected
PW-01A	White Pipe Wrap	South West Corner of Mechanical Room	20% Chrysotile
PW-01B	White Pipe Wrap	South West Corner of Mechanical Room	Stop Positive (Not Analyzed)
PW-01C	White Pipe wrap	South West Corner of Mechanical Room	Stop Positive (Not Analyzed)
PW-02A	Grey Painted Pipe Wrap	Outside of North end men's Washroom	None Detected
PW-02B	Grey Painted Pipe Wrap	Outside of North end men's Washroom	None Detected
PW-02C	Grey Painted Pipe Wrap	Outside of North end men's Washroom	None Detected
DW-01A	Black Duct Wrap	South East Corner of Stage	None Detected
DW-01B	Black Duct Wrap	South East Corner of Stage	None Detected
DW-01C	Black Duct Wrap	South East Corner of Stage	None Detected
DM-01A	Brown Duct Mastic	South East Corner of Stage	None Detected
DM-01B	Brown Duct Mastic	South East Corner of Stage	None Detected
DM-01C	Brown Duct Mastic	South East Corner of Stage	None Detected
BP-01A	Black Building Paper Under Cement Panel on Exterior	West Wall of Mechanical Room	<0.25% Chrysotile
BP-01B	Black Building Paper Under Cement Panel on Exterior	West Wall of Mechanical Room	<0.25% Chrysotile
BP-01C	Black Building Paper Under Cement Panel on Exterior	West Wall of Mechanical Room	<0.25% Chrysotile
MG-01A	Black Mechanical Gasket	Mechanical Room on Red Viking Fitting	None Detected
MG-01B	Black Mechanical Gasket	Mechanical Room on Red Viking Fitting	None Detected
MG-01C	Black Mechanical Gasket	Mechanical Room on Red Viking Fitting	None Detected
CTG-01A	White Ceramic Tile Grout	North End Men's Washroom	None Detected
CTG-01B	White Ceramic Tile Grout	North End Men's Washroom	None Detected
CTG-01C	White Ceramic Tile Grout	North End Men's Washroom	None Detected

<b>Sample Number</b>	<b>Material Description</b>	<b>Sample Location</b>	<b>Results (%/Type Asbestos)</b>
CTG-02A	White Ceramic Tile Grout	North East Outside Women's Washroom	None Detected
CTG-02B	White Ceramic Tile Grout	North East Outside Women's Washroom	None Detected
CTG-02C	White Ceramic Tile Grout	North East Janitor Room	None Detected
SF-01	Tanned Sheet Flooring	North East Handicap Washroom	None Detected
SF-02	Tanned Sheet Flooring	North East Janitor Room	None Detected
DJC-01A	Dry Wall Joint Compound	Mechanical Room at North East Door	2% Chrysotile
DJC-01B	Dry Wall Joint Compound	Hallways Behind Stage at South West Door	Stop Positive (Not Analyzed)
DJC-01C	Dry Wall Joint Compound	Landing in Stairwell C on Main Floor	Stop Positive (Not Analyzed)
DJC-01D	Dry Wall Joint Compound	Corridor Outside Stairwell G on Main Floor	Stop Positive (Not Analyzed)
DJC-01E	Dry Wall Joint Compound	Interior Wall in Stairwell A on Main Floor	Stop Positive (Not Analyzed)
DJC-02A	Dry Wall Joint Compound	East Wall in Library/Meeting Room on Third Floor	2% Chrysotile
DJC-02B	Dry Wall Joint Compound	Landing in Stairwell E on Third Floor	Stop Positive (Not Analyzed)
DJC-02C	Dry Wall Joint Compound	Landing in Stairwell H on Third Floor	Stop Positive (Not Analyzed)
DJC-03A	Dry Wall Joint Compound	Landing in Stairwell H on Second Floor	2% Chrysotile
DJC-03B	Dry Wall Joint Compound	North West Room From Corridor on Second Floor	Stop Positive (Not Analyzed)
DJC-03C	Dry Wall Joint Compound	Landing in Stairwell G on Second Floor	Stop Positive (Not Analyzed)
DJC-03D	Dry Wall Joint Compound	North East Wall in Pin Rail Gallery	Stop Positive (Not Analyzed)
DJC-03E	Dry Wall Joint Compound	Landing in Stairwell E on Second Floor	Stop Positive (Not Analyzed)
CDP-0A	Fibrous Debris	Crawl Space Hatch	50% Chrysotile
CDP-0B	Fibrous Debris	Crawl Space Hatch	Stop Positive (Not Analyzed)
CDP-0C	Fibrous Debris	Crawl Space Hatch	Stop Positive (Not Analyzed)

**APPENDIX C  
CERTIFICATE OF ANALYSIS –  
SUSPECTED ACM SAMPLES**



# EMSL Canada Inc.

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EMSL Canada Order 551500844  
Customer ID: 55JACQ30N  
Customer PO: 123220212.200  
Project ID:

**Attn:** Keith Irwin  
Stantec Consulting, Ltd.  
4370 Dominion Street  
5th Floor  
Burnaby, BC V5G 4L7

**Phone:** (604) 436-3014  
**Fax:** (604) 436-3752  
**Collected:**  
**Received:** 1/26/2015  
**Analyzed:** 2/02/2015

**Proj:** 123220212.200

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** CP-01A

**Lab Sample ID:** 551500844-0001

**Sample Description:** WEST WALL OF MECHANICAL ROOM/EXTERIOR CEMENT PANEL

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015	Gray	0%	85%	15% Chrysotile	

**Client Sample ID:** CP-01B

**Lab Sample ID:** 551500844-0002

**Sample Description:** WEST WALL OF MECHANICAL ROOM/EXTERIOR CEMENT PANEL

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** CP-01C

**Lab Sample ID:** 551500844-0003

**Sample Description:** WEST WALL OF MECHANICAL ROOM/EXTERIOR CEMENT PANEL

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** FDC-01A

**Lab Sample ID:** 551500844-0004

**Sample Description:** MECHANICAL ROOM BETWEEN FURNACES AND FURNACE/DUCTING/WHITE WOVEN FLEX DUCT CONNECTOR

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015	White	5%	35%	60% Chrysotile	

**Client Sample ID:** FDC-01B

**Lab Sample ID:** 551500844-0005

**Sample Description:** MECHANICAL ROOM BETWEEN FURNACES AND FURNACE/DUCTING/WHITE WOVEN FLEX DUCT CONNECTOR

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** FDC-01C

**Lab Sample ID:** 551500844-0006

**Sample Description:** MECHANICAL ROOM BETWEEN FURNACES AND FURNACE/DUCTING/WHITE WOVEN FLEX DUCT CONNECTOR

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** FDC-02A

**Lab Sample ID:** 551500844-0007

**Sample Description:** MECHANICAL ROOM ON EMERGENCY GENERATOR EXHAUST/DUCT/BLACK RUBBERY FLEX DUCT CONNECTOR

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Gray	0.0%	100%	None Detected	



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EMSL Canada Order 551500844  
Customer ID: 55JACQ30N  
Customer PO: 123220212.200  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

<b>Client Sample ID:</b>	FDC-02B				<b>Lab Sample ID:</b>	551500844-0008
<b>Sample Description:</b>	MECHANICAL ROOM ON EMERGENCY GENERATOR EXHAUST/DUCT/BLACK RUBBERY FLEX DUCT CONNECTOR					
<b>TEST</b>	<b>Analyzed Date</b>	<b>Color</b>	<b>Non-Asbestos</b>		<b>Asbestos</b>	<b>Comment</b>
			<b>Fibrous</b>	<b>Non-Fibrous</b>		
PLM Grav. Reduction	1/30/2015	Gray	0.0%	100%	None Detected	

<b>Client Sample ID:</b>	FDC-02C				<b>Lab Sample ID:</b>	551500844-0009
<b>Sample Description:</b>	MECHANICAL ROOM ON EMERGENCY GENERATOR EXHAUST/DUCT/BLACK RUBBERY FLEX DUCT CONNECTOR					
<b>TEST</b>	<b>Analyzed Date</b>	<b>Color</b>	<b>Non-Asbestos</b>		<b>Asbestos</b>	<b>Comment</b>
			<b>Fibrous</b>	<b>Non-Fibrous</b>		
PLM Grav. Reduction	1/30/2015	Gray	0.0%	100%	None Detected	

<b>Client Sample ID:</b>	FHL-01A				<b>Lab Sample ID:</b>	551500844-0010
<b>Sample Description:</b>	MECHANICAL ROOM ON BACK OF CIRCULAR FURNACE/HATCHES/WHITE FIBROUS LINER					
<b>TEST</b>	<b>Analyzed Date</b>	<b>Color</b>	<b>Non-Asbestos</b>		<b>Asbestos</b>	<b>Comment</b>
			<b>Fibrous</b>	<b>Non-Fibrous</b>		
PLM	1/29/2015	Beige	2%	48%	50% Chrysotile	

<b>Client Sample ID:</b>	FHL-01B				<b>Lab Sample ID:</b>	551500844-0011
<b>Sample Description:</b>	MECHANICAL ROOM ON BACK OF CIRCULAR FURNACE/HATCHES/WHITE FIBROUS LINER					
<b>TEST</b>	<b>Analyzed Date</b>	<b>Color</b>	<b>Non-Asbestos</b>		<b>Asbestos</b>	<b>Comment</b>
			<b>Fibrous</b>	<b>Non-Fibrous</b>		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

<b>Client Sample ID:</b>	FHL-01C				<b>Lab Sample ID:</b>	551500844-0012
<b>Sample Description:</b>	MECHANICAL ROOM ON BACK OF CIRCULAR FURNACE/HATCHES/WHITE FIBROUS LINER					
<b>TEST</b>	<b>Analyzed Date</b>	<b>Color</b>	<b>Non-Asbestos</b>		<b>Asbestos</b>	<b>Comment</b>
			<b>Fibrous</b>	<b>Non-Fibrous</b>		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

<b>Client Sample ID:</b>	HS-01A				<b>Lab Sample ID:</b>	551500844-0013
<b>Sample Description:</b>	WEST SECOND FLOOR EMERGENCY STAIRWELL LANDING/HEAT SHIELD INSIDE ROUND INCANDESCENT LIGHT FIXTURES					
<b>TEST</b>	<b>Analyzed Date</b>	<b>Color</b>	<b>Non-Asbestos</b>		<b>Asbestos</b>	<b>Comment</b>
			<b>Fibrous</b>	<b>Non-Fibrous</b>		
PLM Grav. Reduction	1/30/2015	Yellow	0.0%	100%	None Detected	

<b>Client Sample ID:</b>	HS-01B				<b>Lab Sample ID:</b>	551500844-0014
<b>Sample Description:</b>	WEST SECOND FLOOR EMERGENCY STAIRWELL LANDING/HEAT SHIELD INSIDE ROUND INCANDESCENT LIGHT FIXTURES					
<b>TEST</b>	<b>Analyzed Date</b>	<b>Color</b>	<b>Non-Asbestos</b>		<b>Asbestos</b>	<b>Comment</b>
			<b>Fibrous</b>	<b>Non-Fibrous</b>		
PLM Grav. Reduction	1/30/2015	Yellow	0.0%	100%	None Detected	

<b>Client Sample ID:</b>	HS-01C				<b>Lab Sample ID:</b>	551500844-0015
<b>Sample Description:</b>	WEST SECOND FLOOR EMERGENCY STAIRWELL LANDING/HEAT SHIELD INSIDE ROUND INCANDESCENT LIGHT FIXTURES					
<b>TEST</b>	<b>Analyzed Date</b>	<b>Color</b>	<b>Non-Asbestos</b>		<b>Asbestos</b>	<b>Comment</b>
			<b>Fibrous</b>	<b>Non-Fibrous</b>		
PLM Grav. Reduction	1/30/2015	Yellow	0.0%	100%	None Detected	



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EMSL Canada Order 551500844  
Customer ID: 55JACQ30N  
Customer PO: 123220212.200  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** FG-01A **Lab Sample ID:** 551500844-0016  
**Sample Description:** MECHANICAL ROOM ON BETWEEN FURNACE AND RED BURNER/BOX/WHITE FURNACE GASKET

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Gray	0.0%	98.7%	1.3% Chrysotile	

**Client Sample ID:** FG-01B **Lab Sample ID:** 551500844-0017  
**Sample Description:** MECHANICAL ROOM ON BETWEEN FURNACE AND RED BURNER/BOX/WHITE FURNACE GASKET

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015				Positive Stop (Not Analyzed)	

**Client Sample ID:** FG-01C **Lab Sample ID:** 551500844-0018  
**Sample Description:** MECHANICAL ROOM ON BETWEEN FURNACE AND RED BURNER/BOX/WHITE FURNACE GASKET

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015				Positive Stop (Not Analyzed)	

**Client Sample ID:** PS-01A **Lab Sample ID:** 551500844-0019  
**Sample Description:** EAST CORNER OF MECHANICAL ROOM ON PIPING/BROWN PIPE SEALANT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Brown	0.0%	100%	None Detected	

**Client Sample ID:** PS-01B **Lab Sample ID:** 551500844-0020  
**Sample Description:** EAST CORNER OF MECHANICAL ROOM ON PIPING/BROWN PIPE SEALANT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Brown	0.0%	100%	None Detected	

**Client Sample ID:** PS-01C **Lab Sample ID:** 551500844-0021  
**Sample Description:** EAST CORNER OF MECHANICAL ROOM ON PIPING/BROWN PIPE SEALANT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Brown	0.0%	100%	None Detected	

**Client Sample ID:** PS-02A **Lab Sample ID:** 551500844-0022  
**Sample Description:** ON 2" SPRINKLER SYSTEM IN ATTIC SPACE/LIGHT BLUE PIPE SEALANT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Blue	0.0%	100%	None Detected	

**Client Sample ID:** PS-02B **Lab Sample ID:** 551500844-0023  
**Sample Description:** ON 2" SPRINKLER SYSTEM IN ATTIC SPACE/LIGHT BLUE PIPE SEALANT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Blue	0.0%	100%	None Detected	



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EMSL Canada Order 551500844  
Customer ID: 55JACQ30N  
Customer PO: 123220212.200  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** PS-02C **Lab Sample ID:** 551500844-0024  
**Sample Description:** ON 2" SPRINKLER SYSTEM IN ATTIC SPACE/LIGHT BLUE PIPE SEALANT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Blue	0.0%	100%	None Detected	

**Client Sample ID:** PW-01A **Lab Sample ID:** 551500844-0025  
**Sample Description:** SOUTH WEST CORNER OF MECHANICAL ROOM/WHITE PIPE WRAP

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015	White/Beige	50%	30%	20% Chrysotile	

**Client Sample ID:** PW-01B **Lab Sample ID:** 551500844-0026  
**Sample Description:** SOUTH WEST CORNER OF MECHANICAL ROOM/WHITE PIPE WRAP

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** PW-01C **Lab Sample ID:** 551500844-0027  
**Sample Description:** SOUTH WEST CORNER OF MECHANICAL ROOM/WHITE PIPE WRAP

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** PW-02A **Lab Sample ID:** 551500844-0028  
**Sample Description:** OUTSIDE OF NORTH END MEN'S WASHROOM/GREY PAINTED PIPE WRAP

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015	Gray/Black/Beige	55%	45%	None Detected	

**Client Sample ID:** PW-02B **Lab Sample ID:** 551500844-0029  
**Sample Description:** OUTSIDE OF NORTH END MEN'S WASHROOM/GREY PAINTED PIPE WRAP

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015	Gray/Black/Beige	55%	45%	None Detected	

**Client Sample ID:** PW-02C **Lab Sample ID:** 551500844-0030  
**Sample Description:** OUTSIDE OF NORTH END MEN'S WASHROOM/GREY PAINTED PIPE WRAP

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	2/02/2015	Black/Beige	60%	40%	None Detected	

**Client Sample ID:** DW-01A **Lab Sample ID:** 551500844-0031  
**Sample Description:** SOUTH EAST CORNER OF STAGE/BLACK DUCT WRAP

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015	Brown/Black/Beige	60%	40%	None Detected	



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EMSL Canada Order 551500844  
Customer ID: 55JACQ30N  
Customer PO: 123220212.200  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** DW-01B **Lab Sample ID:** 551500844-0032  
**Sample Description:** SOUTH EAST CORNER OF STAGE/BLACK DUCT WRAP

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015	Brown/Black/Beige	60%	40%	None Detected	

**Client Sample ID:** DW-01C **Lab Sample ID:** 551500844-0033  
**Sample Description:** SOUTH EAST CORNER OF STAGE/BLACK DUCT WRAP

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	2/02/2015	Black/Beige	60%	40%	None Detected	

**Client Sample ID:** DM-01A **Lab Sample ID:** 551500844-0034  
**Sample Description:** SOUTH WEST CORNER OF STAGE/BROWN DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Brown	0.0%	100%	None Detected	

**Client Sample ID:** DM-01B **Lab Sample ID:** 551500844-0035  
**Sample Description:** SOUTH WEST CORNER OF STAGE/BROWN DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Brown	0.0%	100%	None Detected	

**Client Sample ID:** DM-01C **Lab Sample ID:** 551500844-0036  
**Sample Description:** SOUTH WEST CORNER OF STAGE/BROWN DUCT MASTIC

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Brown	0.0%	100%	None Detected	

**Client Sample ID:** BP-01A **Lab Sample ID:** 551500844-0037  
**Sample Description:** WEST WALL OF MECHANICAL ROOM/BLACK BUILDING PAPER UNDER CEMENT PANEL ON EXTERIOR

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Black	0.0%	100%	<0.25% Chrysotile	

**Client Sample ID:** BP-01B **Lab Sample ID:** 551500844-0038  
**Sample Description:** WEST WALL OF MECHANICAL ROOM/BLACK BUILDING PAPER UNDER CEMENT PANEL ON EXTERIOR

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Black	0.0%	100%	<0.25% Chrysotile	

**Client Sample ID:** BP-01C **Lab Sample ID:** 551500844-0039  
**Sample Description:** WEST WALL OF MECHANICAL ROOM/BLACK BUILDING PAPER UNDER CEMENT PANEL ON EXTERIOR

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Black	0.0%	100%	<0.25% Chrysotile	



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EMSL Canada Order 551500844  
Customer ID: 55JACQ30N  
Customer PO: 123220212.200  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** MG-01A **Lab Sample ID:** 551500844-0040  
**Sample Description:** MECHANICAL ROOM ON RED VIKING FITTING/BLACK MECHANICAL GASKET

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** MG-01B **Lab Sample ID:** 551500844-0041  
**Sample Description:** MECHANICAL ROOM ON RED VIKING FITTING/BLACK MECHANICAL GASKET

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** MG-01C **Lab Sample ID:** 551500844-0042  
**Sample Description:** MECHANICAL ROOM ON RED VIKING FITTING/BLACK MECHANICAL GASKET

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Black	0.0%	100%	None Detected	

**Client Sample ID:** CTG-01A **Lab Sample ID:** 551500844-0043  
**Sample Description:** NORTH END MEN'S WASHROOM/WHITE CERAMIC TILE GROUT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2015	White	0%	100%	None Detected	

**Client Sample ID:** CTG-01B **Lab Sample ID:** 551500844-0044  
**Sample Description:** NORTH END MEN'S WASHROOM/WHITE CERAMIC TILE GROUT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2015	White	0%	100%	None Detected	

**Client Sample ID:** CTG-01C **Lab Sample ID:** 551500844-0045  
**Sample Description:** NORTH END MEN'S WASHROOM/WHITE CERAMIC TILE GROUT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2015	White	0%	100%	None Detected	

**Client Sample ID:** CTG-02A **Lab Sample ID:** 551500844-0046  
**Sample Description:** NORTH EAST OUTSIDE WOMEN'S WASHROOM/WHITE CERAMIC TILE GROUT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2015	White	0%	100%	None Detected	

**Client Sample ID:** CTG-02B **Lab Sample ID:** 551500844-0047  
**Sample Description:** NORTH EAST OUTSIDE WOMEN'S WASHROOM/WHITE CERAMIC TILE GROUT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2015	White	0%	100%	None Detected	



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EMSL Canada Order 551500844  
Customer ID: 55JACQ30N  
Customer PO: 123220212.200  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** CTG-02C **Lab Sample ID:** 551500844-0048  
**Sample Description:** NORTH EAST JANITOR ROOM/WHITE CERAMIC TILE GROUT

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2015	White	0%	100%	None Detected	

**Client Sample ID:** SF-01 **Lab Sample ID:** 551500844-0049  
**Sample Description:** NORTH EAST HANDICAP WASHROOM/TANNED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Beige	0.0%	100%	None Detected	

**Client Sample ID:** SF-02 **Lab Sample ID:** 551500844-0050  
**Sample Description:** NORTH EAST JANITOR ROOM/TANNED SHEET FLOORING

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM Grav. Reduction	1/30/2015	Gray	0.0%	100%	None Detected	

**Client Sample ID:** DJC-01A **Lab Sample ID:** 551500844-0051  
**Sample Description:** MECHANICAL ROOM AT NORTH EAST DOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015	Beige	0%	98%	2% Chrysotile	

**Client Sample ID:** DJC-01B **Lab Sample ID:** 551500844-0052  
**Sample Description:** HALLWAYS BEHIND STAGE AT SOUTH WEST DOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** DJC-01C **Lab Sample ID:** 551500844-0053  
**Sample Description:** LANDING IN STAIRWELL C ON MAIN FLOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** DJC-01D **Lab Sample ID:** 551500844-0054  
**Sample Description:** CORRIDOR OUTSIDE STAIRWELL G ON MAIN FLOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** DJC-01E **Lab Sample ID:** 551500844-0055  
**Sample Description:** INTERIOR WALL IN STAIRWELL A ON MAIN FLOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	



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EMSL Canada Order 551500844  
Customer ID: 55JACQ30N  
Customer PO: 123220212.200  
Project ID:

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** DJC-02A **Lab Sample ID:** 551500844-0056  
**Sample Description:** EAST WALL IN LIBRARY/MEETING ROOM ON THIRD FLOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015	Beige	0%	98%	2% Chrysotile	

**Client Sample ID:** DJC-02B **Lab Sample ID:** 551500844-0057  
**Sample Description:** LANDING IN STAIRWELL E ON THIRD FLOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** DJC-02C **Lab Sample ID:** 551500844-0058  
**Sample Description:** LANDING IN STAIRWELL H ON THIRD FLOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** DJC-03A **Lab Sample ID:** 551500844-0059  
**Sample Description:** LANDING IN STAIRWELL H ON SECOND FLOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015	Beige	0%	98%	2% Chrysotile	

**Client Sample ID:** DJC-03B **Lab Sample ID:** 551500844-0060  
**Sample Description:** NORTH WEST ROOM FROM CORRIDOR ON SECOND FLOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** DJC-03C **Lab Sample ID:** 551500844-0061  
**Sample Description:** LANDING IN STAIRWELL G ON SECOND FLOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** DJC-03D **Lab Sample ID:** 551500844-0062  
**Sample Description:** NORTH EAST WALL IN PINRAIL GALLERY/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** DJC-03E **Lab Sample ID:** 551500844-0063  
**Sample Description:** LANDING IN STAIRWELL E ON SECOND FLOOR/DRY WALL JOINT COMPOUND

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/29/2015				Stop Positive (Not Analyzed)	



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EMSL Canada Order 551500844  
Customer ID: 55JACQ30N  
Customer PO: 123220212.200  
Project ID:

### Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

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#### Analyst(s):

---

Jefferson Salvador	PLM (11)
John Biesiadecki	PLM (4) PLM Grav. Reduction (16)
Kate Fee	PLM (2)
Nicole Yeo	PLM (2) PLM Grav. Reduction (8)

#### Reviewed and approved by:

Matthew Davis  
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Calgary, AB

Initial report from: 02/02/2015 13:16:55



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EMSL Canada Order 551500974  
Customer ID: 55JACQ30L  
Customer PO: 123220212  
Project ID:

**Attn:** Keith Irwin  
Stantec Consulting, Ltd.  
500 - 4730 Kingsway  
Burnaby, BC V5H 0C6  
**Phone:** (604) 412-3004  
**Fax:**  
**Collected:**  
**Received:** 1/29/2015  
**Analyzed:** 1/30/2015  
**Proj:** 123220212

## Test Report: Asbestos Analysis in Bulk Material for Occupational Health and Safety British Columbia Regulation 188/2011 via EPA 600/R-93/116 Method

**Client Sample ID:** CDP-0A **Lab Sample ID:** 551500974-0001  
**Sample Description:** CRAWL SPACE HATCH/FIBROUS DEBRIS

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2015	Gray	0%	50%	50% Chrysotile	

**Client Sample ID:** CDP-0B **Lab Sample ID:** 551500974-0002  
**Sample Description:** CRAWL SPACE HATCH/FIBROUS DEBRIS

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2015				Stop Positive (Not Analyzed)	

**Client Sample ID:** CDP-0C **Lab Sample ID:** 551500974-0003  
**Sample Description:** CRAWL SPACE HATCH/FIBROUS DEBRIS

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	1/30/2015				Stop Positive (Not Analyzed)	

**Analyst(s):**  
John Biesiadecki PLM (1)

**Reviewed and approved by:**

Matthew Davis  
or Other Approved Signatory

None Detected = <0.5%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 02/05/2015 13:58:28

**APPENDIX D  
CERTIFICATE OF ANALYSIS –  
SUSPECTED LCP SAMPLES**

**EMSL Canada Inc.**

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<http://www.EMSL.com>[torontolab@emsl.com](mailto:torontolab@emsl.com)

EMSL Canada Or	551500839
CustomerID:	55JACQ30L
CustomerPO:	123220212.200
ProjectID:	

Attn: **Keith Irwin**  
**Stantec Consulting, Ltd.**  
**500 - 4730 Kingsway**  
**Burnaby, BC V5H 0C6**

Phone: (604) 412-3004  
 Fax:  
 Received: 01/26/15 11:23 AM  
 Collected:

Project: 123220212.200

**Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)\***

<i>Client Sample Description</i>	<i>Lab ID</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Lead Concentration</i>
P-01 Site: FURNACE DUCT Desc: GREY	551500839-0001		1/28/2015	3600 ppm
P-02 Site: STAGE WALLS Desc: BLACK	551500839-0002		1/28/2015	<90 ppm
P-03 Site: EMERGENCY STAIRWELL Desc: WHITE	551500839-0003		1/28/2015	240 ppm
P-04 Site: MECHANICAL ROOM Desc: GREY	551500839-0004		1/28/2015	1700 ppm
P-05 Site: EXTERIOR TRIM Desc: GREY	551500839-0005		1/28/2015	<90 ppm

\_\_\_\_\_  
 Lisa Podzyhun  
 or other approved signatory

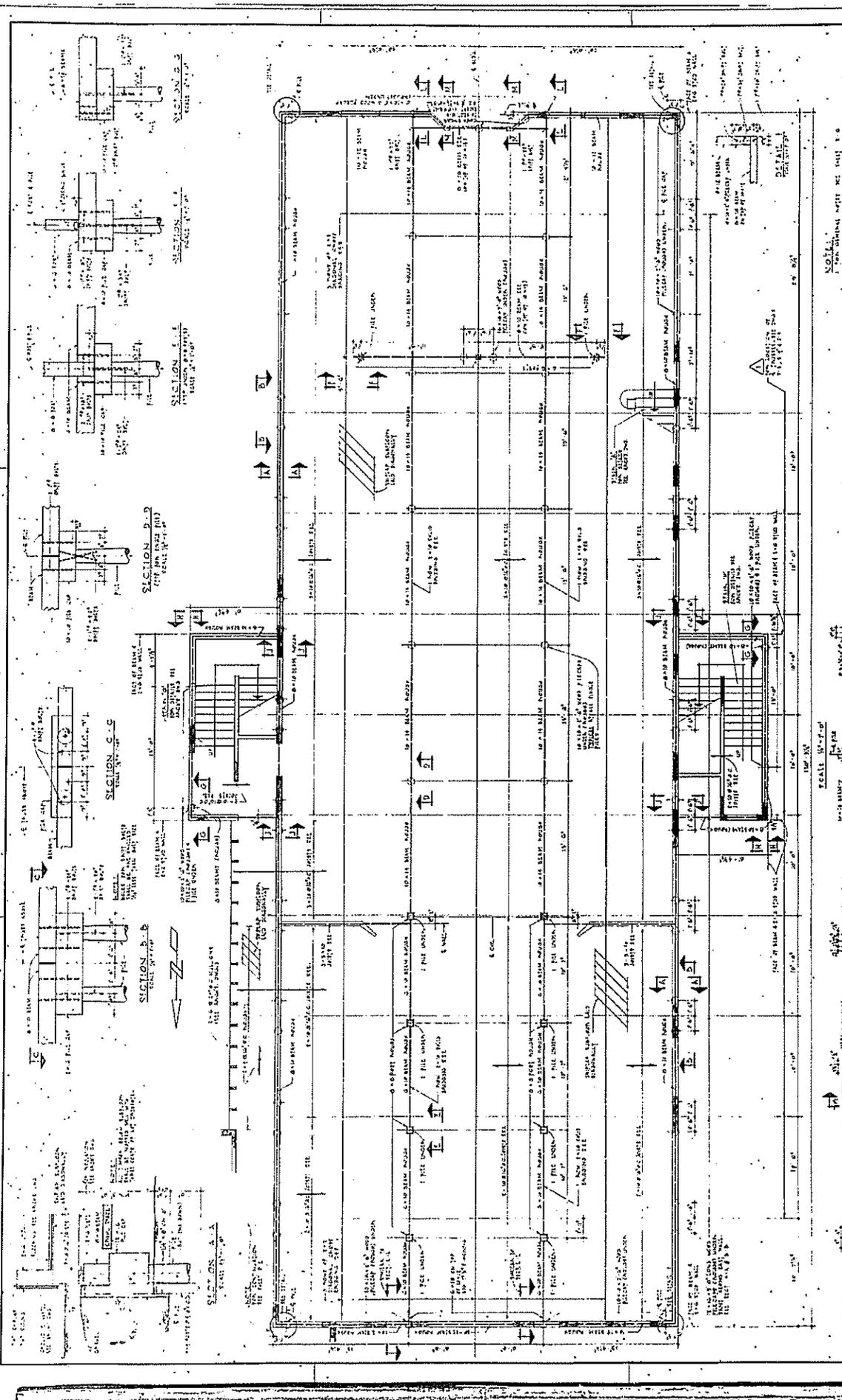
\*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 01/30/2015 14:42:05

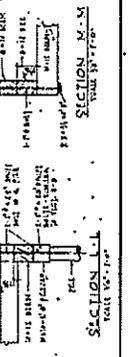
## **APPENDIX C**

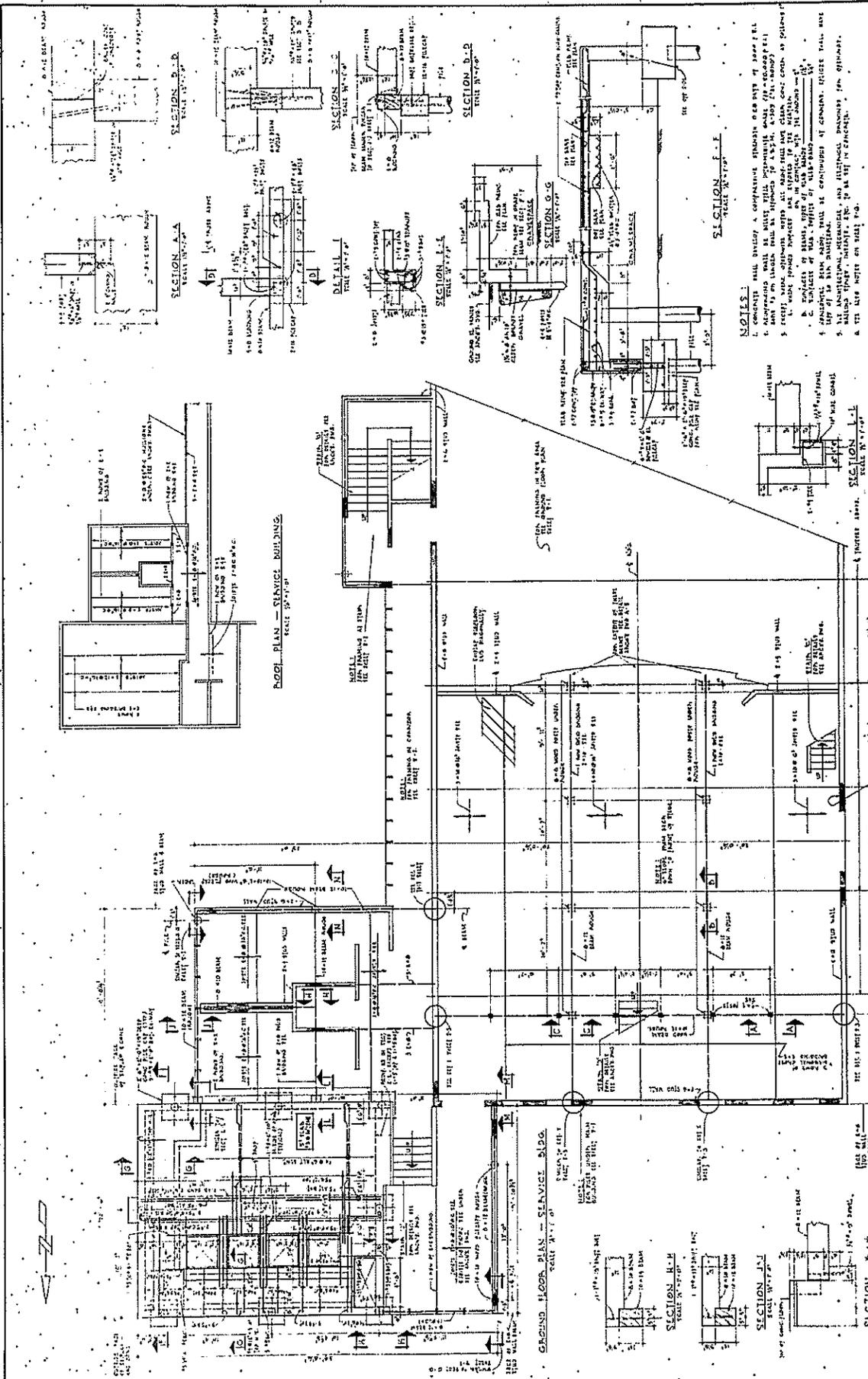
**The existing drawings included in this Appendix C are for information only. There is no guarantee that the information shown on those drawings are a true representative of the existing building condition.**



**NOTE:**  
 1. For details refer to sheet 7-10

<b>GROUND FLOOR AND PILING PLAN.</b>	
DATE	1916
PROJECT	PALACE GRAND THEATRE
OWNER	JANSON CITY UNION TRADING
ARCHITECT	GARDNER THOMSON & ASSOCIATES
ENGINEER	W. H. JONES



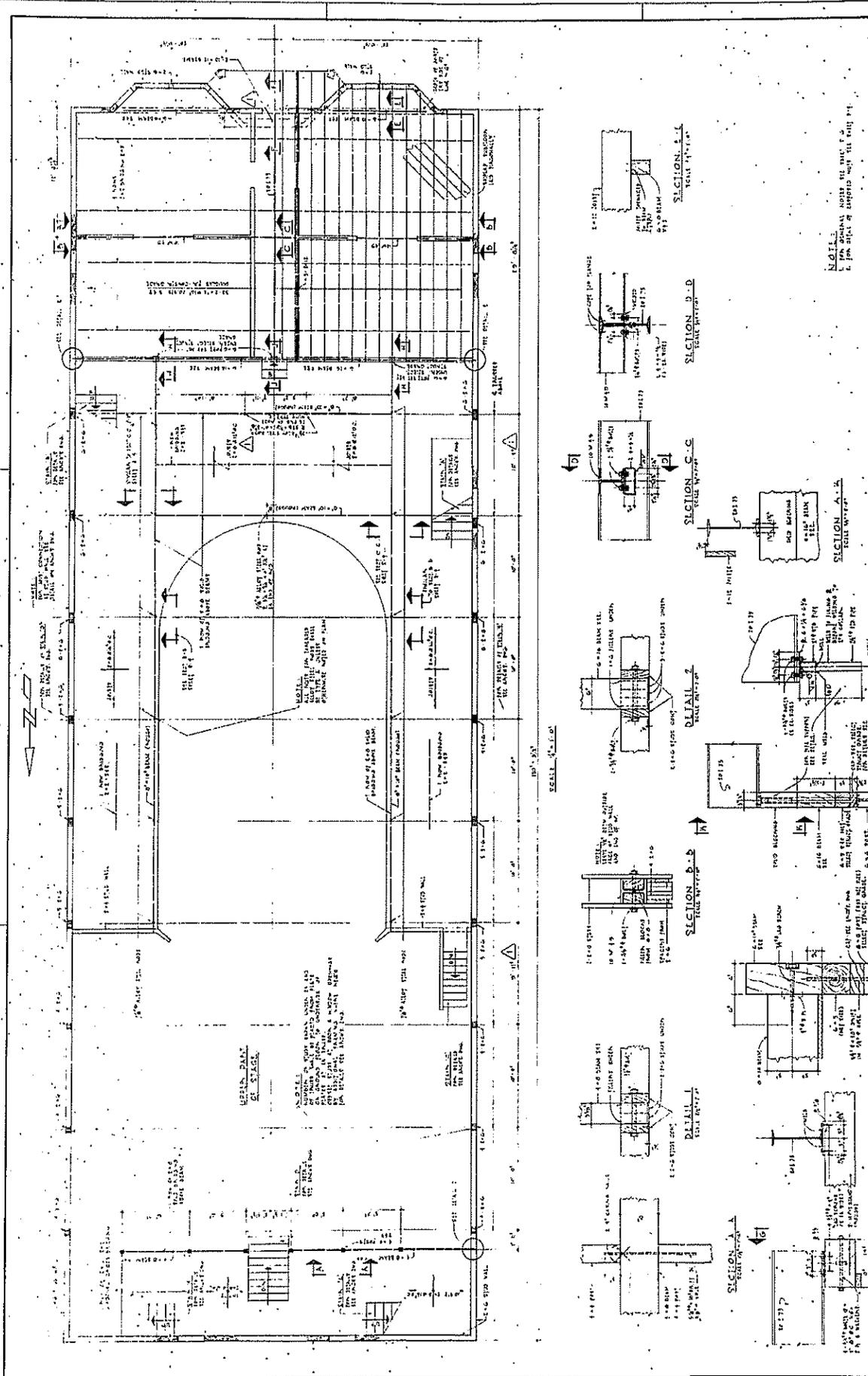


**NOTES:**

1. CONCRETE SHALL BE 1500 PSI COMPRESSIVE STRENGTH AND 4000 PSI TENSILE STRENGTH.
2. ALL REINFORCING SHALL BE 1/2" DIA. UNLESS OTHERWISE SPECIFIED.
3. ALL REINFORCING SHALL BE PLACED IN ACCORDANCE WITH THE FOLLOWING:
4. ALL REINFORCING SHALL BE PLACED IN ACCORDANCE WITH THE FOLLOWING:
5. ALL REINFORCING SHALL BE PLACED IN ACCORDANCE WITH THE FOLLOWING:

STAGE FLOOR AND SERVICE BUILDING PLANS:	
DESIGNED BY	READ JONES CHRISTOFFERSON
SCALE	AS SHOWN
DATE	MAY 1939
PROJECT NO.	1140
CLIENT	PALACE GRAND THEATRE
LOCATION	INDIANAPOLIS, INDIANA
ARCHITECT	BARDNER THORNTON BATHIE & ASSOCIATES
INDIANAPOLIS, INDIANA	

7056 76 D-4239



REVISIONS		SECOND FLOOR PLAN	
1	HEAD	NO. 1	NO. 1
2	ADDED	NO. 2	NO. 2
3	CHANGED	NO. 3	NO. 3
4	REMOVED	NO. 4	NO. 4
5	ADDED	NO. 5	NO. 5
6	CHANGED	NO. 6	NO. 6
7	REMOVED	NO. 7	NO. 7
8	ADDED	NO. 8	NO. 8
9	CHANGED	NO. 9	NO. 9
10	REMOVED	NO. 10	NO. 10
11	ADDED	NO. 11	NO. 11
12	CHANGED	NO. 12	NO. 12
13	REMOVED	NO. 13	NO. 13
14	ADDED	NO. 14	NO. 14
15	CHANGED	NO. 15	NO. 15
16	REMOVED	NO. 16	NO. 16
17	ADDED	NO. 17	NO. 17
18	CHANGED	NO. 18	NO. 18
19	REMOVED	NO. 19	NO. 19
20	ADDED	NO. 20	NO. 20
21	CHANGED	NO. 21	NO. 21
22	REMOVED	NO. 22	NO. 22
23	ADDED	NO. 23	NO. 23
24	CHANGED	NO. 24	NO. 24
25	REMOVED	NO. 25	NO. 25
26	ADDED	NO. 26	NO. 26
27	CHANGED	NO. 27	NO. 27
28	REMOVED	NO. 28	NO. 28
29	ADDED	NO. 29	NO. 29
30	CHANGED	NO. 30	NO. 30
31	REMOVED	NO. 31	NO. 31
32	ADDED	NO. 32	NO. 32
33	CHANGED	NO. 33	NO. 33
34	REMOVED	NO. 34	NO. 34
35	ADDED	NO. 35	NO. 35
36	CHANGED	NO. 36	NO. 36
37	REMOVED	NO. 37	NO. 37
38	ADDED	NO. 38	NO. 38
39	CHANGED	NO. 39	NO. 39
40	REMOVED	NO. 40	NO. 40
41	ADDED	NO. 41	NO. 41
42	CHANGED	NO. 42	NO. 42
43	REMOVED	NO. 43	NO. 43
44	ADDED	NO. 44	NO. 44
45	CHANGED	NO. 45	NO. 45
46	REMOVED	NO. 46	NO. 46
47	ADDED	NO. 47	NO. 47
48	CHANGED	NO. 48	NO. 48
49	REMOVED	NO. 49	NO. 49
50	ADDED	NO. 50	NO. 50
51	CHANGED	NO. 51	NO. 51
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55	REMOVED	NO. 55	NO. 55
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61	REMOVED	NO. 61	NO. 61
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65	ADDED	NO. 65	NO. 65
66	CHANGED	NO. 66	NO. 66
67	REMOVED	NO. 67	NO. 67
68	ADDED	NO. 68	NO. 68
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70	REMOVED	NO. 70	NO. 70
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77	ADDED	NO. 77	NO. 77
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90	CHANGED	NO. 90	NO. 90
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92	ADDED	NO. 92	NO. 92
93	CHANGED	NO. 93	NO. 93
94	REMOVED	NO. 94	NO. 94
95	ADDED	NO. 95	NO. 95
96	CHANGED	NO. 96	NO. 96
97	REMOVED	NO. 97	NO. 97
98	ADDED	NO. 98	NO. 98
99	CHANGED	NO. 99	NO. 99
100	REMOVED	NO. 100	NO. 100

NOTE:  
 1. FOR GENERAL NOTES SEE SHEET 1-1  
 2. FOR DETAIL OF STAIRS SEE SHEET 1-2

SECTION A-A  
 SCALE 1/4" = 1'-0"

SECTION B-B  
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SECTION C-C  
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SECTION D-D  
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SECTION E-E  
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SECTION G-G  
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DETAIL 95  
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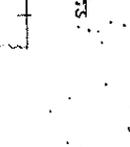
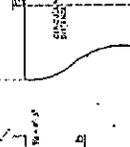
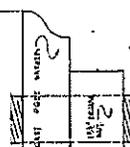
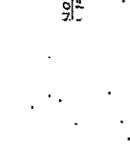
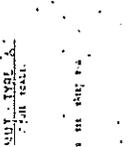
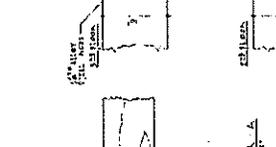
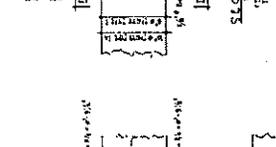
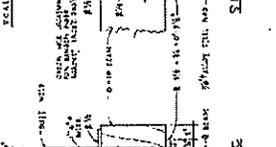
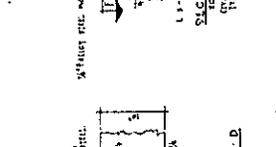
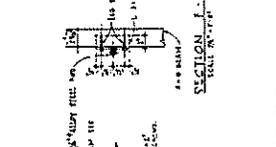
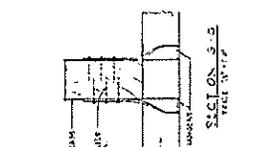
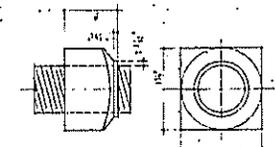
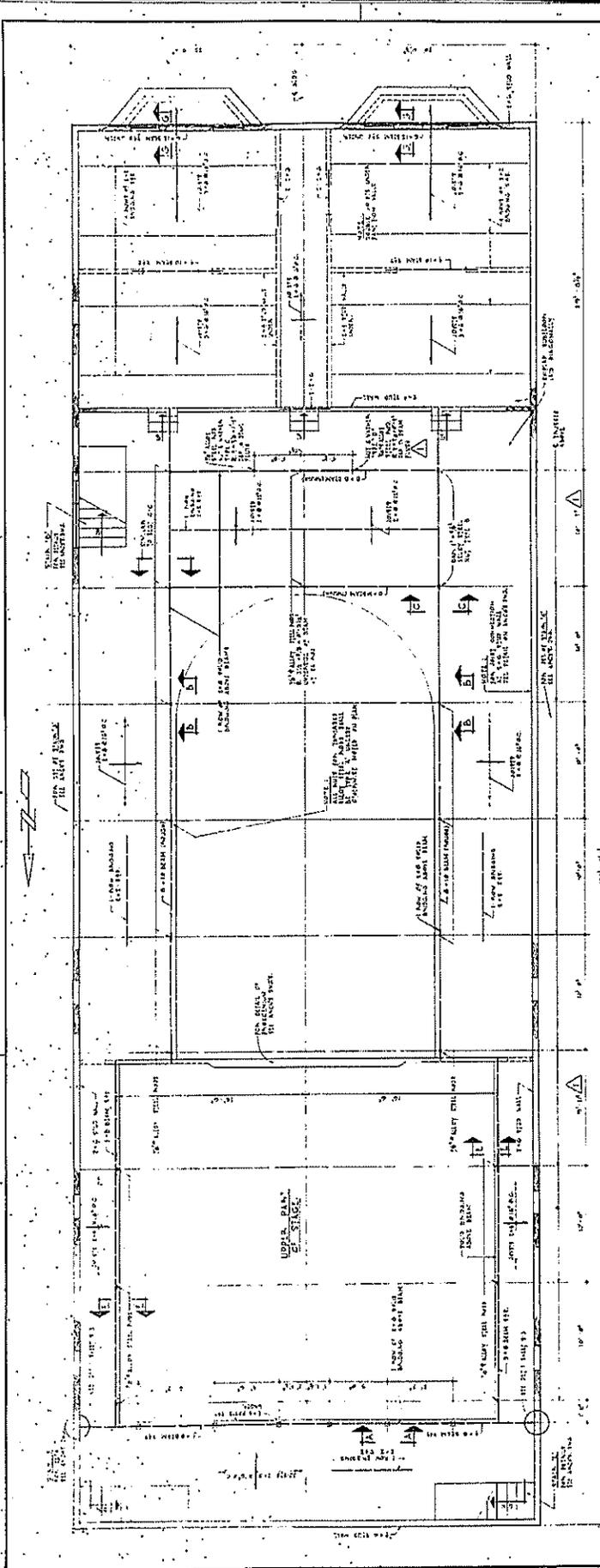
DETAIL 96  
 SCALE 1/4" = 1'-0"

DETAIL 97  
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DETAIL 100  
 SCALE 1/4" = 1'-0"



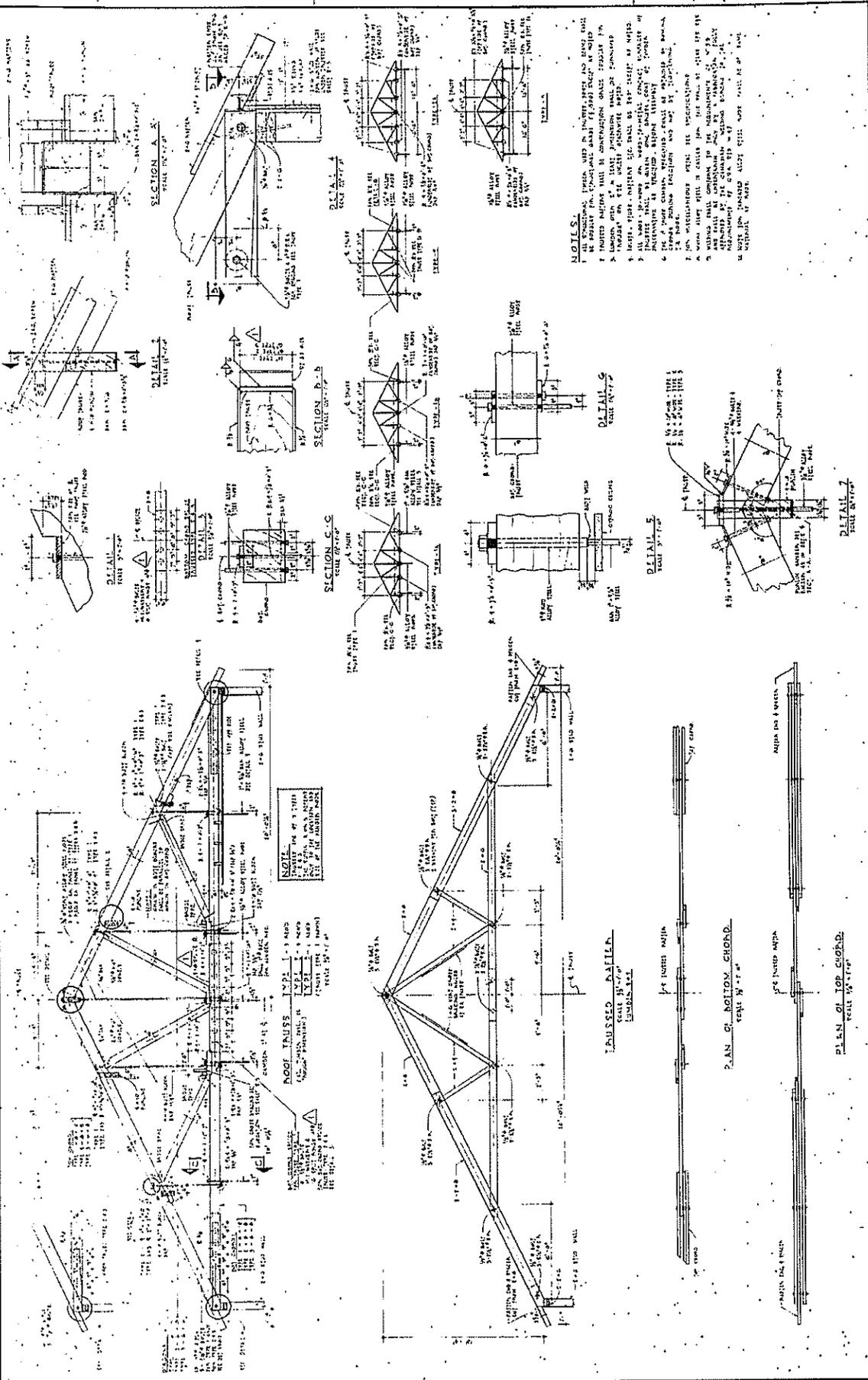
THIRD FLOOR PLAN

<p>ARCHITECT H. C. ADAMS JOHN J. JONES CHIEF ARCHITECT</p>	<p>NO. 1000 A. 1416 PLAN NO. 1000 SECTION 3-B</p>	<p>PROJECT PALACE GRAND THEATRE BOGOTON CITY - THORN TERRACE GARDNER THORNTON BATH &amp; ASSOCIATES ARCHITECTS 1000 ABBOTT ST. BOSTON 10, MASS.</p>
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SCALE 1/4" = 1'-0"

NOTE:  
1. FOR DETAILS REFER TO SHEET 3-A



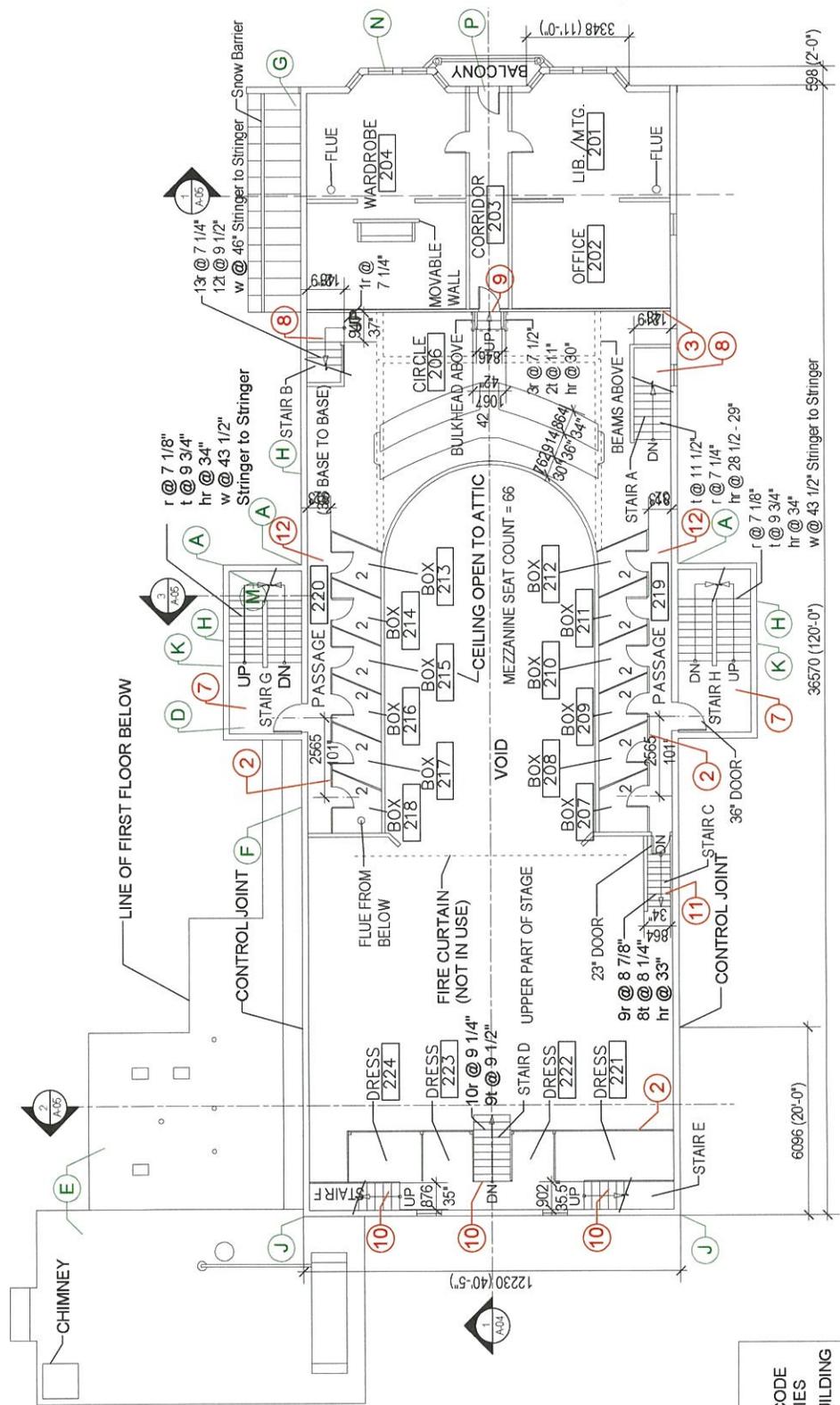


**NOTES.**

- 1 ALL TRUSS MEMBERS SHALL BE 100% STEEL AND SHALL BE FABRICATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC. (AISC) SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.
- 2 ALL TRUSS MEMBERS SHALL BE 100% STEEL AND SHALL BE FABRICATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC. (AISC) SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.
- 3 ALL TRUSS MEMBERS SHALL BE 100% STEEL AND SHALL BE FABRICATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC. (AISC) SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.
- 4 ALL TRUSS MEMBERS SHALL BE 100% STEEL AND SHALL BE FABRICATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC. (AISC) SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.
- 5 ALL TRUSS MEMBERS SHALL BE 100% STEEL AND SHALL BE FABRICATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC. (AISC) SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.
- 6 ALL TRUSS MEMBERS SHALL BE 100% STEEL AND SHALL BE FABRICATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC. (AISC) SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.
- 7 ALL TRUSS MEMBERS SHALL BE 100% STEEL AND SHALL BE FABRICATED IN ACCORDANCE WITH THE REQUIREMENTS OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC. (AISC) SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS.

ROOF TRUSSES & DETAILS		DATE
DESIGNED BY	READ JONES	1935
CHECKED BY	CHRISTOPHERSON	
DATE	MAY 1935	
PROJECT NO.	A-1540	
PROJECT NAME	PALACE GRAND THEATRE	
PROJECT ADDRESS	DIXON CITY - IOWA	
ENGINEER	GARDNER THORNTON SMITH & ASSOCIATES	
OFFICE ADDRESS	1000 ALABAMA ST.	
REGISTERED IN I. C. E.	1928 No. 0-4835	





LEGEND:  
 1 NUMBER: CODE DEFICIENCIES  
 A LETTER: BUILDING ENVELOPE DEFICIENCIES

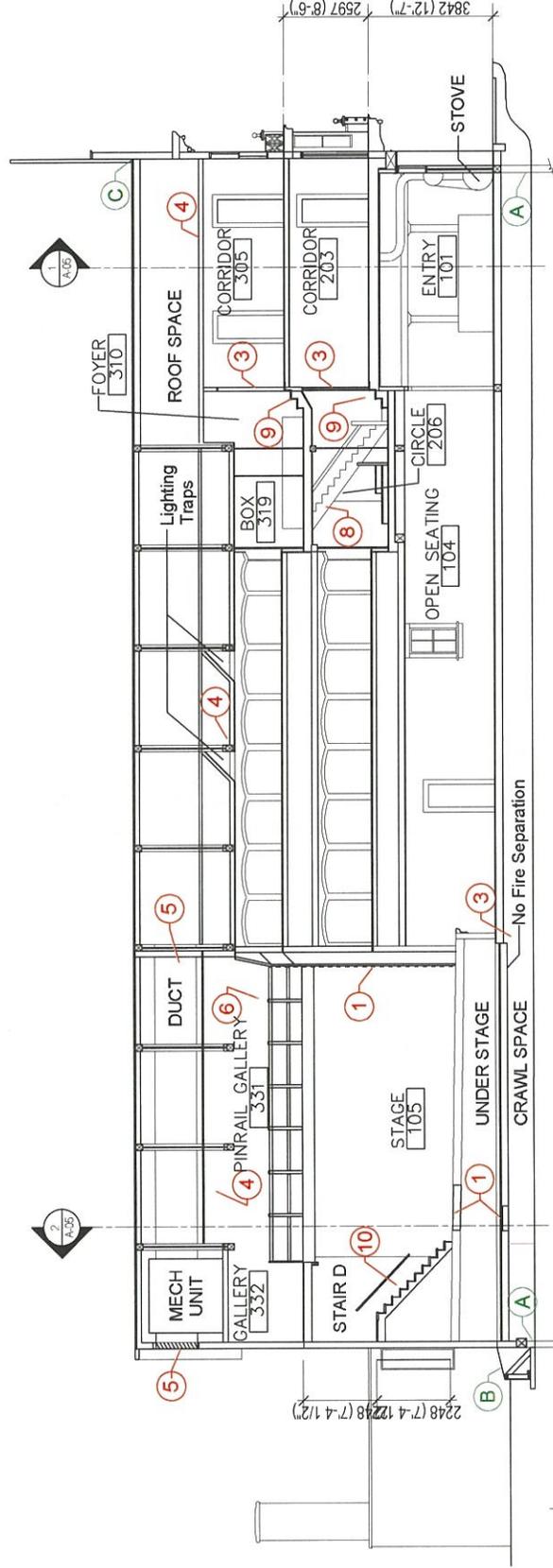
1 MEZZANINE FLOOR PLAN  
 A-02

SCALE: NTS

Palace Grand Theatre Mezzanine Floor

Drawn: A-02  
 April 25th, 2014  
 NTS  
 201.450.04





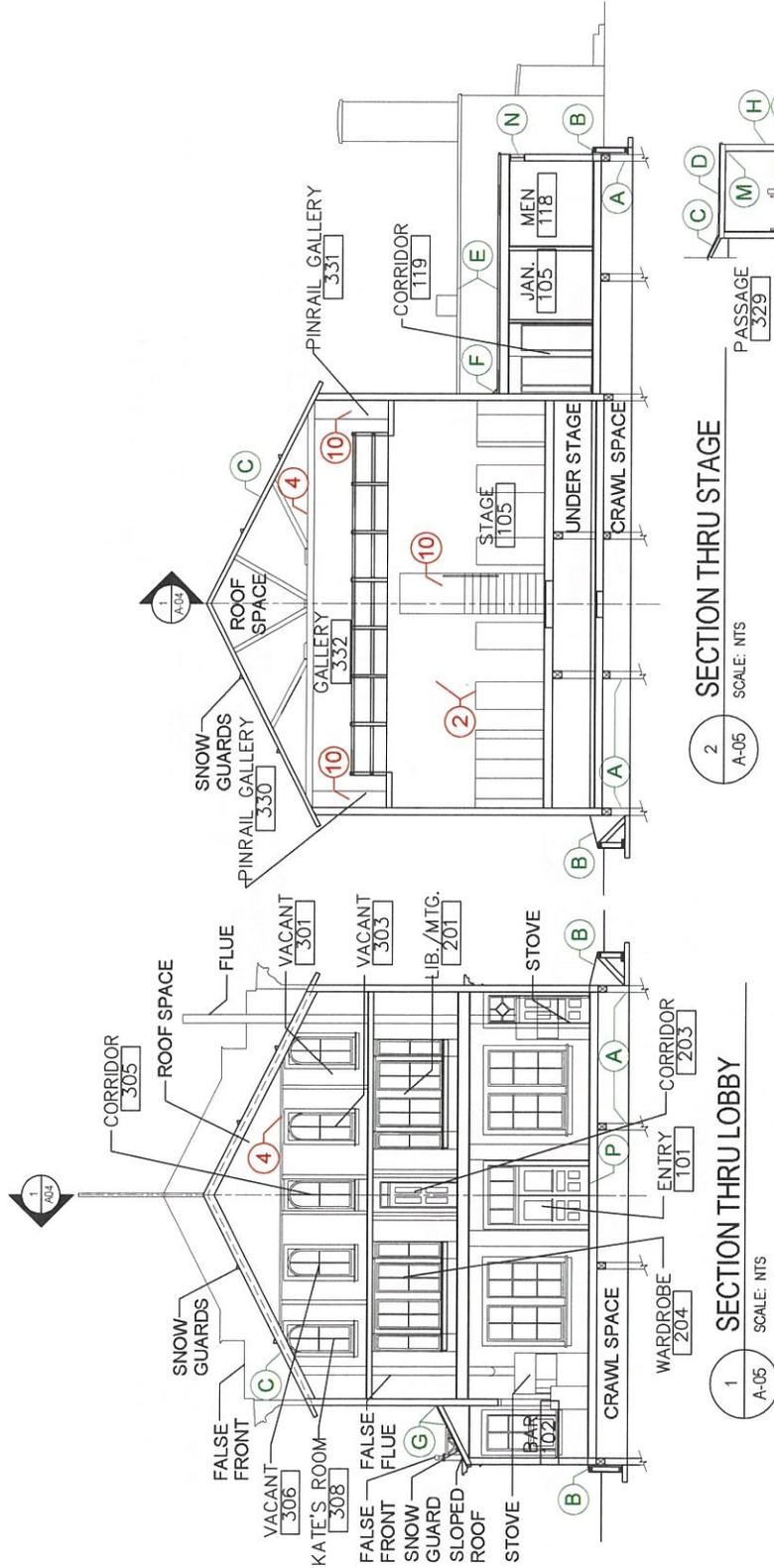
1 LONGITUDINAL SECTION  
SCALE: NTS

**LEGEND:**

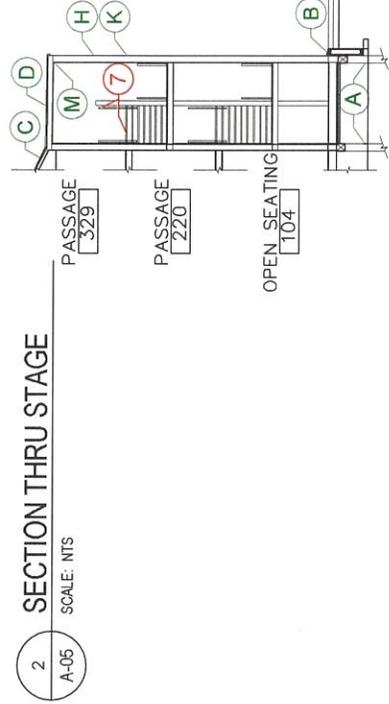
1	NUMBER: CODE DEFICIENCIES
A	LETTER: BUILDING ENVELOPE DEFICIENCIES

Drawn: A-04  
 Date: April 25th, 2014  
 Project: 2014-0038 Grand Theatre  
 Location: Chicago, IL, USA  
 NTS  
 2014504  
 www.pandesign.com

# Palace Grand Theatre Sections



1 SECTION THRU LOBBY  
A-05 SCALE: NTS

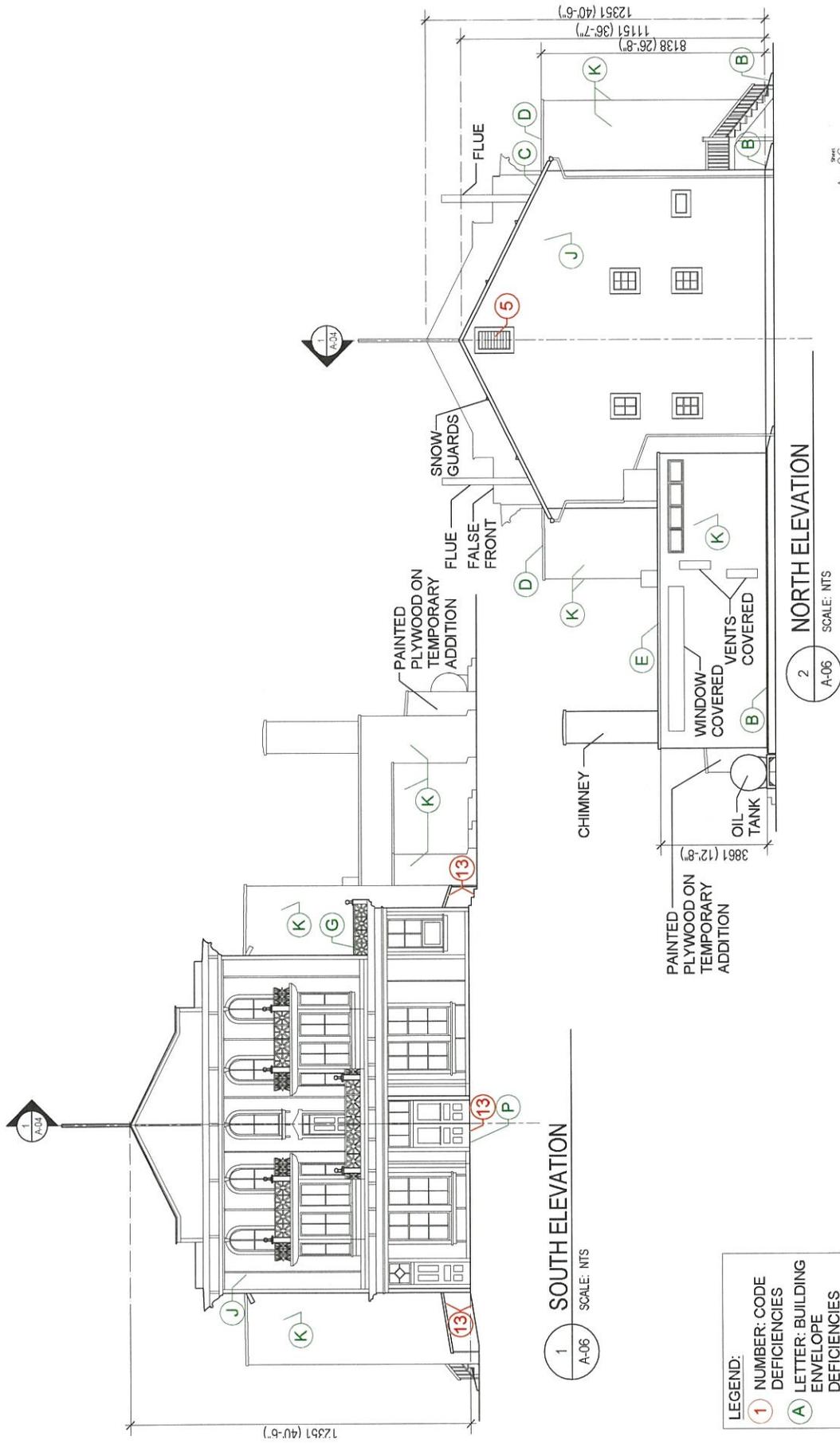


2 SECTION THRU STAGE  
A-05 SCALE: NTS



3 SECTION THRU STAIR G  
A-05 SCALE: NTS

**LEGEND:**  
 1 NUMBER: CODE DEFICIENCIES  
 A LETTER: BUILDING ENVELOPE DEFICIENCIES

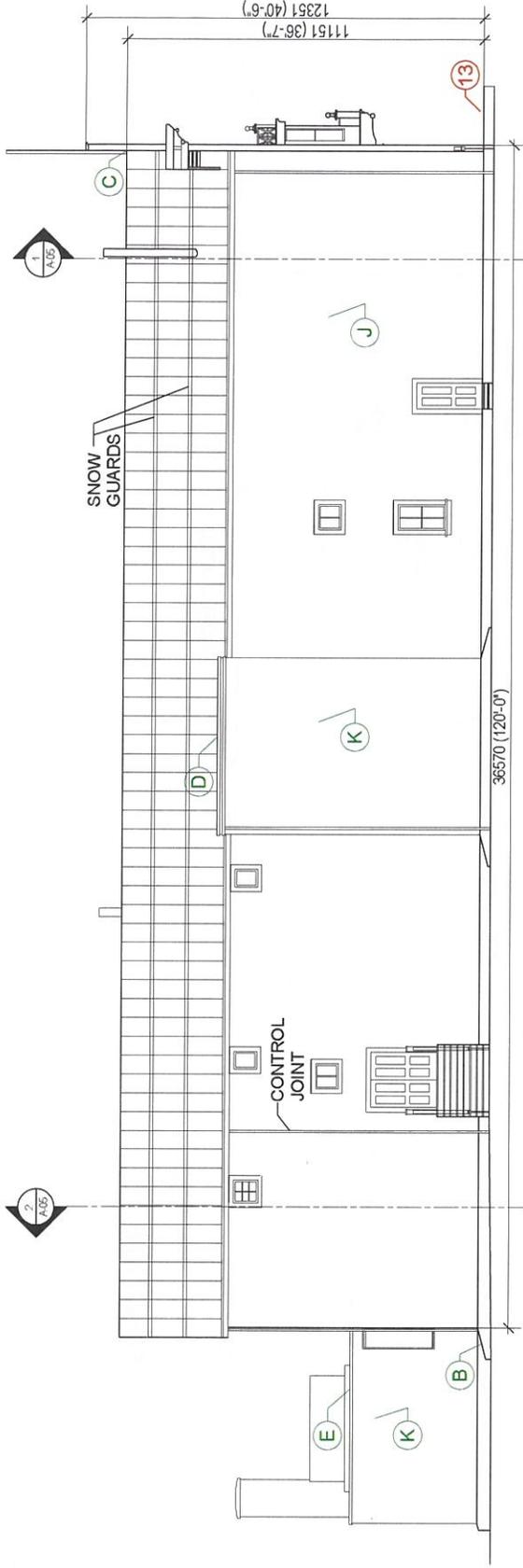


**LEGEND:**

- 1 NUMBER: CODE DEFICIENCIES
- A LETTER: BUILDING ENVELOPE DEFICIENCIES

Drawn  
 A-06  
 April 25th, 2014  
 201-4504  
 www.aceinteriors.com

Palace Grand Theatre Elevations



1 WEST ELEVATION

SCALE: NTS



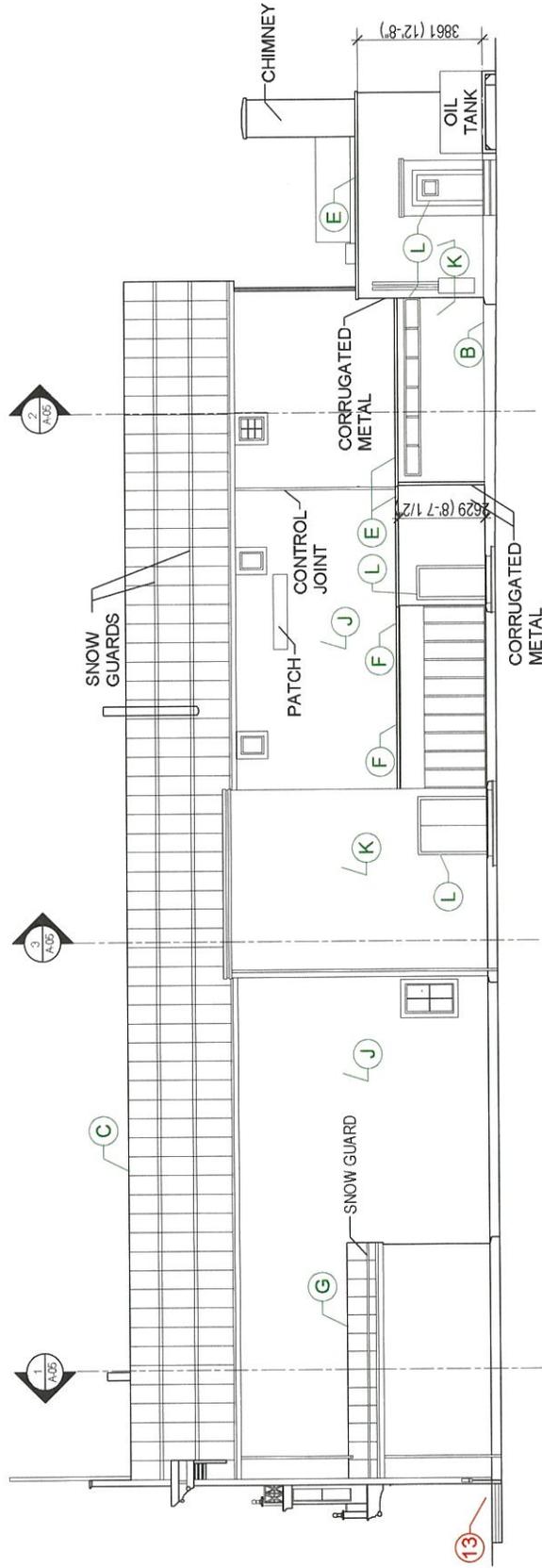
**LEGEND:**

1	NUMBER: CODE DEFICIENCIES
A	LETTER: BUILDING ENVELOPE DEFICIENCIES

Sheet  
A-07  
April 25th, 2014  
2014504

200 W. 17th Street, Suite 500  
Chicago, IL 60604  
N.T.S.  
Tel: 312.352.2200  
Fax: 312.352.2206  
www.encompassinc.com

Palace Grand Theatricals



1 EAST ELEVATION

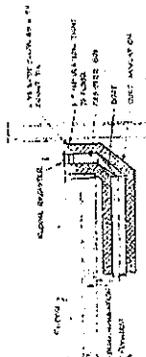
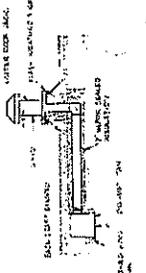
SCALE: NTS

LEGEND:	
1	NUMBER: CODE DEFICIENCIES
A	LETTER: BUILDING ENVELOPE DEFICIENCIES

Drawn  
A-08  
April 25th, 2014  
NIS  
2014504

100 - 1075 State Street  
Chicago, IL 60643  
P: 312.326.2100  
www.nisus.com

Palace Grand Theatricals



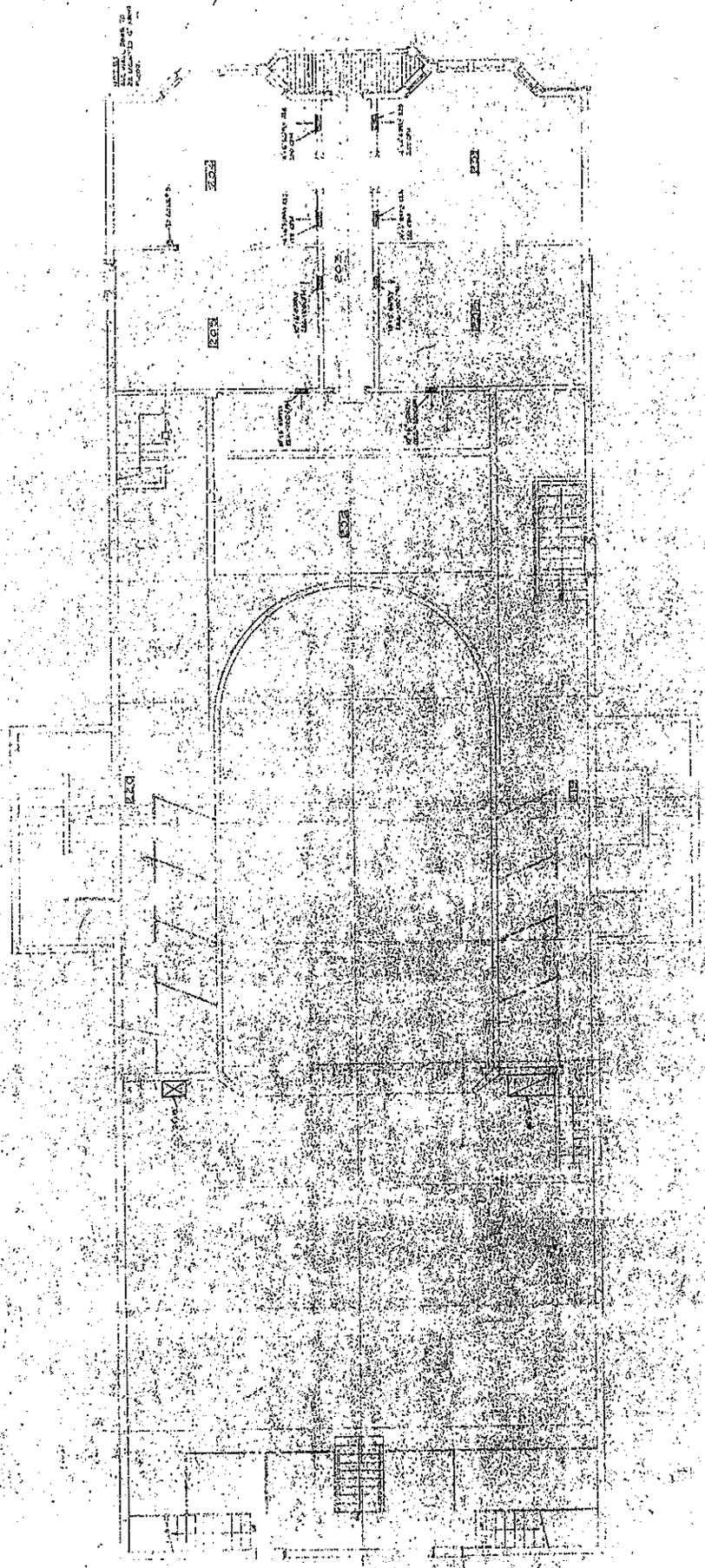
SECTION C-C  
SCALE: 1/4" = 1'-0"

GROUND FLOOR PLAN  
SCALE: 1/4" = 1'-0"

SECTION D-D  
SCALE: 1/4" = 1'-0"

D. W. THOMPSON & COMPANY LTD. CORPORATE ARCHITECTS 400 WEST BROADWAY VANCOUVER B.C.	HEATING	OWNER A. T. T.
	PALACE GRAND THEATRE	ENGINEER R. L. R.
	VICTORIA CITY	DATE MAY 1961
	1000 WEST BROADWAY VANCOUVER B.C.	NO. 1641
		SHEET 41 OF 4
		PROJECT 61/721/P-27

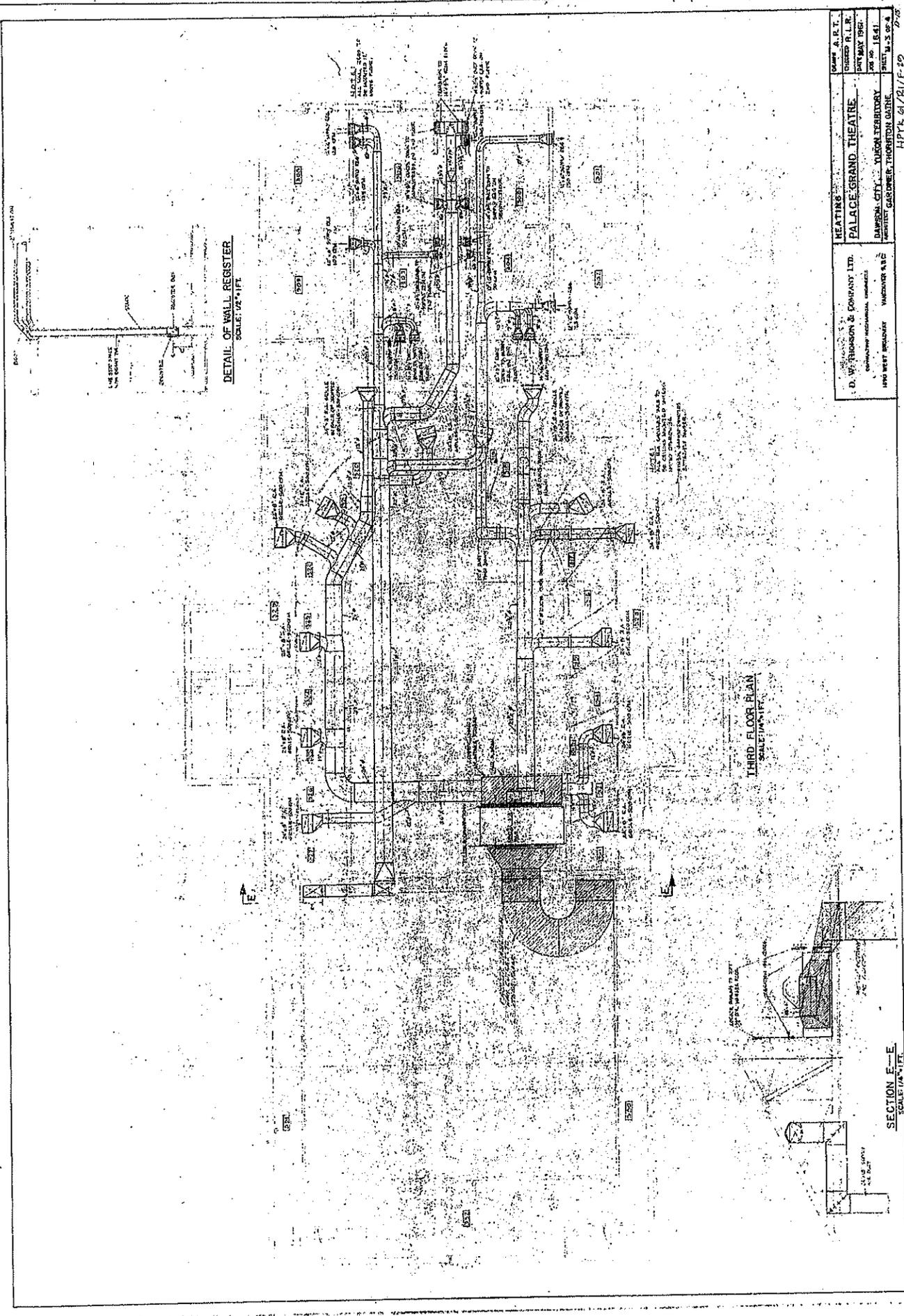
**CAUTION**  
THIS IS A REDUCED SIZE PRINT  
CHECK SCALE  
0 1 2 3  
3 INCHES



SECOND FLOOR PLAN  
SCALE: 1/4" = 1'-0"

HEATING	OWNER: J. W. THOMPSON & COMPANY LTD. ENGINEERS: J. W. THOMPSON & COMPANY LTD. MAN WEST ENGINEERS' ASSOCIATES R.E.C.
PROJECT: PALACE GRAND THEATRE	DATE: MAY 1934
LOCATION: DUNDON CITY, UNION TERRITORY	JOB NO: 12437
DESIGNER: J. W. THOMPSON & COMPANY LTD.	SCALE: 1/4" = 1'-0"
HPTR 6175/F-15	

**CAUTION**  
THIS IS A REDUCED SIZE PRINT  
CHECK SCALE  
0 1 2 3  
3 INCHES



DETAIL OF WALL REGISTER  
SCALE: 1/32" = 1 FT.

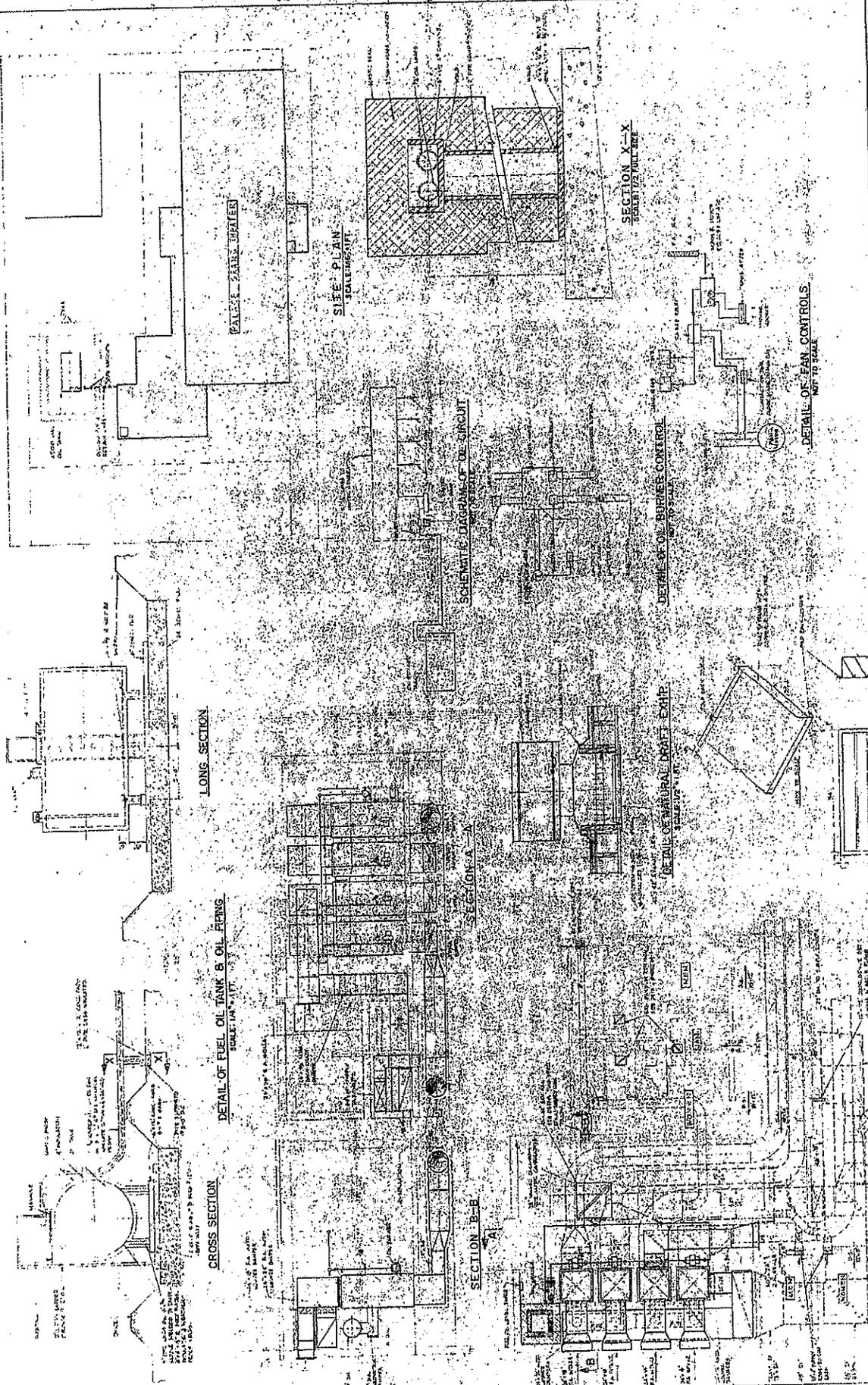
THIRD FLOOR PLAN  
SCALE: 1/32" = 1 FT.

SECTION E-E  
SCALE: 1/8" = 1 FT.

HEATING		DATE: A.R.T.
PALACE GRAND THEATRE		DRAWN: R.L.R.
DANFORTH CITY - YORKTON TERRITORY		DATE: MAY 1941
DESIGNED BY: GARDNER, THORNTON & CO.		NO. 1502
D. W. THORNTON & COMPANY LTD.		BY: S. G. &
HEATING ENGINEERS, CONSULTANTS		
1470 WEST BRIDGWAY VANCOUVER, B.C.		

HPYR 61/21/F-29 2/38

**CAUTION**  
THIS IS A REDUCED SIZE DRAWING  
CHECK ON SCALES  
0 1 2 3  
3 INCHES



HEATING	ENGINEER	DATE
PALACE GRAND THEATRE	W. THOMSON & COMPANY LTD.	MAY 1941
MANCHESTER	100, MARKET STREET	
PROJECT: THEATRE	MANCHESTER	
DATE: 1941		

D. W. THOMSON & COMPANY LTD.  
 CONSULTING MECHANICAL ENGINEERS  
 100, MARKET STREET  
 MANCHESTER

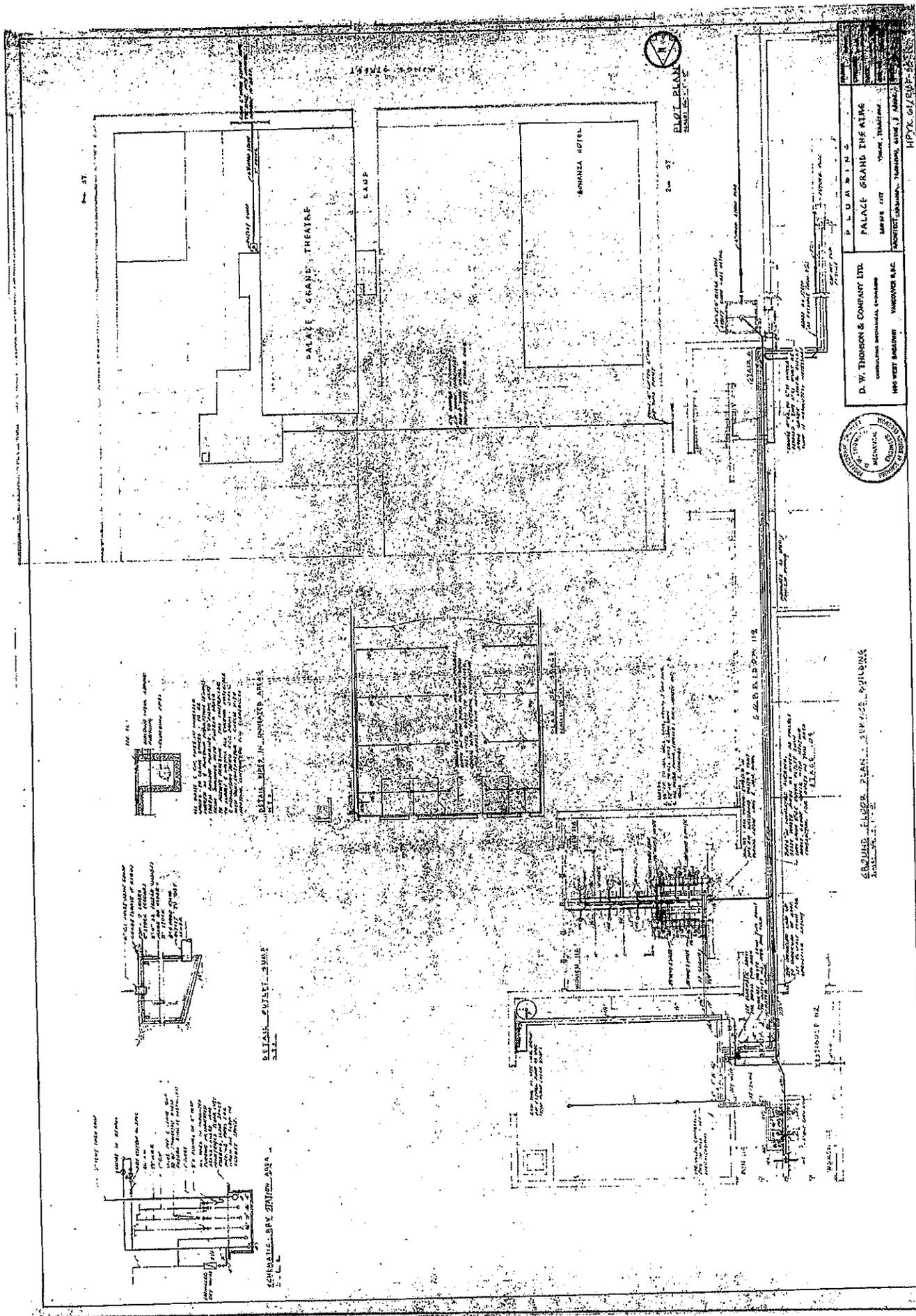
SECTION X-X  
 SCALE 1/2\"/>

DETAIL OF FRESH AIR LOUVERES  
 SCALE 1\"/>

DETAIL OF MECHANICAL EQUIPMENT ROOM  
 SCALE 1/4\"/>

SECTION X-X  
 SCALE 1/2\"/>

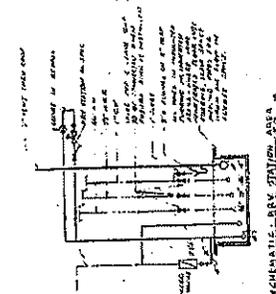
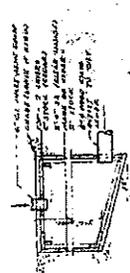
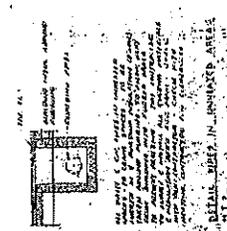
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 THIS IS A REDUCED SIZE PRINT  
 CHECK SCALE  
 0 1 2 3  
 3 INCHES



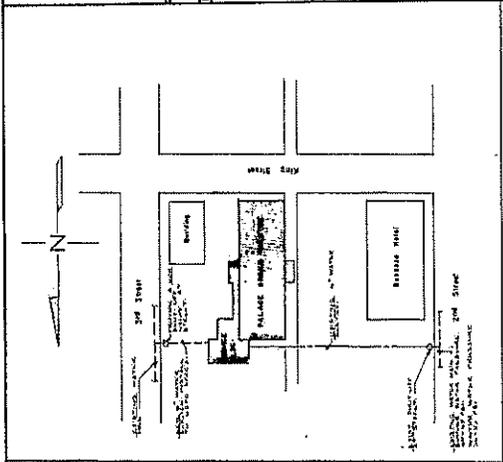
P. L. A. B. I. N. G.  
 PALACE GRAND THEATRE  
 BAWANA HOTEL  
 ARCHITECTS: D. W. THORSON & COMPANY LTD.  
 140 WEST BROADWAY, VANCOUVER, B.C.

Page 27

PLAN  
 SCALE 1/8" = 1'-0"

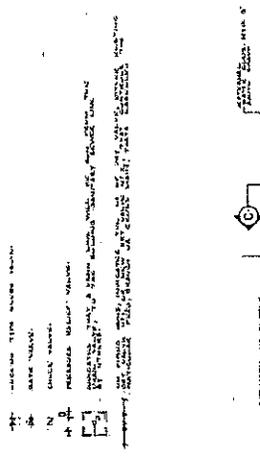


**CAUTION**  
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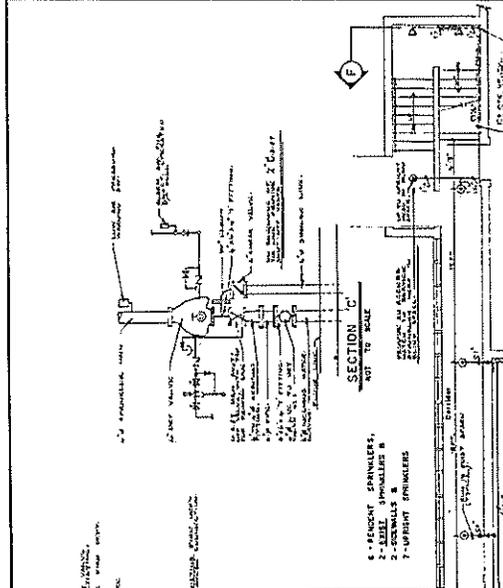


**SITE PLAN**  
 SCALE: 1/4" = 10'-0"  
 ...  
 ...

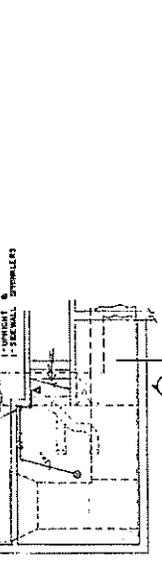
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 ...  
 ...



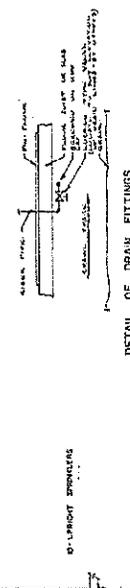
**PLAN: VIEW 4" DRY VALVE IN MECH. & ELECT. RM.**  
 NOT TO SCALE



**GROUND FLOOR SERVICE BLDG & CORRIDOR REFLECTED CEILING PLAN**  
 SCALE: 1/4" = 10'-0"  
 ...  
 ...

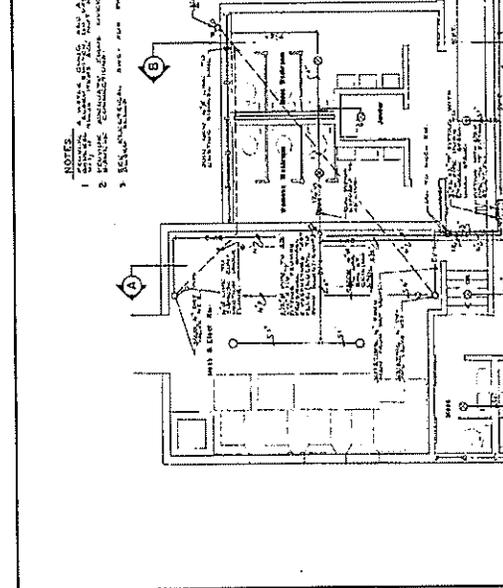


**PLAN OF AREA UNDER VESTIBULE 8 MEN'S & WOMEN'S WASHROOMS**  
 SCALE: 1/4" = 10'-0"  
 ...  
 ...

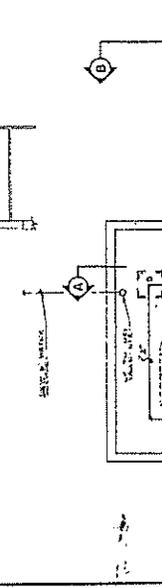


**SERVICE BLDG CRAWL SPACE PLAN**  
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 ...  
 ...

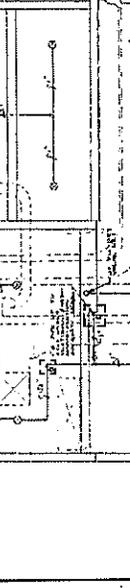
...  
 ...



**SECTION C**  
 NOT TO SCALE



**DETAIL OF DRAIN FITTINGS IN CRAWL SPACE**  
 NOT TO SCALE



**PLAN: VIEW 4" DRY VALVE IN MECH. & ELECT. RM.**  
 NOT TO SCALE

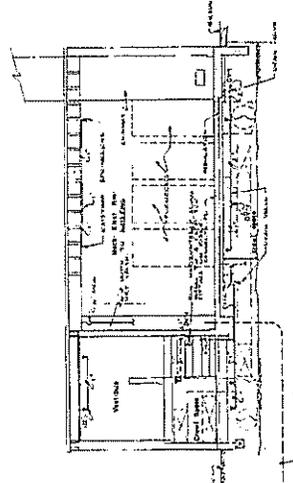
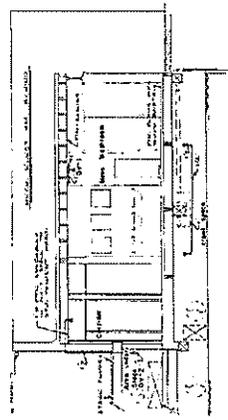
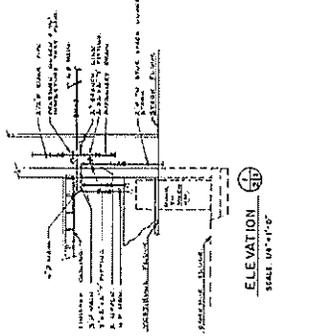
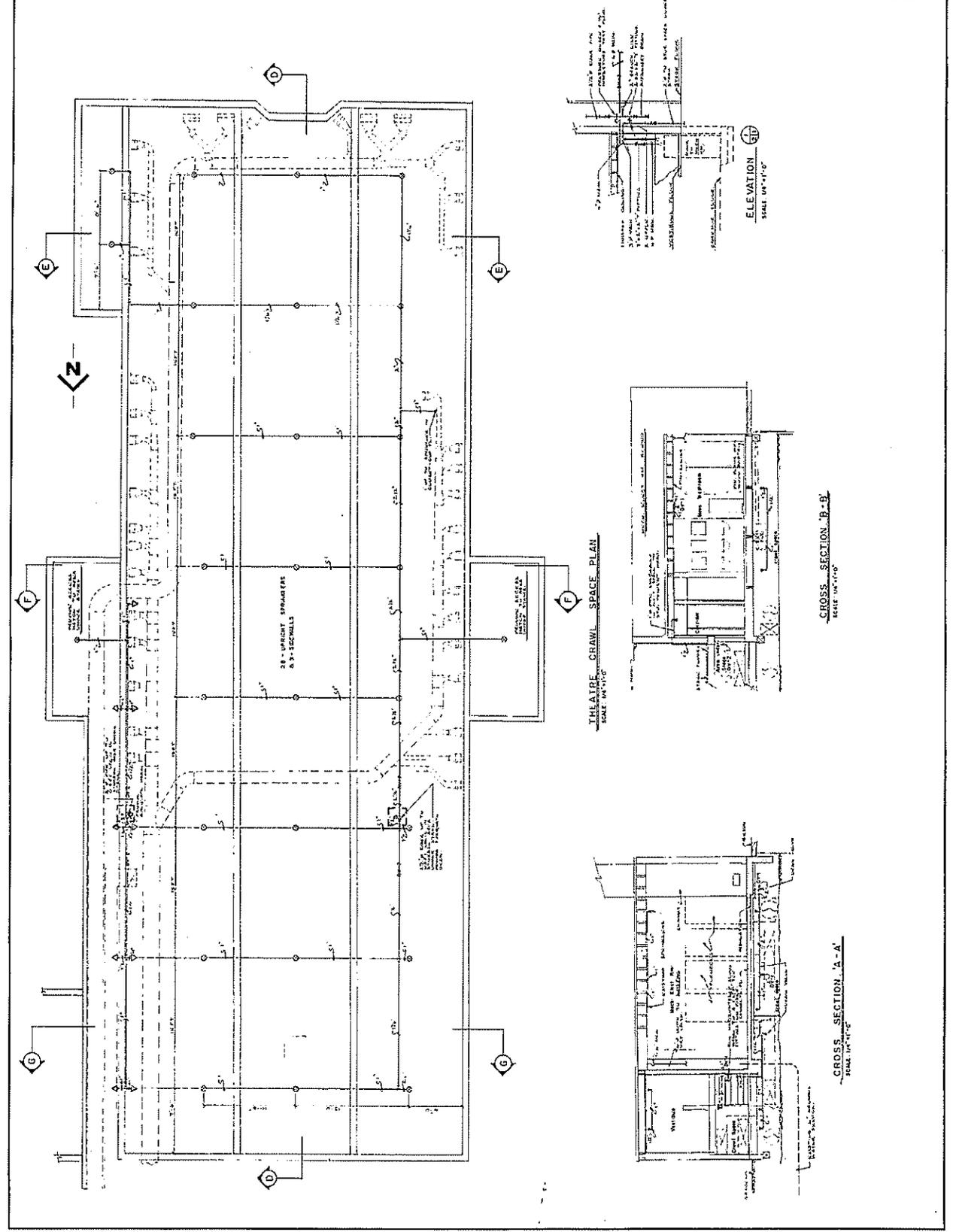
...  
 ...



INCORPORATED  
ARCHITECTS  
NEW YORK, N.Y.

ENGINEERING AND ARCHITECTURE  
BRANCH

NEW YORK, N.Y.



HWDC 76/H7 M206



ENGINEERING AND ARCHITECTURE  
BRANCH

DATE	NOV 19 1967
PROJECT	SPRINKLER AND EMERGENCY ELECTRICAL SYSTEMS
CLIENT	PALACE GRAND THEATRE
LOCATION	DANSON Y.T.

DESIGNED BY	W. J. GIBSON
CHECKED BY	W. J. GIBSON
APPROVED BY	W. J. GIBSON

SCALE	AS SHOWN
DATE	NOV 19 1967

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

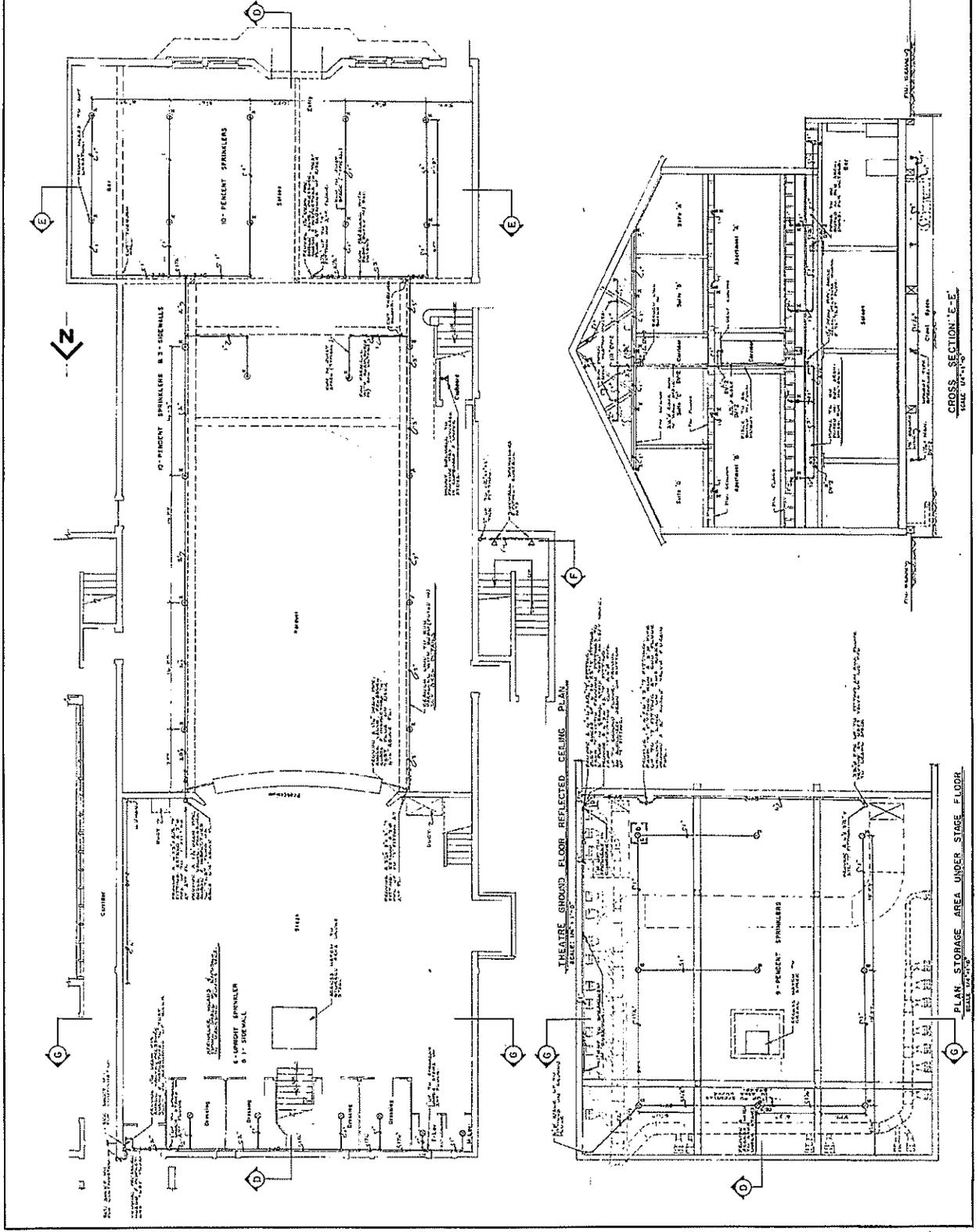
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DATE	M3/66

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DATE	M3/66

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DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66

PROJECT NO.	HWDC 76/17
DATE	M3/66







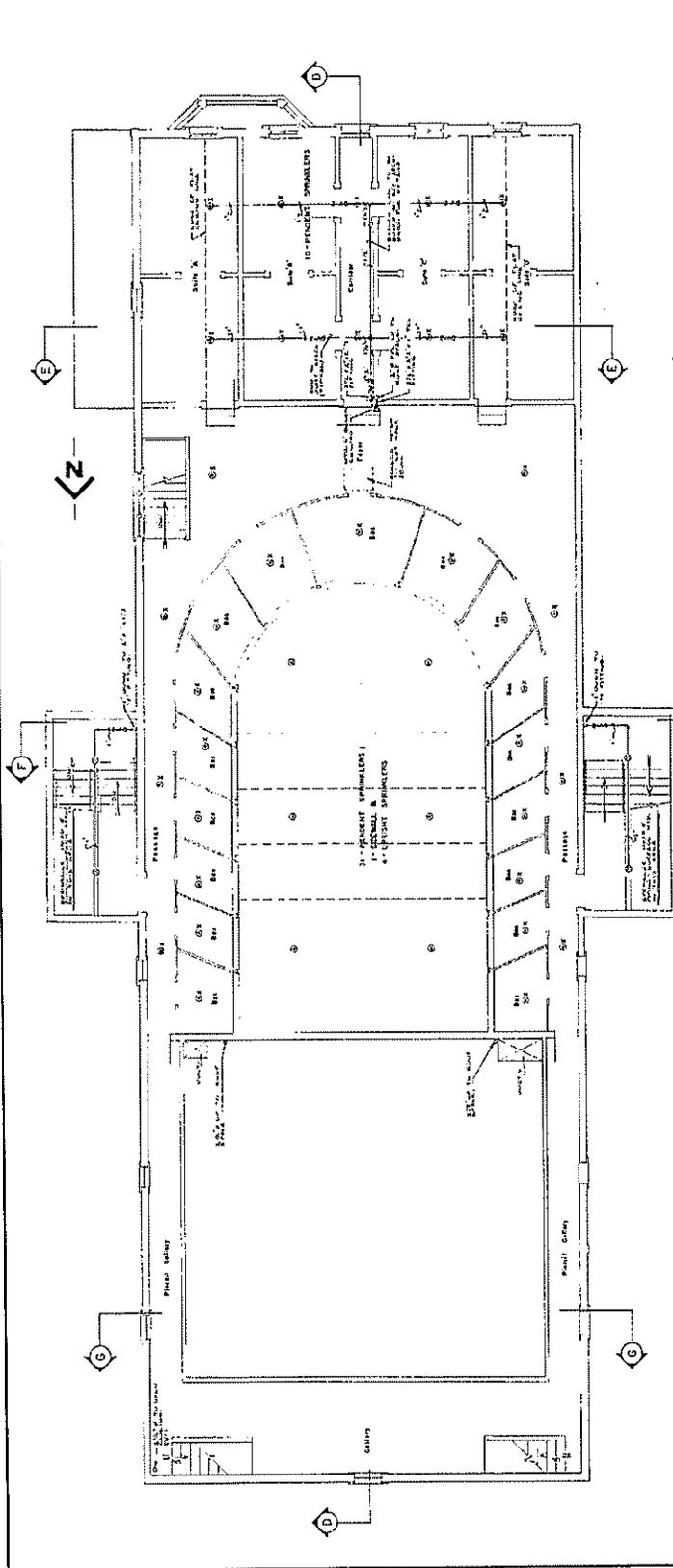
ENGINEERING AND ARCHITECTURE BOARD

Address: 1000 ...  
City: ...  
State: ...

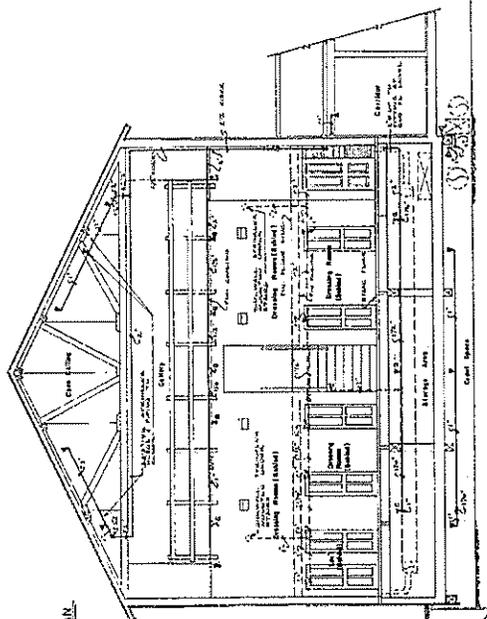
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Date: ...

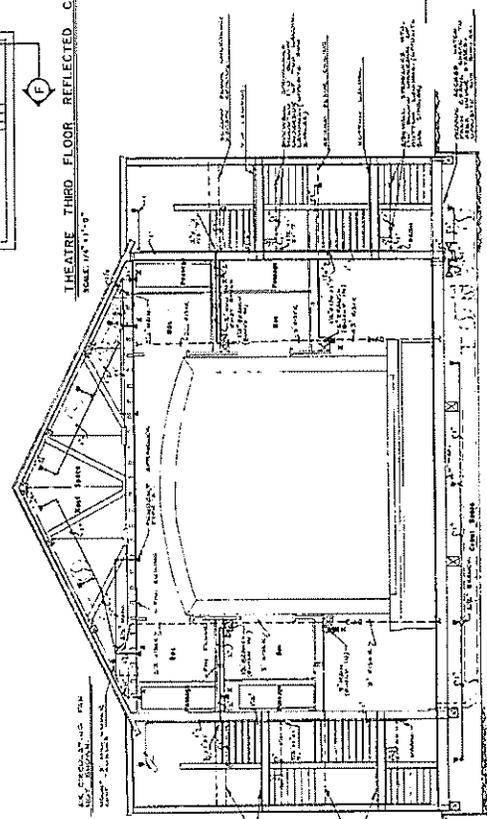
PROJECT NO. ... SHEET NO. ... DATE ...	PROJECT NO. ... SHEET NO. ... DATE ...
SPRINKLER AND EMERGENCY ELECTRICAL SYSTEMS PALACE GRAND THEATRE DANBURY, V.T.	
DRAWN BY: ... CHECKED BY: ... APPROVED BY: ...	
HWDC 76/H7 M5 of 6	



THEATRE THIRD FLOOR REFLECTED CEILING PLAN  
SCALE: 1/8" = 1'-0"

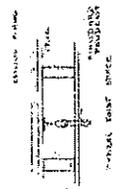
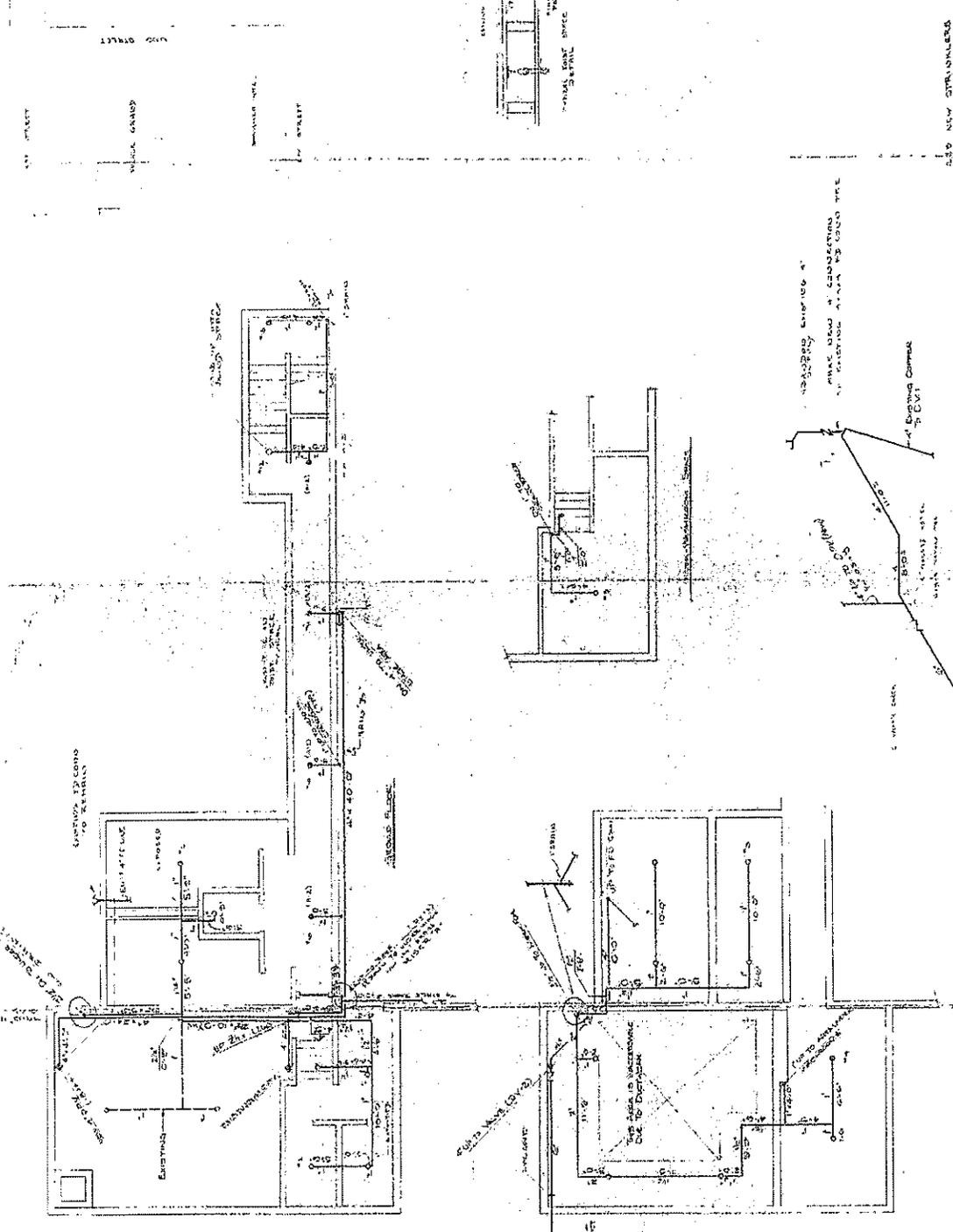
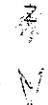


CROSS SECTION "G-G"  
SCALE: 1/8" = 1'-0"



CROSS SECTION "F-F"  
SCALE: 1/8" = 1'-0"



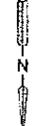
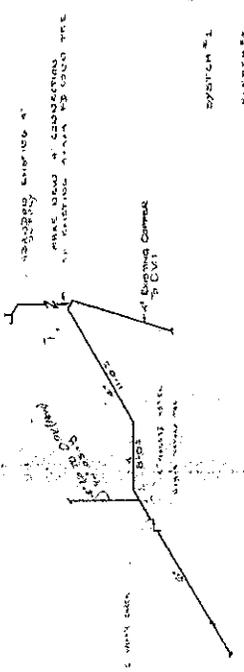


APPROVED:  
 [Signature]  
 ARCHITECT  
 [Signature]  
 ENGINEER

REVISIONS:  
 NO. 1  
 DATE  
 DESCRIPTION

PROJECT NO.	100-100-100
DATE	10/10/10
SCALE	1/4" = 1'-0"
DESIGNED BY	[Name]
CHECKED BY	[Name]
DATE	10/10/10

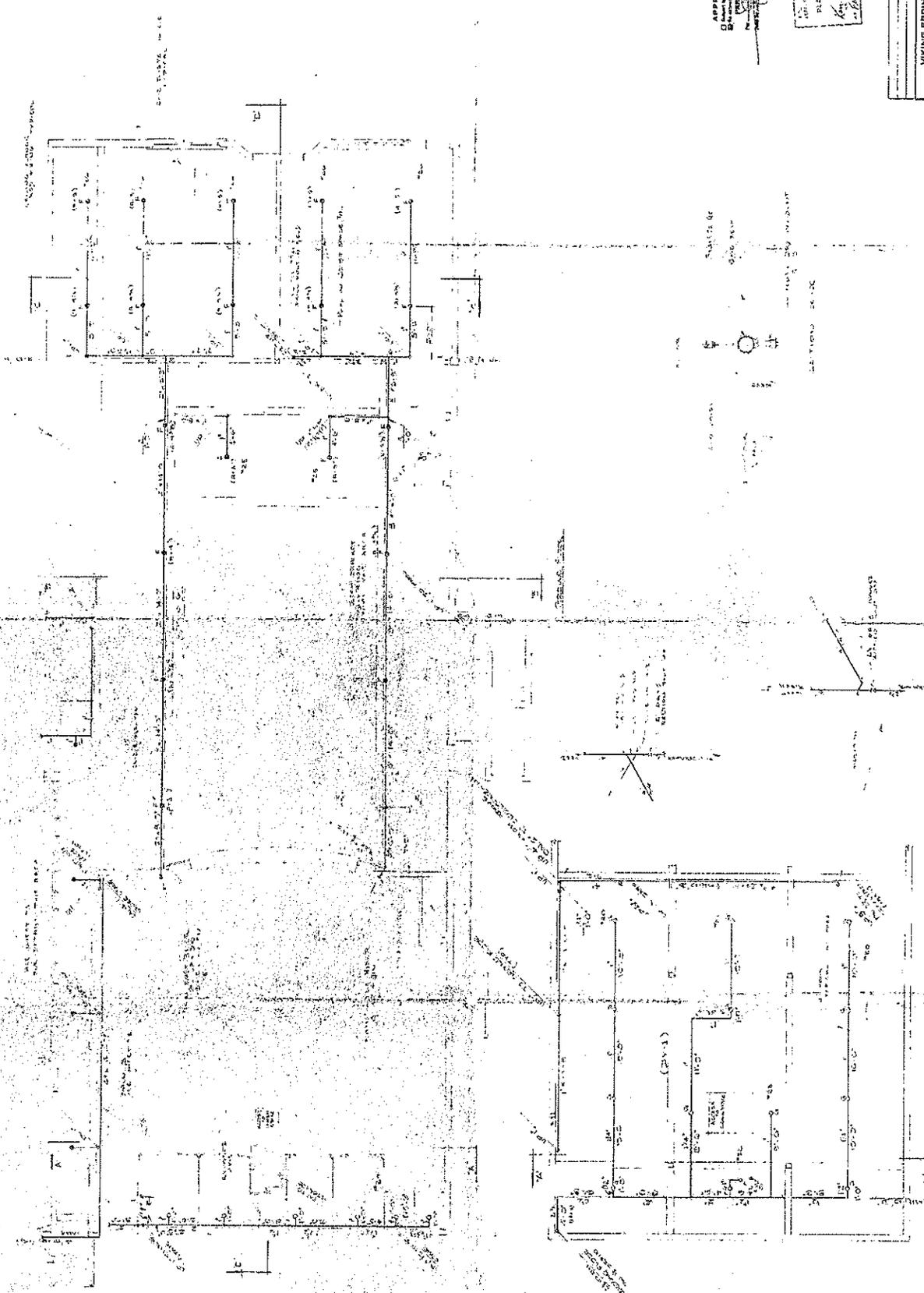
250 NEW SYSTEMS  
 SYSTEM 1  
 SYSTEM 2  
 SYSTEM 3



1" = 100'

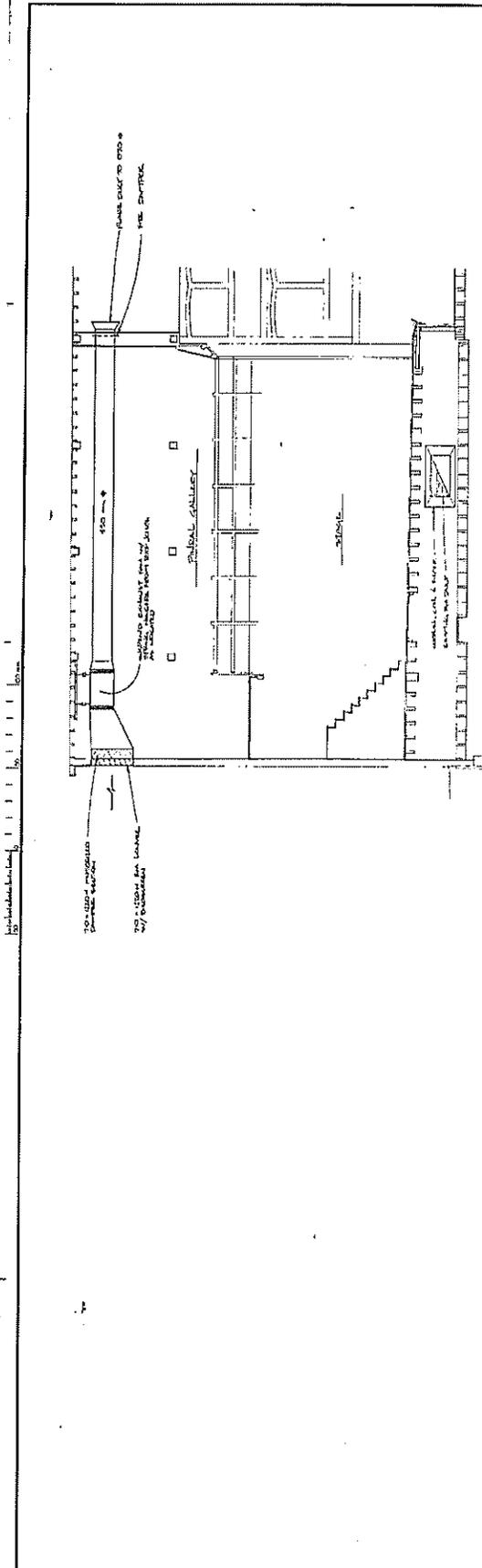
Viking Sprinkler Co. Ltd.	
Address	1000 - 15th Avenue S.W.
City	Edmonton, Alberta
Telephone	244-1111
Project	1000 - 15th Avenue S.W.
Client	1000 - 15th Avenue S.W.
Contract No.	1000 - 15th Avenue S.W.
Date	1000 - 15th Avenue S.W.

APPROVED:  
 [Signature]  
 10/10/75



APPROVED:  
 [Signature]  
 10/10/75





**Public Works Canada**  
**Traux publics Canada**

Approved by:  
 Director General  
 Infrastructure Canada

Approved by:  
 Director General  
 Infrastructure Canada

No.	Date	Description	By	Chk.
1	July 15	REV. 100%		

Project / Mission: **PARADE VENTILATION AND PROVISION OF AN AUDIO SYSTEM AT PALACE GRANDS THEATRE**

Drawn by: **THE BURNS**

**MECHANICAL LAYOUT**

Drawn by: **THE BURNS**

Checked by: **THE BURNS**

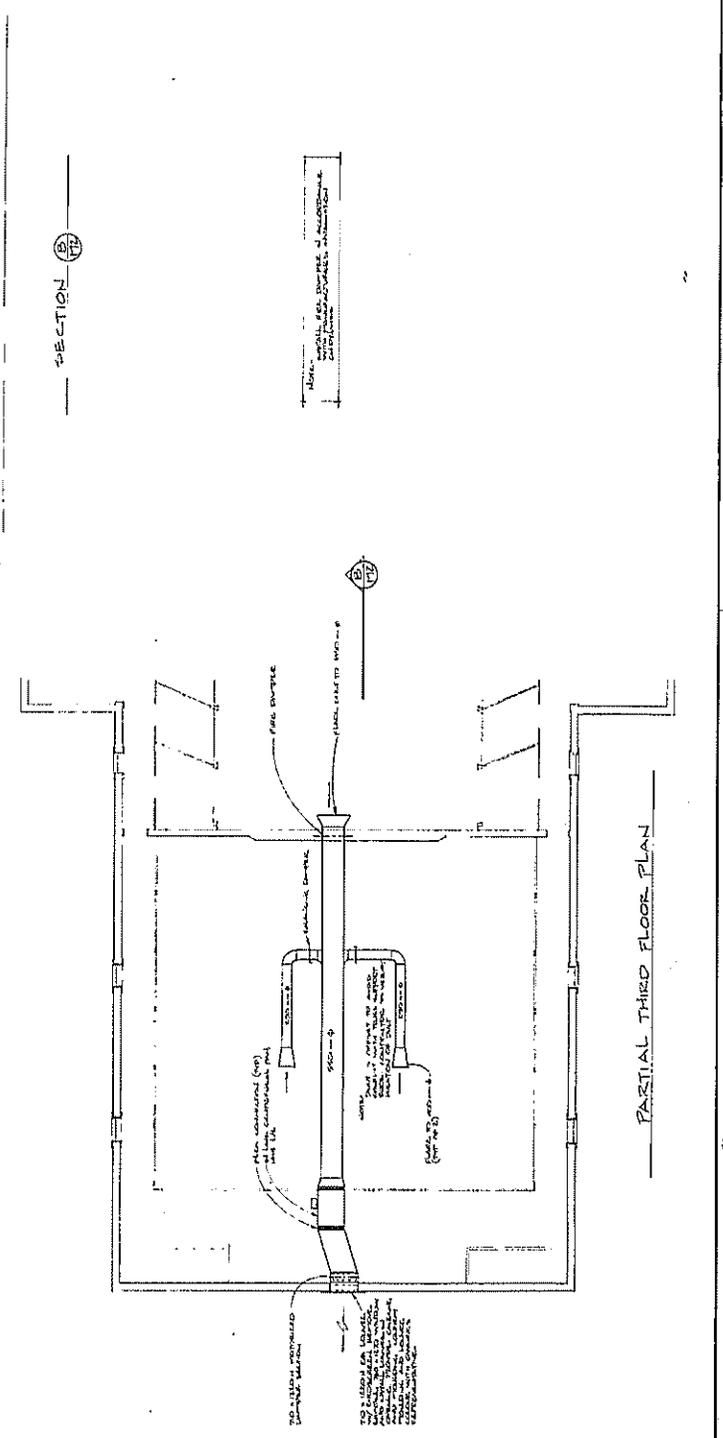
Scale: **1/8" = 1'-0"**

Sheet No.: **2 of 2**

Date: **1970**

Project No.: **11-1000 (11-1000)**

Drawn by: **THE BURNS**



**SECTION B/B**

NOTE: ALL DIMENSIONS ARE APPROXIMATE AND SUBJECT TO CHANGE.

**PARTIAL THIRD FLOOR PLAN**