

**New Police Station**  
**Inuvik, NT**  
**Project Number: R.050563**  
**Addendum #1**  
**May 21, 2014**

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**1.0 General**

- .1 This Addendum is issued prior to receipt of Bids to provide for certain revisions to and clarification to the Contract Documents.
- .2 The work required by this Addendum shall be executed in accordance with the requirements of the Contract and Contract Documents.
- .3 Include in the Stipulated Price, the cost of all work described in this Addendum.

**2.0 Architectural Addendum**

**2.1 Specifications**

- .1 Section 01 33 00 – Submittal Procedures
  - .1 Delete Article 1.7 in its entirety.
- .2 Section 02 41 16 – Structural Demolition
  - .1 Revise Sentence 3.2.4 to read as follows:
    - “.4 Prior to start of work remove contaminated or hazardous materials identified in the Pre-Demolition Designated Substances Assessment Report appended to Appendix C”.
- .3 Section 07 52 00 – Modified Bituminous Membrane Roofing
  - .1 Revise Sentence 1.10.1 to read as follows:
    - “.1 For work of this Section 07 52 00 – Modified Bituminous Membrane Roofing, the twelve (12) month warranty period prescribed in General Conditions GC 3.13 is extended to sixty (60) months”.
- .4 Section 07 61 00 – Sheet Metal Roofing
  - .1 Revise Sentence 1.6.1 to read as follows:
    - “.1 For work of this Section 07 61 00 – Sheet Metal Roofing, the twelve (12) month warranty period prescribed in General Conditions GC 3.13 is extended to sixty (60) months”.

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- .5 Section 07 62 00 – Sheet Flashing & Trim
- .1 Revise Sentence 1.5.1 to read as follows:
- “.1 For work of this Section 07 62 00 – Sheet Flashing & Trim, the twelve (12) month warranty period prescribed in General Conditions GC 3.13 is extended to sixty (60) months”.
- .6 Section 08 56 73 – Acoustic Steel Door, Window and Frame Assemblies
- .1 Revise Sentence 1.4.1 to read as follows:
- “.1 For work of this Section 08 56 73 – Acoustic Steel Door, Window and Frame Assemblies, the twelve (12) month warranty period prescribed in General Conditions GC 3.13 is extended to sixty (60) months”.
- .7 Section 09 51 13 – Acoustical Panel Ceilings
- .1 Deleted Article 2.2 in its entirety.
- .8 Section 13 34 19 – Metal Building Systems
- .1 Revise Sentence 1.5.1 to read as follows:
- “.1 For work of this Section 13 34 19 – Metal Building Systems, the twelve (12) month warranty period prescribed in General Conditions GC 3.13 is extended to twenty-four (24) months”.
- 2.2 Drawings:
- .1 Refer to Drawing D1.0 – Demolition Phasing Plan, Issued For Tender; Dated March 17, 2014.
- .1 Revise Keynote #1 to read as follows:
- “1 Existing secure bay to be demolished. Vehicular access to existing entry door to be maintained. Coordinate installation of temporary barriers with RCMP Inuvik Detachment Commander”.
- .2 Revise Keynote #2 to read as follows:
- “2 Existing houses have been demolished and removed off site”.
- .3 Revise Keynote #9 to read as follows:
- “9 Not Used”.
- .4 Revise Keynote #16 to read as follows:
- “16 Refer to structural documents for removal procedures of any left over piles, following demolition of existing houses”.
- .5 Revise Detail 2/D1.0 per appended Sketch Drawing ASK-01, prepared by IBI Group, dated April 15, 2014.

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- .2 Refer to Drawing A0.3 – Construction Assemblies, Symbol Legend, Code Synopsis, Issued For Tender; Dated March 17, 2014.
- .1 Revise parapet assembly PR1 and exterior wall assemblies W1, W2, W3, W3A, W4 and W7 as per appended Sketch Drawing ASK-04, prepared by IBI Group; dated April 15, 2014.
- .3 Refer to Drawing A0.4 – Outboard Garage (Pre-Engineered); Issued for Tender, Dated March 17, 2014.
- .1 Delete detail referencing to trench drains at Building Sections 7/A0.4 and 8/A0.4.
- .4 Refer to Drawing A1.7 – Enlarged Main Floor Plan (East); Issued for Tender, Dated March 17, 2014.
- .1 Revise detail referencing to north corner of the building at Grid Line D1 as per appended Sketch Drawing ASK-02, prepared by IBI Group; dated April 15, 2014.
- .5 Refer to Drawing A1.8 – Enlarged Main Floor Plan (West); Issued for Tender, Dated March 17, 2014.
- .1 Refer to appended Sketch Drawing ASK-05, prepared by IBI Group; dated May 21, 2014.
- .1 Add annotation to bunks in Room 502A.
- .2 Delete “bunk” annotation in Room 502N.
- .6 Refer to Drawing A1.9 – Enlarged Upper Floor Plan; Issued for Tender, Dated March 17, 2014.
- .1 Revise annotation to work bench located in Room 305A to read as follows:  
“1500 mm W x 457 mm D wood bench. Refer to Detail 16/A6.3”.  
Add millwork reference tag “MW20” to the bench.
- .7 Refer to Drawing A1.11 – Floor Finish Layout Plan – Rooms 101B/202A/306; Issued for Tender, Dated March 17, 2014.
- .1 Delete this Drawing in its entirety and replace with appended Drawing A1.11(R), issued for Addendum #1; dated May 21, 2014.
- .8 Refer to Drawing A5.1 – Plan Details; Issued for Tender, Dated March 17, 2014.
- .1 Revise detail 1/A5.1 as per appended Sketch Drawing ASK-03, prepared by IBI Group; dated April 15, 2014.
- .9 Refer to Drawing A6.4 – Millwork Sections; Issued for Tender, Dated March 17, 2014.
- .1 Revise keynote #43 to read as follows:  
“43 38 mm x 89 mm stained Douglas Fir planks bolted to painted steel frame. Length of bench as indicated on the floor plans”.

**3.0 Civil Addendum**

.1 Refer to appended Civil Addendum 1, dated April 9, 2014, 2 pages.

**4.0 Structural Addendum**

.1 Refer to appended Structural Addendum No. S-01, dated May 16, 2014, 35 pages.

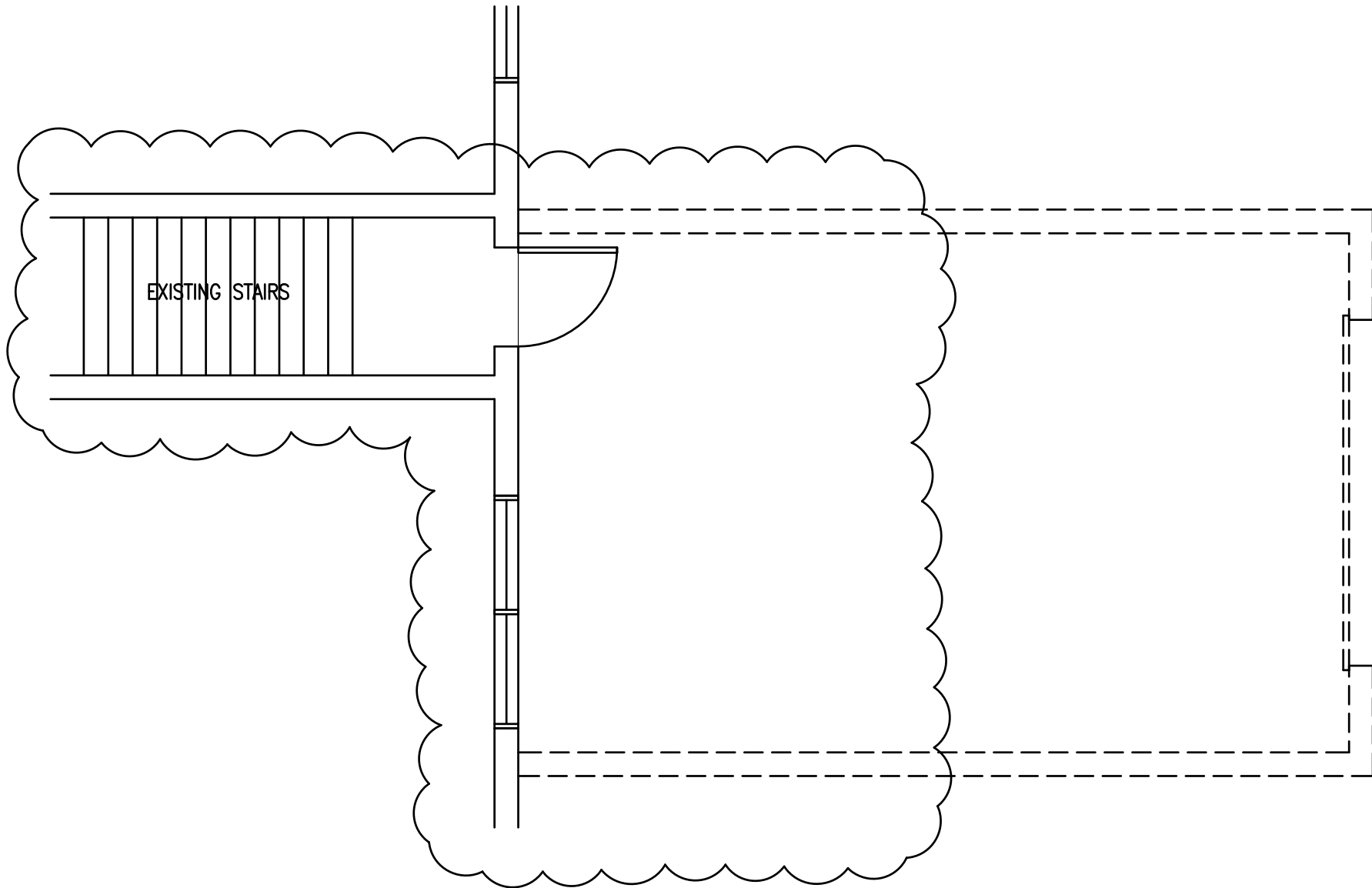
**5.0 Mechanical Addendum**

.1 Refer to appended Mechanical Addendum No. M-01, dated May 15, 2014, 2 pages.

**6.0 Electrical Addendum**

.1 Refer to appended Electrical Addendum No. E1, dated April 11, 2014, 1 page.

**END OF ADDENDUM No. 1**



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Project Title:  
**NEW POLICE BUILDING  
INUVIK, NWT**

Sheet Title:  
**ADDENDUM #1  
DEMOLITION PHASING PLAN - 2/D1.0 - EXISTING SECURE BAY DEMOLITION PLAN**

Scale:  
**1:100**

Drawn by:  
**IBI**

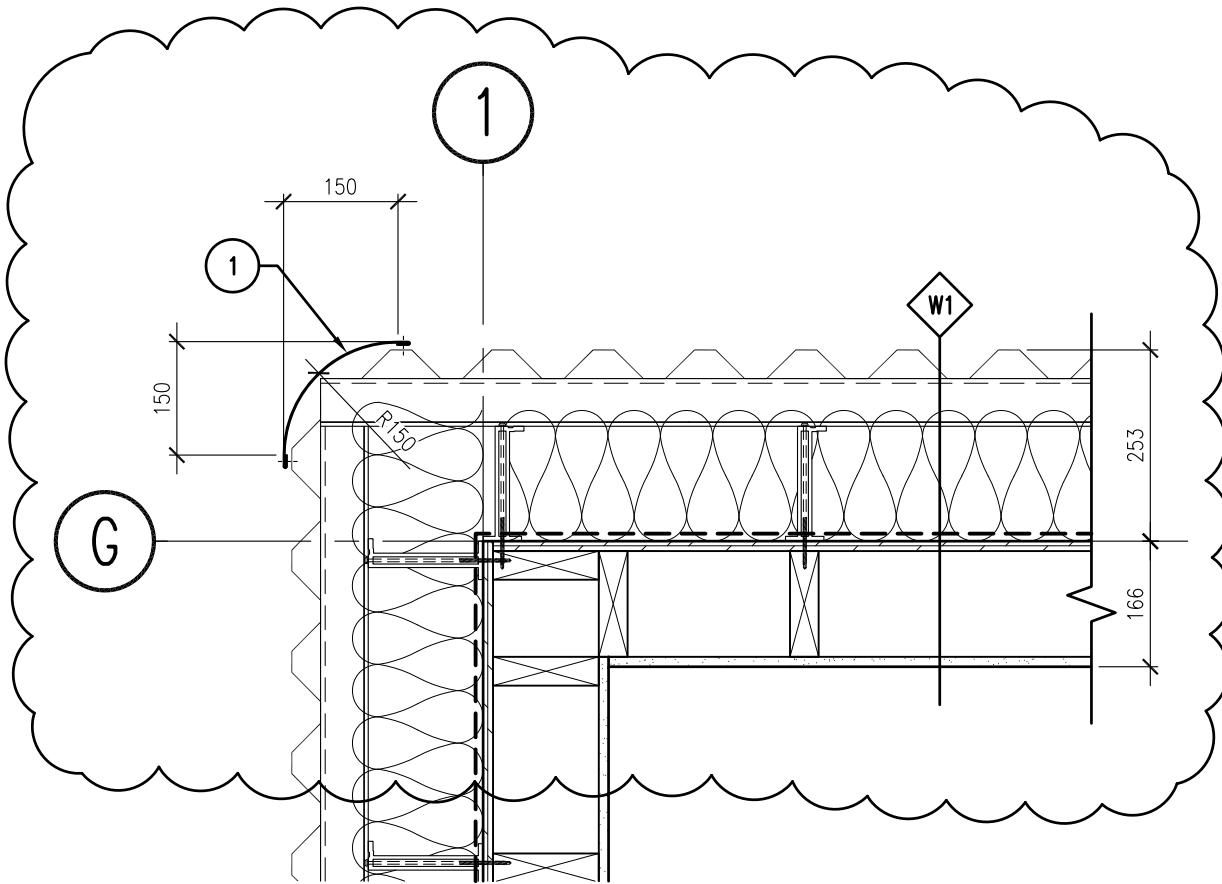
Project no.  
**R.050563**

Date:  
**2014-04-15**

Checked by:  
**EK**

Sheet no.  
**ASK-01**





**KEYNOTES (PLAN DETAILS):**

- 1 PREFINISHED METAL 150mm RADIUS CURVED FLASHING TRIM, SECURED TO WALL CLADDING. COLOR TO MATCH ADJACENT CLADDING.



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Project Title:  
**NEW POLICE BUILDING  
INUVIK, NWT**

Sheet Title:  
**ADDENDUM #1  
PLAN DETAILS - 1/A5.1**

Scale:

**1:10**

Date:

**2014-04-15**

Drawn by:

**IBI**

Checked by:

**EK**

Project no.

**R.050563**

Sheet no.

**ASK-03**

**PARAPET ASSEMBLIES**

- PR1 PREFINISHED PROFILED METAL CLADDING**
- 25mm AIR SPACE.
  - MINIMUM 1.2mm (18 GA) THICK X 63mm DEEP GALVANIZED METAL Z-GIRTS INSTALLED HORIZONTALLY. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - 152mm FIBREGLASS THERMAL SPACERS. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - RSI 5.3 (R-30) MINERAL WOOL BATT INSULATION IN CAVITY SPACE.
  - FULLY ADHERED SBS MODIFIED BITUMINOUS MEMBRANE (AIR-VAPOUR BARRIER).
  - 13mm PLYWOOD SHEATHING.
  - 38mm X 140mm WOOD STUD WALL FRAMING AT 400mm O.C.
  - 140mm RSI 3.7 (R22) MINERAL WOOL BATT INSULATION
  - 19mm G1S PLYWOOD SHEATHING
  - EXTEND UP & OVER, FULLY ADHERED 2 PLY SBS MEMBRANE TO SHEATHING

**EXTERIOR WALL ASSEMBLIES**

- W1 PREFINISHED PROFILED METAL CLADDING**
- 25mm AIR SPACE.
  - MINIMUM 1.2mm (18 GA) THICK X 63mm DEEP GALVANIZED METAL Z-GIRTS INSTALLED HORIZONTALLY. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - 152mm FIBREGLASS THERMAL SPACERS. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - RSI 5.3 (R-30) MINERAL WOOL BATT INSULATION IN CAVITY SPACE.
  - FULLY ADHERED SBS MODIFIED BITUMINOUS MEMBRANE (AIR-VAPOUR BARRIER).
  - 13mm PLYWOOD SHEATHING.
  - 38mm X 140mm WOOD STUD WALL FRAMING AT 400mm O.C.
  - 13mm GYPSUM BOARD SHEATHING.
  - FINISH AS SCHEDULED.
- W2 1 HR F.R.R. EXTERIOR WALL ASSEMBLY (NBC 2010 - TABLE D-2.3.4.A AND D-2.3.4.C)**
- PREFINISHED PROFILED METAL CLADDING.
  - 25mm AIR SPACE.
  - MINIMUM 1.2mm (18 GA) THICK X 63mm DEEP GALVANIZED METAL Z-GIRTS INSTALLED HORIZONTALLY AT 400mm O.C., AND VERTICALLY AT 600mm O.C.
  - 152mm FIBREGLASS THERMAL SPACERS. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - RSI 5.3 (R-30) MINERAL WOOL BATT INSULATION IN CAVITY SPACE.
  - FULLY ADHERED SBS MODIFIED BITUMINOUS MEMBRANE (AIR-VAPOUR BARRIER).
  - 13mm PLYWOOD SHEATHING.
  - 38mm X 184mm WOOD STUD WALL FRAMING AT 400mm O.C.
  - 16mm F.R.R. GYPSUM BOARD.
- W3 PREFINISHED PROFILED METAL CLADDING.**
- 25 MM AIR SPACE.
  - MINIMUM 1.2mm (18 GA) THICK X 63mm DEEP GALVANIZED METAL Z-GIRTS INSTALLED HORIZONTALLY. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - 152mm FIBREGLASS THERMAL SPACERS. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - RSI 5.3 (R-30) MINERAL WOOL BATT INSULATION IN CAVITY SPACE.
  - FULLY ADHERED SBS MODIFIED BITUMINOUS MEMBRANE (AIR-VAPOUR BARRIER).
  - 13mm PLYWOOD SHEATHING.
  - 38mm X 140mm WOOD STUD WALL FRAMING AT 203mm O.C.
  - 19 MM FIRE RETARDANT PLYWOOD SHEATHING.
  - FINISH AS SCHEDULED.

- W3A PREFINISHED PROFILED METAL CLADDING.**
- 25mm AIR SPACE.
  - MINIMUM 1.2mm (18 GA) THICK X 63 MM DEEP GALVANIZED METAL Z-GIRTS INSTALLED HORIZONTALLY. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - 152mm FIBREGLASS THERMAL SPACERS. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - RSI 5.3 (R-30) MINERAL WOOL BATT INSULATION IN CAVITY SPACE.
  - FULLY ADHERED SBS MODIFIED BITUMINOUS MEMBRANE (AIR-VAPOUR BARRIER).
  - 13mm PLYWOOD SHEATHING.
  - 38mm X 140mm WOOD STUD WALL FRAMING AT 400mm O.C.
  - 19mm FIRE RETARDANT PLYWOOD SHEATHING.
  - FINISH AS SCHEDULED.
- W4 PREFINISHED PROFILED METAL CLADDING.**
- 25mm AIR SPACE
  - MINIMUM 1.2mm (18 GA) THICK X 63mm DEEP GALVANIZED METAL Z-GIRTS INSTALLED HORIZONTALLY. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - 152mm FIBREGLASS THERMAL SPACERS. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - RSI 5.3 (R-30) MINERAL WOOL BATT INSULATION IN CAVITY SPACE.
  - FULLY ADHERED SBS MODIFIED BITUMINOUS MEMBRANE (AIR-VAPOUR BARRIER).
  - 13mm PLYWOOD SHEATHING.
  - 38mm X 140mm WOOD STUD WALL FRAMING AT 400mm O.C.
  - 16mm F.R.R. GYPSUM BOARD (MOISTURE RESISTANT).
  - 19mm T & G PLYWOOD TO 2150mm A.F.F.
  - FINISH AS SCHEDULED.
- W7 PREFINISHED PROFILED METAL CLADDING**
- 25mm AIR SPACE.
  - MINIMUM 1.2mm (18 GA) THICK X 63mm DEEP GALVANIZED METAL Z-GIRTS INSTALLED HORIZONTALLY. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - 152mm FIBREGLASS THERMAL SPACERS. SPACING TO BE DETERMINED BY CLADDING CONTRACTOR.
  - RSI 5.3 (R-30) MINERAL WOOL BATT INSULATION IN CAVITY SPACE.
  - FULLY ADHERED SBS MODIFIED BITUMINOUS MEMBRANE (AIR-VAPOUR BARRIER).
  - 13mm PLYWOOD SHEATHING.
  - 38mm X 140mm WOOD STUD WALL FRAMING AT 400mm O.C.
  - 140mm MINERAL WOOL BATT INSULATION.
  - 2 LAYERS 13mm F.R.R. GYPSUM BOARD
  - FINISH AS SCHEDULED.



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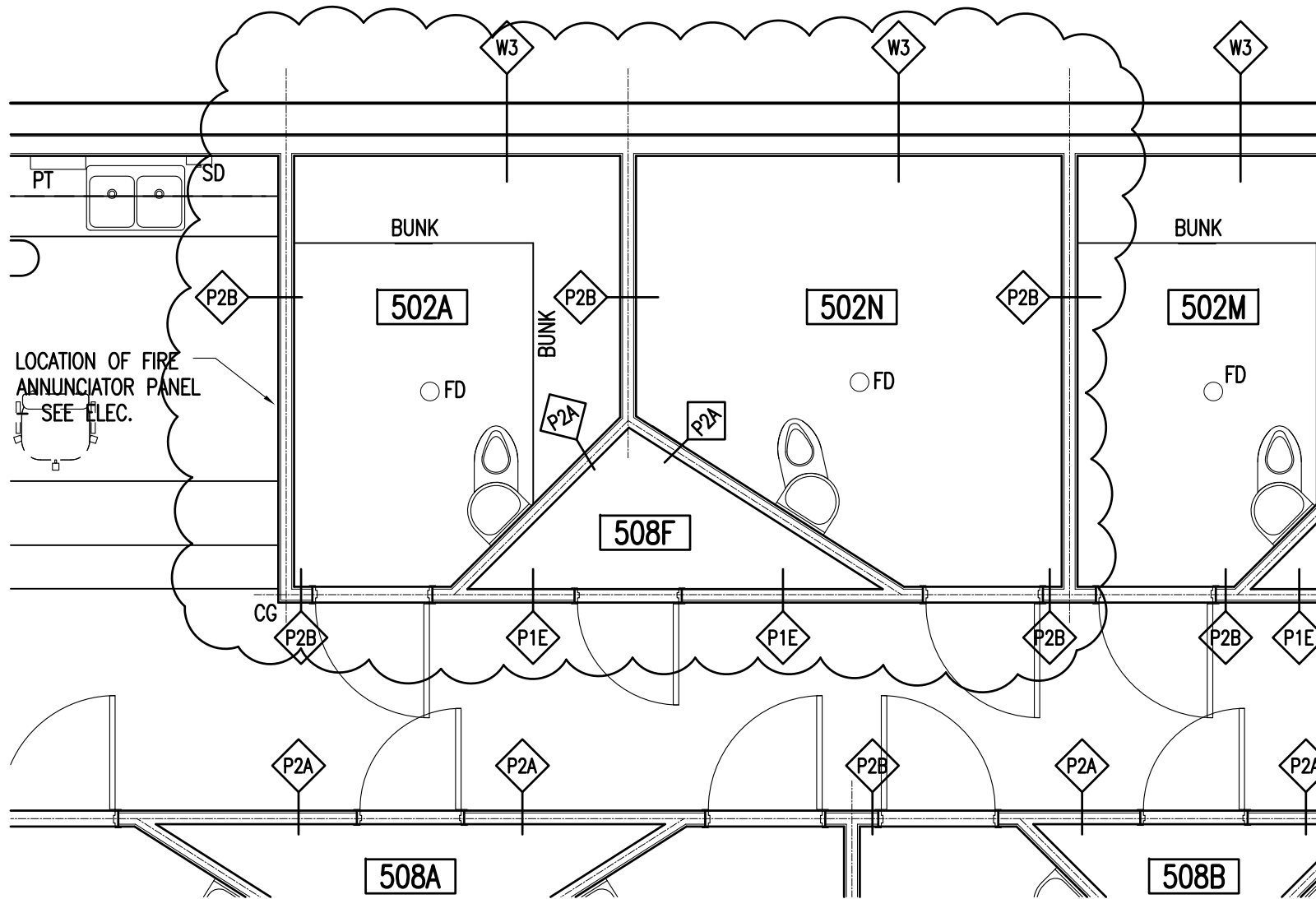
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Project Title:  
**NEW POLICE BUILDING  
INUUVIK, NWT**

Sheet Title:  
**ADDENDUM #1  
CONSTRUCTION ASSEMBLIES - A0.3**

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Project Title:  
**NEW POLICE BUILDING  
INUUVIK, NWT**

Sheet Title:  
**ADDENDUM #1  
ENLARGED MAIN FLOOR PLAN (WEST) - 1/A1.8**

Scale:

**1:50**

Drawn by:

**IBI**

Project no.

**R.050563**

Date:

**2014-05-21**

Checked by:

**EK**

Sheet no.

**ASK-05**

**ISSUED FOR TENDER**

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**LEGEND**

- CPT-1
- CPT-2
- SV-1
- SV-2
- RT-1



DO NOT SCALE DRAWINGS

Revision/Revision	Description/Description	Date/Date
2	ISSUED FOR ADDENDUM #1	2014/05/23
1	ISSUED FOR TENDER	2014/03/17

Client/client  
**PUBLIC WORKS AND GOVERNMENT SERVICES CANADA**

Project title/Titre du projet  
**NEW POLICE BUILDING INUVIK, NWT**

Approved by/Approuvé par  
EK  
Designed by/Concept par  
BSO  
Drawn by/Dessiné par  
BSO/MC  
PWSC Project Manager/Administrateur de Projets TPSC  
HENRY LEE  
PWSC Architectural and Engineering Resources Manager/  
Ressources Architecturales et de Directeur d'Ingénierie, TPSC  
STEVE BANSEE

Client/client  
Drawing title/Titre du dessin  
**FLOOR FINISH LAYOUT PLAN  
ROOMS 101B/ 202A/ 306**

**1** FLOOR FINISH LAYOUT PLAN  
A1.11 SCALE : N.T.S.

Project No./No. du projet  
**R.050563**  
Sheet/Feuille  
**A1.11(R)**  
Revision no./  
no. de révisión  
OF XX

# Civil Addendum 1

Date: April 9, 2014

This addendum forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts. The cost of all work contained herein is to be included in the Contract Sum. The specifications and drawings are complementary. Items listed under the specification in this addendum and having influence on the drawings are so deemed to alter the drawings. Items listed under the drawings in this addendum and having influence on the specification are so deemed to alter the specification.

## 1. Revisions to Specifications

### 1.1 Section 33 07 16

- .1 Subsection 2.1.1: Delete pipe sizes from this section. Refer to Civil drawings for pipe sizes.
- .2 Subsection 2.2.1: Delete. Return line to follow specs for supply line, pipe size as shown on Civil drawings.

## 2. Revisions to Specifications

### 2.1 Section 33 42 13

- .1 Subsection 2.3.1.1.1: Delete and replace with following:  
  
Graded rip-rap, average diameter 100 mm, maximum diameter 150 mm, minimum diameter 50 mm. No more than 50% of pieces to exceed 100 mm.
- .2 Subsection 3.4.2: Delete and replace with following:  
  
Place rip-rap apron 225 mm thick around culvert ends to following dimensions:
  - .1 For 300 mm culvert:
    - .1 Apron width: 900 mm
    - .2 Inlet end apron length: 600 mm
    - .3 Outlet end apron length: 900 mm
    - .4 Extend rip-rap up embankment 450 mm
  - .2 For 400 mm culvert:
    - .1 Apron width: 1200 mm
    - .2 Inlet end apron length: 800 mm
    - .3 Outlet end apron length: 1200 mm
    - .4 *Extend rip-rap up embankment 600 mm*

### **3. Revisions to Drawings**

#### **3.1 Drawing C2.0**

- .1 Detail B: Kick plate on secure bay ramp pedestrian railing to be 8 mm thick steel plate, 100 mm high, mounted 25 – 50 mm above ground, fabricated and finished as for railings described in spec section 05 50 01.
- .2 Detail B: Dimensions of concrete base shown for railing on top of gabion are 300 mm high by 850 mm wide.

# Structural Addendum S-01

Date: May 16, 2014

This addendum forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts. The cost of all work contained herein is to be included in the Contract Sum. The specifications and drawings are complementary. Items listed under the specification in this addendum and having influence on the drawings are so deemed to alter the drawings. Items listed under the drawings in this addendum and having influence on the specification are so deemed to alter the specification.

## 1. Revisions to Specifications

### 1.1 Section 31 63 20

- .1 Under Clause 1.2 Geotechnical Report, this is to be replaced by the following updated geotechnical report:

“Geotechnical Design of Thermopile Foundation for RCMP Detachment, Inuvik, NT”, by Nehruh - EBA Consultants Ltd., dated March 2014. File: Y14103266-01/NE1033.

- .2 Delete specification Section 31 63 20 in its entirety and replace with the appended specification Section 31 63 20 (10 pages). Revisions to this section include the following:

- .1 Clause 2.2.8 has been revised to read as follows:

Backfill: 20mm minus crushed gravel saturated with potable water. Should not contain particles over 20mm in diameter and should have no more than 10% fines passing the No. 200 sieve size (silt and clay sizes). The degree of saturation to be 100%, or as required to produce a mixture with a slump of 100 mm to 150 mm. The material must be completely thawed and contain no ice. In mixing the slurry in extreme cold, the contractor must either heat the mixer drum, use hot water, or create the mix under a heated tent structure. Slump tests are to be performed immediately prior to the placement of the slurry.

- .2 Clause 3.7 – Load Testing has been deleted. There is no requirement to load test the thermopiles.

- .3 A Thermopile Inspection Table has been added to Section 31 63 20.

.4 The structural drawings provide the design for the thermopiles.

Full time pile inspection of piling operations will be carried out by an independent firm, retained and paid for by the Owner. The requirements of the independent inspection firm are outlined in Sub-Section 3.5 of the project specifications.

There is no requirement for the General Contractor to engage a professional engineer to be responsible for the design of the thermopiles.

.5 Sub-Section 1.3 has been revised deleting the requirements for the contractor to retain a professional engineer to design the thermopiles.

.6 Sub-Section 1.4 – Design has been deleted from the original specification.

.7 Under Sub-Section 1.5, the original Clause 1.5.2 has been deleted.

## **2. Revisions to Specifications**

### **2.1 Section 31 63 21**

.1 Specification Section 31 63 21 entitled “Flat Loop Thermosyphons” has been added to the contract documents. This section forms part of this addendum.

## **3. Revisions to Drawings**

### **3.1 Drawing S1.0**

.1 Under note 1.6 Geotechnical Information, replace note .1 with the following:

“The following investigation report has been used by the engineer in the design and preparation of the drawings: Geotechnical Design of Thermopile Foundation for RCMP Detachment, Inuvik, NT. Dated March 2014 – Issued for Use by Nehruh - EBA Consulting Ltd. File: Y14103266-01/NE1033”.

## **4. Revisions to Drawings**

### **4.1 Drawing S1.1**

.1 The Steel Pile Schedule has been revised to show pile diameter and pile loads. Refer to attached sketch SSK-01.

.2 Detail 6/S1.1 has been revised. Replace the 219 dia. thermopile with a 273 dia. x 8.5 m long Sch 40 Adfreeze steel pipe pile. Refer to attached sketch SSK-02.

.3 Detail 7/S1.1 has been revised. Replace the 219 dia. thermopile with a 273 dia. x 8.5 m long Sch 40 Adfreeze steel pipe pile. Refer to attached sketch SSK-03.

## **5. Revisions to Drawings**

### **5.1 Drawing S1.2**

- .1 Detail 15A has been added to show the typical Adfreeze Steel Pipe Pile detail. Refer to attached sketch SSK-04.
- .2 Detail 16 has been revised. Rod sizes and hold down loads have been revised on the HD-2 and HD-3 details. Refer to attached sketch SSK-05.
- .3 Detail 17 has been revised to show pile bracing loads. Refer to attached sketch SSK-06.

## **6. Revisions to Drawings**

### **6.1 Drawing S2.0**

- .1 Refer to attached sketch SSK-07 for clarification of locations of pile bracing along Line 8.

## **7. Revisions to Drawings**

### **7.1 Drawing S2.0A**

- .1 Drawing S2.0A has been added to the document set to show the relationship of the existing wood pile layout to that of the new pile foundations.

## **8. Revisions to Drawings**

### **8.1 Drawing S2.2**

- .1 Section J/S2.2 has been revised. Refer to attached sketch SSK-08 for the revised section.

## **9. Revisions to Drawings**

### **9.1 Drawing S2.3**

- .1 Section K/S2.1 has been revised to add Section P/S2.3 at the pile/ramp interface. Refer to attached sketch SSK-09.
- .2 Detail 3/S2.3 has been revised to read as Section P/S2.3 to show the L203x102 angle embedded in a concrete cap secured to the top of the gabion baskets. Refer to attached sketch SSK-10 for the revised section.
- .3 Detail 1/S2.3 has been revised to show the L203x102x13 angle embedded in a concrete cap secured to the top of the gabion baskets. Refer to attached sketch SSK-11 for the revised section.

## **10. Revisions to Drawings**

### **10.1 Drawing S6.2**

- .1 Section B/S6.2 has been revised to show the L203x102 angle embedded in a concrete cap secured to the top of the gabion baskets. Refer to attached sketch SSK-12 for the revised section.

## **11. Revisions to Drawings**

### **11.1 Drawing S7.0**

- .1 As shown in Section D/S7.0 (and Detail 1/S7.0), the hinged steel checker plate and embedded bent plate with nelson studs is not required at the interface between the garage apron slab and the parking lot. Refer to attached sketch SSK-13 for the revised section.

Enclosure(s): Revised Specification Section 31 63 20 (10 pages)  
Thermopile Inspection Table (Section 31 63 20B)  
Specification Section 31 63 21 Flat Loop Thermosyphons (6 pages)  
Sketches 24950.02-SSK-01 to 24950.02-SSK-13, inclusive (8 ½" x 11")  
Drawing S2.0A – Existing/New Pile Layout Plan (Full Size)

End of Addendum No. S-01



**1. General**

**1.1 REFERENCES**

- .1 NBCC 2010, "National Building Code of Canada"
- .2 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - .2 ASTM A252-10, Standard Specification for Welded and Seamless Steel Pipe Piles
  - .3 ASTM A1008/A1008M-13, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
- .3 Canadian Standards Association (CSA International)
  - .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CAN/CSA-S16-09, Design of Steel Structures.
  - .3 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
  - .4 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.
  - .5 CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding)
- .4 The Master Painters Institute/MPI ASM-[February 2004], Architectural Painting Specification Manual.
  - .1 MPI #19, Inorganic Zinc Rich Primer.
- .5 The Society for Protective Coatings (SSPC)
  - .1 SSPC Painting Manual, Volume 2-2005, Systems and Specifications.
    - .1 SSPC-SP2-82 (R2004), Hand Tool Cleaning.
    - .2 SSPC-SP3-82 (R2004), Power Tool Cleaning.
    - .3 SSPC-SP5/NACE No.1-00 (R2004), White Metal Blast Cleaning.
    - .4 SSPC-SP6/NACE No.3-00 (R2004), Commercial Blast Cleaning.
    - .5 SSPC-SP7/NACE No.4-00 (R2004), Brush-Off Blast Cleaning.
    - .6 SSPC-SP8-82 (R2000), Pickling.
    - .7 SSPC-SP10/NACE No.2-00 (R2004), Near-White Blast Cleaning.
- .6 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.171-98, Inorganic Zinc Coating.
  - .2 CAN/CGSB-1.184-98, Coal Tar-Epoxy Coating.

**1.2 GEOTECHNICAL REPORT**

- .1 Refer to the Geotechnical Reports entitled
  - .1 "Geotechnical Design of Thermopile Foundation for RCMP Detachment, Inuvik, NT", by Nehtruh - EBA Consultants Ltd., dated March 2014. File: Y14103266-01/NE1033.
- .2 Ensure the requirements of the geotechnical report are read and understood prior to commencing with work.

### 1.3 QUALIFICATIONS

- .1 The organization undertaking to weld under this section is to be fully approved by the Canadian Welding Bureau (CWB) under the requirements of CSA W47.1, Division 1 or 2.1 only. Division 3 qualifications are not sufficient.

### 1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings and indicate: radiators, helix, pile cap, clips for cross bracing.
  - .1 Each drawing shall be stamped and signed by a professional engineer registered or licensed in the Northwest Territories, Canada.
- .3 Product data: submit manufacturer's printed product literature, specifications and datasheet.
- .4 Submit schedule of planned sequence of installation to Departmental Representative for review.
- .5 Sub-surface investigation report: when site conditions differ from those indicated, submit written notification to Departmental Representative and await further instructions.
- .6 Maintain field installation records for each pile, including embedment depth, volume of sand slurry, cut-off elevation of shell, brief description of subsurface conditions, and installed pile location.
- .7 Provide Departmental Representative with three copies and electronic copy of field records.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Piles to be delivered to site prior to beginning of construction.
- .2 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .3 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .4 Deliver new, undamaged materials to site, accompanied by certified test reports, with manufacturer's logo and mill identification mark provided on piling.
- .5 Store materials to permit easy access for inspection and identification. Keep steel off the ground using pallets, platforms or other supports. Protect steel members and packaged material from erosion and deterioration.
- .6 Storage and Protection:
  - .1 Store and handle thermo piles in accordance with manufacturer's written instructions to prevent permanent deflection, distortion or damage to piles.
  - .2 Store pipe piling to facilitate required inspection activities and prevent damage to coatings and corrosion prior to installation.

**1.6 EXISTING STRUCTURES, SERVICE AND UTILITES**

- .1 Confirm and establish the locations and extents of all underground structures, services and utilities in the work area prior to commencement of piling work by notifying the applicable owners, authorities or agencies. Clearly mark such locations to prevent disturbance or damage.
- .2 General Contractor will arrange and pay for disconnecting, removing and capping, services and utilities within area of piling work. General Contractor will disconnect and stub off as required.
- .3 Place markers to indicate location of disconnected services and utilities. Identify utility and service lines and capping locations on as-built drawings.

**1.7 CERTIFICATION OF QUALITY CONTROL BY PILING CONTRACTOR**

- .1 A full time qualified superintendent representing the Piling Contractor is to be in attendance during all phases of the work.
- .2 Piling Contractor is responsible to accurately lay out the control points for all work on site. Piling Contractor to keep accurate notes and data on the work and at completion of work certify that the work is constructed in accordance with the drawings and changes authorized in writing by the Department Representative.
- .3 Implement such quality control procedures as may be required to permit the Piling Quality Control Certificate, Document 31 63 20A, appended to this Section, to be completed and submitted.
- .4 Submit final pile location, both horizontal and vertical, checked by a registered land surveyor, licensed to practice in the Northwest Territories.
- .5 Submit complete drilling logs of each pile boring.
- .6 Submit gradation test results for slurry aggregate.
- .7 Submit Piling Quality Control Certificate promptly upon completion of work of this Section.
- .8 Certificate shall not be signed by an engineer performing inspections on Owner's behalf.

**1.8 QUALITY ASSURANCE**

- .1 Welding will conform to CSA W59 and all welders must hold valid welding certificates, issued by the Canadian Welding Bureau.
- .2 The Piling Contractor will be fully experienced in the installation of thermopiles piles and thermosyphons.
- .3 The Piling Contractor will provide at least one person thoroughly trained and experienced in the work who will be present at all time during execution of the work and who will direct all work performed under the contract.

## 2. Products

- .1 At all times, only new materials are to be used for the fabrication of thermopiles.
- .2 Piles to be two-phase liquid/vapor type Thermo Helix Piles as manufactured by Arctic Foundations Inc. or approved equal.
- .3 Construction to be in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, and ASME M31.5 to the configuration shown on the drawings. The minimum design metal temperature of the pile to be -29°C.
- .4 Pile shells to meet ASTM A53 (also known as ASME SA 53) Grade B as a minimum.
- .5 The top 4.6m to be protected with HB Fuller IF-1074 fusion bond epoxy applied over 3mils (minimum) of flame or arc-sprayed aluminum applied per AWS C2.2.
- .6 Passive refrigeration to be an integral part of the piles.
  - .1 The passive refrigerant to be R-744
  - .2 The passive refrigeration system to be designed for subsurface heat removal of not less than 225 BTU/hour based on an air velocity of 8Km/hr, an air/soil temperature differential of 7.8°C, and an average influence radius of 1.8 m.
- .7 Fabrication shall be carried out in accordance with standard practices and all applicable codes. The designs and pile components shall conform to the latest editions of the National Building Code of Canada and any local applicable building codes.

## 2.2 MATERIALS

- .1 Straight seamless and welded steel pipe to diameters and wall thickness as indicated, to ASTM A53 (also known as ASME SA 53) Grade B.
- .2 Helix: to ASTM A1008/A1008M or CSA-G40.20/G40.21 .
- .3 Steel pile caps: to CSA-G40.20/G40.21.
- .4 Welding electrodes: to CSA W48 series.
- .5 All edges on piles shall be ground and clear of burrs or sharp edges.
- .6 Welding materials: to CSA W59.
- .7 Pipe charge: Carbon Dioxide (CO<sub>2</sub>) or alternative material proposed by manufacturer if approved by Departmental Representative.
- .8 Backfill: 20mm minus crushed gravel saturated with potable water. Should not contain particles over 20mm in diameter and should have no more than 10% fines passing the No. 200 sieve size (silt and clay sizes). The degree of saturation to be 100%, or as required to produce a mixture with a slump of 100 mm to 150 mm. The material must be completely thawed and contain no ice. In mixing the slurry in extreme cold, the contractor must either heat the mixer drum, use hot water, or create the mix under a heated tent structure. Slump tests are to be performed immediately prior to the placement of the slurry.
- .9 Water for backfilling: fresh potable water. Placement temperature not to exceed 10°C. After mixing with aggregate, backfill slurry to have a salinity of less than 3 ppt.

- .10 Cuttings from pile holes not to be used for slurry.
- .11 Single bead ground temperature cables.
- .12 Multi-bead ground temperature cables (GTCs) as detailed in geotechnical report, with lead wires of sufficient length with standard plugs to extend above grade for connection to read-out equipment. Fabricated thermistor strings to be calibrated by the supplier at 0°C to 0.005°C.
- .13 Read out equipment to become property of the Owner and to be stored as directed by the Department Representative.
- .14 Insulation of the thermistor leads to be capable of withstanding moderate flexing with the -40°C to +65.6°C range without failure.
- .15 Schedule 40 PVC pipe meeting ASTM D 2665 and D2949 to be used to protect the thermistor strings and to be installed adjacent to each Thermopile.

### **2.3 WELDING**

- .1 All pipe splicing shall be full strength complete penetration groove welds or the combination of a collar and continuous fillet welds on each end on collar to ensure continuity of pipe.
- .2 Helix shall be welded to the pipe section using a continuous fillet weld on both sides of the helix to pipe connection.
- .3 Welding procedure and welder qualification shall conform to CSA W59 and CSA 47.1. Welding electrodes shall be E7018 classification conforming to CSA W48.1 for stick welding and E4802C-6-CH classification conforming to CSA W48.5 for wire feed welding.
- .4 Other than pile caps to top of pile shaft, no welding to be done on site unless authorized in writing by thermo pile manufacturer.

### **2.4 PAINTING AND COATINGS**

- .1 Painting requirements include surface preparation of outer surfaces of piling (including pile caps), application of inorganic zinc coatings and touch up after delivery.
- .2 Paint piles as specified herein.
- .3 Surface preparation: to SSPC-SP 10.
- .4 Application:
  - .1 Flame or arc-sprayed aluminum to 3mil thickness min.
  - .2 Epoxy paint to 3-4 mils thickness.

### **3. Execution**

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

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

#### **3.2 PREPARATION**

- .1 Contractor to inspect the piles upon arrival at site, and to note and report to Department Representative any damage.
- .2 Protection:
  - .1 Protect adjacent structures, services, underground utilities and work of other sections from hazards due to pile drilling operations.
  - .2 Arrange sequencing of pile drilling operations and methods to avoid damages to adjacent existing structures.
  - .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.
- .3 Ensure that ground conditions at pile locations are adequate to support pile drilling operation and load testing operation.
  - .1 Make provision for access and support of piling equipment during performance of Work.
- .4 Existing wood piles
  - .1 Piles conflicting with specified thermopiles to be drilled.
  - .2 Piles under new parking areas to be cut-off 1m below finished grade.
  - .3 Piles under new building footprint to be cut at grade level
- .5 Drill piles only when site grading has been completed.
- .6 Contractor to coordinate work and access with Department Representative.

#### **3.3 INSTALLATION**

- .1 Installation performed by a qualified and/ or certified contractor.
- .2 Install piles during winter, under winter conditions.
- .3 Piling contractor to be prepared to use temporary casing to control seepage and sloughing
- .4 Notify the Departmental Representative and inspection five (5) working days prior to any installations on site.
- .5 Before a hole is drilled, the hole location to be surveyed and identified with an accuracy of +/- 0.1m.
- .6 Evaporator section (length of embedment) of the thermopile should be measured. This length to be used to determine the required drill hole depth.
- .7 Holes for thermopile installation to be drilled vertically.

- .8 Drilling fluids and thawing of permafrost will not be allowed.
- .9 Pile will be drilled without interruption until the lengths and drilling criteria shown and specified elsewhere in the Contract Documents are met.
- .10 Keep holes dry, cover immediately, and keep holes covered until pile placement. Cover to be of sufficient size and strength to prevent personnel from falling into hole and to prevent intrusion of snow, ice, and debris. Casing of the active layer may be required to prevent sloughing and water penetration.
- .11 Inspect piles prior to placing. Damaged piles not be placed. The portion of the pile that is not coated to be free from ice, snow, mud, oil, varnish, paint, loose mill scale, or any coatings that will adversely affect the slurry adfreeze bond. Residue other than light rust or well-bonded mill scale to be removed prior to installation.
- .12 Set piles with the top of pipe between 75 and 250 mm above the design cut-off elevation. Thermopile to be installed to an almost exact depth to ensure thermopile radiator is located according to design. Allowable installation accuracy of depths is +/- 50mm. If required to achieve this installation accuracy, slight overdrilling of hole and backfill with crush gravel to the design bottom elevation prior to installing the pile, as directed and monitored by Pile Installation Monitoring Agency, is allowed. Radiator section is charged with coolant and is not to be cut or welded to achieve required top of pile elevation.
- .13 Install thermopile in a vertical position, centered in the drill hole before backfilling the annulus. Centerline of the pile at the cut-off elevation to be within 15 mm of the design location.
- .14 Protect the annular space prior to slurry placement by plugging or with a cover that fits around the pile.
- .15 All piles to plumbed and checked for horizontal, vertical and angular position, both prior to and after placement of the slurry.
- .16 The piles to be restrained in the hole to the required elevation and horizontal location by clamps, wedges or other devices as required. Cover the exposed pressurized portion of the pile with an insulated blanket to reduce its thermal capacity during slurry placement.
- .17 A closed end 19 mm diameter Schedule 40 PVC pipe to be installed at the bottom of each hole with the pipe and to extend to a height of 450 mm below the pile cap elevation.
- .18 Place the slurry in the annular space as soon as practical. Augered holes not to stand open after drilling for more than 24 hours.
  - .1 Water and gravel to be placed in an alternating sequence in 900 to 1200mm lifts. Gravel to be submerged at all times. Each lift to be thoroughly densified with a concrete vibrator.
  - .2 Slurry temperatures to be less than 7°C when placed. Slurry not to contain frozen lumps.
  - .3 Place gravel slowly. Possible presence of groundwater seepage into pile hole may reduce the requirement for additional water.
  - .4 Remove insulation from exposed portion of pile after slurring.
  - .5 Mound material around pile to reduce water infiltration.
- .19 Measure the final location of piles. Piles to conform to the tolerances stated above. Piles not meeting the specified tolerances to be replaced at Contractor's expense.

- .20 Install single bead ground temperature cables (GTCs) with select piles during installation to permit monitoring of freeze-back of the backfill. No significant loading should occur before the backfill is completely frozen.
- .21 Install Thermistors in PVC tubes adjacent to the piles at specified locations to allow for long term monitoring of pile performance.
- .22 Monitor freeze back using installed thermistor strings. Remove restraints after freeze back has occurred.
- .23 Uncharged top section of piles, if allowed in writing and as per instructions by pile manufacturer, will be cut-off normal to the pile axis at the elevation show on the drawings.
- .24 Upon completion of pile installation, the Manufacturer will inspect each pile to ensure that proper gas pressures, valve operation, and all other aspects of the piles cooling system are in proper operation. Upon completion of the inspection the Manufacturer will submit a report as to the condition of each pile and the required repairs or adjustments made to it. A second inspection and report by the Manufacturer will be required after Substantial Completion of the Project
- .25 The contractor will adequately protect all materials and installed piles from the weather or physical abuse which may impair the quality, strength or usefulness of them. Items not so protected and suffering damage due to neglect by the Contractor in this regard will be rejected by the Owner.
- .26 The contractor shall notify the owner immediately of any pile not in compliance with the drawings and these specifications.
- .27 Should any obstruction be encountered in drilling pile which prevents the pile from being placed to approximately the expected tip elevation, the pile will be removed. An additional pile will be placed at an adjacent location, to be decided by the Departmental Representative.

### 3.4 REJECTED PILES

- .1 A pile will be rejected if any one of the following conditions exists:
  - .1 The pile is damaged during installation;
  - .2 The as-installed location of the pile deviates by more than 75 mm in any direction from its indicated plan location;
  - .3 The pile is out of plumb by more than 2% inclination from the vertical; to a maximum of 50 mm from vertical.
  - .4 It does not conform to any of the materials, workmanship or performance requirements of the contract Documents.
  - .5 If the non-conformance in any rejected pile cannot be corrected, the Contractor will either remove the pile and replace it with a new pile installed in its place, or will install a new pile(s) to compensate for the rejected pile and make all other consequent structural modifications necessary at no additional expense to Owner.
  - .6 Where the Contractor is required to install additional piling as a result of pile rejection on the basis of non-conformance with the requirements of the Contract Documents, the Contractor will replace at no cost to the Owner.



### **3.5 INSPECTION AND TESTING**

- .1 Full time pile inspection of piling operations will be carried out by an independent firm, retained and paid for by the Owner and approved by the Departmental Representative in accordance with Section 01 45 00 of these specifications.
- .2 Inspection and testing firm to submit to the Departmental Representative a final report summarizing their inspection and testing and Contractor's degree of compliance with the contract documents and reviewed shop drawings, including any remedial requirements that may have been required during the course of work. This report is to be submitted under the seal and signature of a professional geotechnical engineer registered in the Northwest Territories.
- .3 Notify Departmental Representative and inspection and testing firm five (5) working days in advance of starting piling work on site.
- .4 Provide free access to all portions of the work and cooperate with the Departmental Representative and inspection agency.
- .5 Pay costs for re-testing required due to defective materials or workmanship
- .6 Pile drilling will be carried out only in the presence of the inspection and testing firm.
- .7 The contractor will provide the inspection and testing firm with access to the piles and will cooperate with the consultant at all times for such purposes as inspecting, recording pile movement during drilling and reading the equipment during drilling.
- .8 After the completion of pile installation, the contractor will furnish to the owner, free of charge a copy of the drill records for each pile.
- .9 The Contractor will immediately inform the inspection firm and Departmental Representative when any movement in an installed pile is detected. Inspection and testing firm will provide recommendations for measures to correct the movement.

### **3.6 RECORDS**

- .1 All thermopiles should have identification, location, volume of slurry, finish depth and pile description recorded on an installation summary page.
- .2 Thermopile installation records for all piles shall be provided to Departmental Representative.

## **4. Monitoring**

### **4.1 CONSTRUCTION MONITORING AND MAINTENANCE**

- .1 After the piles have been installed, thermal monitoring of the piles will be required to insure the piles are "working" as designed by the manufacturer. The manufacturer of the thermopiles is required to perform this monitoring. This monitoring must be complete and verified prior to the construction of the building superstructure commencing.
- .2 Pile monitoring will include observations and/or measurements for each pile installation including pile plumbness, length, installation depth, volumes of backfill; and general verification of ground temperatures, soil porewater salinity and soil types encountered.

- .3 Monitor freeze back of piles installed with single bead GTCs prior to applying significant loading to piles.
- .4 Install data logger for multi-bead GTCs to monitor ground temperatures. Ground temperatures to be measured on a weekly basis during the construction period and forwarded to inspection and testing firm. At the discretion of the inspection firm, frequency of temperature measurements may change.
- .5 Perform visual inspection and surface temperature measurements of each thermopile radiator after freeze back is completed. Repeat inspection periodically until building substantial completion (at least once per year during early winter). The surface temperature of a working thermopile in winter will be warmer than air temperature. Notify Departmental Representative and pile manufacturer of any malfunction thermopile.
- .6 Remove any blockage around the building that could interfere with air flow in the cold crawl space under the building, such as snow around the building perimeter or pile radiators. No material to be stored in the cold crawlspace. No close fencing to be installed around the perimeter of the crawlspace.
- .7 Document the as-built condition of the building for future reference.

#### **4.2 POST CONSTRUCTION MONITORING AND MAINTENANCE**

- .1 Ground temperatures to be measured by Contractor and to be submitted for review to the inspection firm on at least a semi-annual basis for the first two years after construction of the building is completed. At the discretion of the inspection firm, frequency of temperature measurements and reviews may change. One of these measurements to be taken during the month of September.
- .2 Inspection firm to train Owner personnel on ground temperature data logging.
- .3 Owner personnel to perform visual inspection and surface temperature measurements of each thermopile radiator monitor on at least a yearly basis after first two years done by Contractor. Perform inspection during early winter. Document and report any malfunctioning piles or signs of building distress to Departmental Representative.
- .4 Ground temperatures to be measured by Owner personnel and to be submitted for review to the Departmental Representative on at least a semi-annual basis after the first two years after construction of the building.
- .5 Remove any blockage around the building that could interfere with air flow in the cold crawlspace under the building, such as snow around the building perimeter or pile radiators. No material to be stored in the cold crawlspace. No close fencing to be installed around the perimeter of the crawlspace.

**END OF SECTION 31 63 20**



**1. General**

**1.1 REERENCES**

- .1 NBCC 2010, National Building Code of Canada.
- .2 Complete all work in general conformance with the Public Review DRAFT CSA Standard "Buildings in Permafrost Supported on Thermosyphon Foundations".
- .3 CSA Plus 4011-10, TECHNICAL GUIDE: Infrastructure in permafrost: A guideline for climate change adaptation.
- .4 CSA B51-14, Boiler, Pressure Vessel, and Pressure Piping Code.

**1.2 GEOTECHNICAL REPORT**

- .1 Refer to the Geotechnical Reports entitled:
  - .1 "Geotechnical Design of Thermopile Foundation for RCMP Detachment, Inuvik, NT", by Nehtruh - EBA Consultants Ltd., dated March 2014. File: Y14103266-01/NE1033.

**1.3 QUALIFICATIONS**

- .1 Engage a professional engineer registered in the Northwest Territories, fully qualified and experienced in the design of flat loop thermosyphons, to be responsible for the design of and monitoring of installing this system.

**1.4 DESCRIPTION OF WORK**

- .1 Non-Frost susceptible fill to be defined by the consultant for the project based on available granular material.
- .2 Design
  - .1 Design a ground freezing system to contain the thaw depth within the layer of non-frost susceptible (NFS) fill below the building and slab insulation. Minimize the potential for the thaw depth to penetrate the native soil.
  - .2 Design the thermosyphon system to re-freeze the NFS fill based on given building floor temperature, ambient weather conditions, and estimates for global warming over the life of the building, in accordance with CSA Plus 4011.
  - .3 All drawings are to be prepared and sealed by a professional engineer registered in the Northwest Territories.
- .3 Insulation
  - .1 Provide a recommendation on the levels and placement of insulation to achieve the design objectives.
- .4 Thermosyphons
  - .1 Provide a fully functional thermosyphon ground freezing system in conformance with the design documents.
- .5 Monitoring
  - .1 Provide temperature sensors, horizontal and vertical sensors, within the NFS layer to monitor the temperature of the granular layer.

- .2 Operation and Maintenance
- .6 Provide an Operation and Maintenance manual, training and all required software to monitor the performance of the thermosyphons over the life of the building.
  - .1 Provide training upon building turnover to the Owner, and again immediately prior to the end of the one-year warranty period.
- .7 Warranty
  - .1 Provide a 5 year warranty. Details on the warranty with the submitted quotation.

## 1.5 THERMOSYPHON DESIGN CRITERIA

- .1 The thermosyphon vendor requires the following documents to design the thermosyphon and insulation systems:
  - .1 A full set of Issued for Construction drawings for the building.
  - .2 A final geotechnical report complete with all data as referenced in the DRAFT CSA Standard for Thermosyphons.
- .2 Design the thermosyphon system in general conformance with the CSA Public Review Draft Thermosyphon standard.
- .3 Temperatures
  - .1 Indoor floor temperature will be maintained throughout the building at +22°C year round, including the boiler room. There are no in-floor heating systems provided in the building.
  - .2 Ambient temperatures – Use Environment Canada historical weather data for 1980-2014 Normal Weather data. Provide for global climate change in accordance with CSA Plus 4011 for the life of the building at the specific location.
    - .1 Climate variability – check the design against climate variability. Complete the thermal analysis using 10-years of mean air temperatures followed by 5 consecutive 1 in 10 warm years.
- .4 Wind speed
  - .1 Use 50% of the normal observed winter wind speed in the design calculations.
- .5 Design shop drawings
  - .1 Provide shop drawings for the flat loop thermosyphon system sealed by a professional engineer registered in in the Northwest Territories.
  - .2 Shop drawings to indicate:
    - .1 General thermosyphon layout including radiators and evaporator piping.
    - .2 General design criteria for the system.
    - .3 Thickness of insulation below the slab and around the perimeter of the building.
    - .4 Minimum thickness of the NFS fill below the insulation.

## 1.6 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to commencing the work, the Contractor's engineer is to submit documentation showing evidence of registration in the Northwest Territories as well as qualifications and experience. The Contractor's engineer is to further acknowledge in writing that he or she has reviewed the specifications and drawings and is aware that he or she is to inspect the fabrication and installation of work and certify the work at completion

- .3 Submit all applicable shop drawings for the flat loop thermosyphon system. Each drawing shall be stamped and signed by a professional engineer registered or licensed in the Northwest Territories.
- .4 Product data: submit manufacturer's printed product literature, specifications and datasheet.
- .5 Submit schedule of planned sequence of installation to Departmental Representative for review.
- .6 Sub-surface investigation report: when site conditions differ from those indicated, submit written notification to Departmental Representative and await further instructions.
- .7 Maintain field installation records for the installation of the flat loop thermosyphon system.
- .8 Provide Departmental Representative with three copies and electronic copy of field records.

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

- .1 Materials to be delivered to site prior to beginning of construction.
- .2 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .3 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .4 Store materials to permit easy access for inspection and identification. Keep steel off the ground using pallets, platforms or other supports. Protect steel members and packaged material from erosion and deterioration.

### **1.8 EXISTING STRUCTURES, SERVICE AND UTILITIES**

- .1 Confirm and establish the locations and extents of all underground structures, services and utilities in the work area prior to commencement of piling work by notifying the applicable owners, authorities or agencies. Clearly mark such locations to prevent disturbance or damage.
- .2 General Contractor will arrange and pay for disconnecting, removing and capping, services and utilities within area of piling work. General Contractor will disconnect and stub off as required.
- .3 Place markers to indicate location of disconnected services and utilities. Identify utility and service lines and capping locations on as-built drawings.

## **2. Products**

- .1 At all times, only new materials are to be used for the fabrication of the flat loop thermosyphon system.
- .2 All material to be designed for the working pressure of the system and compatible with the refrigerant used.

- .3 Radiators
  - .1 Material: Carbon steel pipe complete with spiral wound fins. Wall thickness of the pipe to contain the design pressure of refrigerant.
  - .2 Fins: Spiral wound and welded to the riser radiator. Total fin area as determined during the design phase.
  - .3 Finish: Aluminize and paint all surfaces exposed to ambient conditions.
  - .4 Joints: Weld all joints. Welding to be completed to CSA B51.
- .4 Evaporator Piping
  - .1 Material: carbon steel. Size and wall thickness to be determined during the design phase. All evaporator piping to be ASTM A106 Grade B Seamless.
  - .2 Joints: Use socket weld joints to CSA B51.
  - .3 Fittings: Forged steel Class 3000, socket weld, to ASME B16.11.
- .5 Welding
  - .1 To meet the requirements of CSA B51.
  - .2 Welding: Completed by certified pressure welder.
- .6 Refrigerant
  - .1 Clean and pure refrigerant. Recycled refrigerant shall not be used.
  - .2 Type: as required by the design engineer and vendor.
- .7 Data Gathering
  - .1 Thermistors: Pre-calibrated thermistors installed in factory fabricated strings purpose built for the project.
  - .2 Thermistors are to be connected to a (single/multi) point junction box and a battery powered data storage device.
  - .3 Data storage device: Sized to hold minimum xx-years of data recording time of day, date, and all thermistor temperatures once per day at a pre-specified time.
  - .4 Data Access: Access to the data is provided by:
    - .1 Site access only: visit the site and connect a laptop to the data storage device. Using the vendor's software, download the data into a Microsoft Excel compatible spreadsheet for analysis. Once the memory is full, the new data is to overwrite the oldest data present within the device.  
OR
    - .2 Remote Access: all data is available through satellite communication. The Vendor is to provide all software, passwords, etc. for remote access. Remote access cannot erase the local data, only download in Microsoft Excel compatible format. When the memory is full the oldest data is to be over-written with the new data.

### **3. Installation**

#### **3.1 GENERAL**

- .1 In general conformance with the DRAFT CSA standard on Thermosyphons.

#### **3.2 WORK BY OTHERS**

- .1 Excavation: Excavate all native soil and dewater the site for placement of NFS fill. Do not cause undue heat load on the permafrost with the placement of the NFS fill. Work procedure by others. Excavation of the site is by others.
- .2 Placement of NFS fill: to the geotechnical engineer's requirements.
  - .1 The thermosyphon evaporator piping requires to be installed on a flat and level surface, sand bedding free of sharp rocks. Provision of NFS fill is by others.
  - .2 Do not drive over the thermosyphons with heavy equipment that could cause damage to the evaporator piping prior to or during the backfill process.
  - .3 Backfill to be placed and compacted along the length of the evaporator pipes. Do NOT place backfill perpendicular to the evaporator piping.
- .3 Insulation: provided by others. The thermosyphon design is based on the thermal properties of DOW HI series insulation, or equal. Provision of insulation by others. Stagger insulation joints.
- .4 Concrete pad for radiators: size as shown on the thermosyphon shop drawings. Design of the concrete pad and reinforcing by others. Provision of the concrete pad by others. The concrete pad is to be ready when the thermosyphon installation crews arrive on site.
- .5 Monitoring: at the end of the thermosyphon warranty period, ongoing monitoring of the thermosyphons is to be completed twice per year by a qualified technician.
- .6 A 120V-15Amp dedicated electrical circuit is required at each radiator group. This is required for the data monitoring equipment.

#### **3.3 INSTALLATION OF THERMOSYPHONS**

- .1 In general conformance with the DRAFT CSA standard on Thermosyphons.
- .2 Install the evaporator piping on flat, level sand bedding provided by the general contractor. Weld all joints.
- .3 Install the radiators on the concrete pad and connect to the evaporator piping. Support the radiators during construction to limit the stress caused by wind.
- .4 Pressure test system: pressure test in accordance with the manufacturer's standards.
- .5 Evacuating: evacuate the thermosyphon systems to the manufacturer's standards.
- .6 Charging: charge all thermosyphons with the specified refrigerant to the levels required by the vendor.



**3.4 STANDBY CREW – DURING EVAPORATOR BACKFILLING**

- .1 The vendor is to leave a qualified technician, and welder on site while the contractor backfills over top of the evaporator piping. In case the evaporator piping is damaged during the backfill process, the technician is required to repair the damage.
- .2 Prove thermosyphons are in good condition after completion of backfilling and prior to leaving site.
- .3 Clearly state the allowances for site labour during the backfilling time in the quotation submitted and daily rates.

**3.5 DOCUMENTATION**

- .1 Record the location of evaporator piping relative to the site benchmarks as developed by the General Contractor, including elevation. Record the data on the "Record Drawings."

**3.6 TRAINING**

- .1 The Vendor is to be called back to site on turnover of the building to the Occupant. The purpose of the site visit is to:
  - .1 Confirm proper operation of the thermosyphons.
  - .2 Download the data from the thermosyphon monitoring system.
  - .3 Train the Maintenance staff how to download the data.
- .2 Return to site one-year immediately prior to end of warranty for the thermosyphon system to:
  - .1 Confirm proper operation of the thermosyphons.
  - .2 Download the data from the thermosyphon monitoring system.
  - .3 Train the Maintenance staff how to download the data.

**END OF SECTION 31 63 21**

STEEL PILE SCHEDULE			
TYPE	EMBEDMENT LENGTH (m)	DIAMETER (mm)	SERVICE LOAD (kN)
P1	14.5	219	250
P2	12.3	219	200
P3	10.6	219	150

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JOB. TITLE:

NEW POLICE BUILDING  
INUUVIK, NWT

DWG. TITLE:

REVISED STEEL PIPE PILE SCHEDULE  
(REF. DWG S1.1)  
(ADD. S-01)

DWN. BY:

DES. BY:

PROJ. MGR.:

BB

LS

BT

PEER REVIEW:

DATE: (YY-MM-DD)

SCALE:

LS

2014.04.22

AS SHOWN

CLIENT PROJ. #

WE PROJ. #

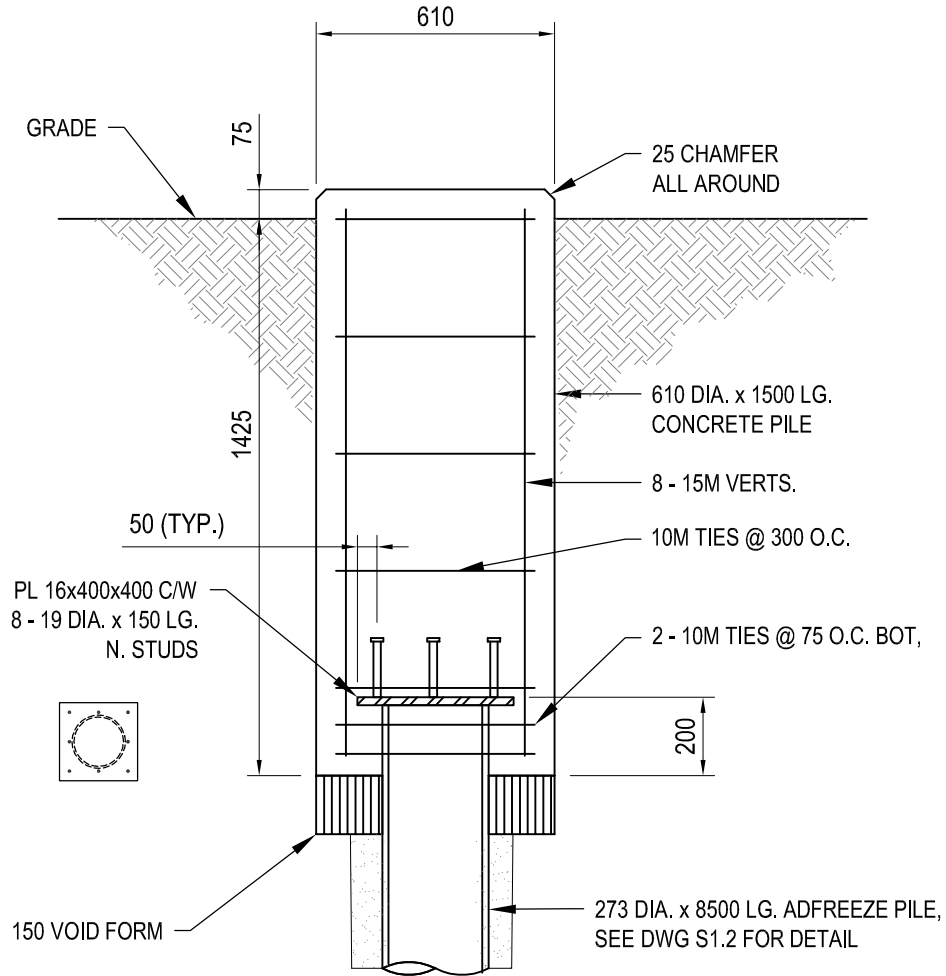
OF

REV #

24950.02

DWG #

24950.02-SSK-01



6 TYPICAL SIGN BASE DETAIL  
- N.T.S.

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DWG. TITLE:

REVISED SECTION "6"  
(REF. DWG S1.1)  
(ADD. S-01)

DWN. BY:

DES. BY:

PROJ. MGR.:

BB

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PEER REVIEW:

DATE: (YY-MM-DD)

SCALE:

LS

2014.04.22

AS SHOWN

CLIENT PROJ. #

WE PROJ. #

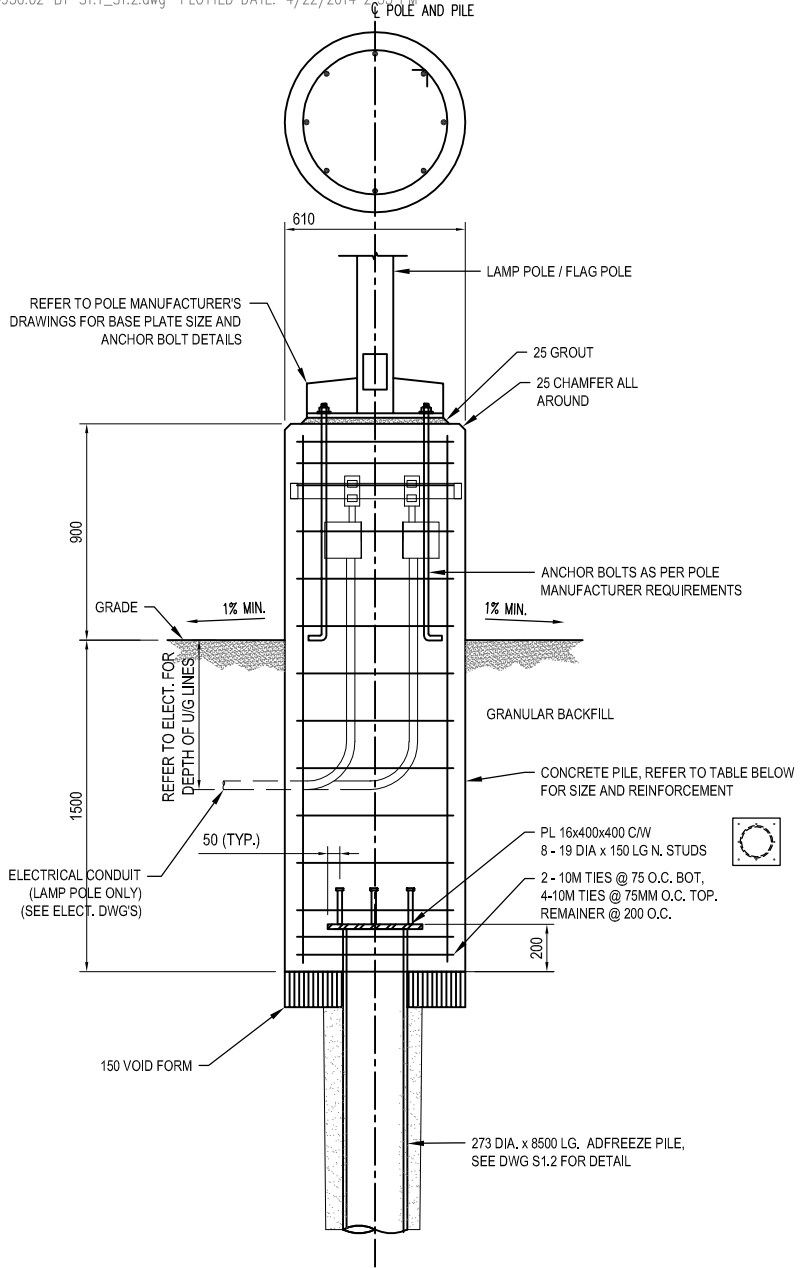
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REV #

24950.02

DWG #

24950.02-SSK-02

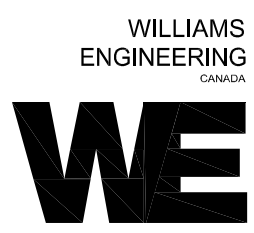


PILE SHAFT DIAMETER	CONCRETE PILE LENGTH	PILE REINFORCEMENT	REMARKS
610	2400	8 - 15M x FULL LENGTH	10M TIES @ 200 O.C.

POLE DIAMETER	HEIGHT	REMARKS
127 DIA. LAMP POLE	5500	POLE TO WITHSTAND 160 KM/HR WINDS WITH GUST FACTOR OF 1.3 WITH DOUBLE HEAD LUMINAIRE ASSEMBLY POLE TO BE ERRECTED WITH THE LUMINAIRE ALREADY INSTALLED AND BASE GROUT ADEQUATELY APPLIED
127 DIA. FLAG POLE	9144	

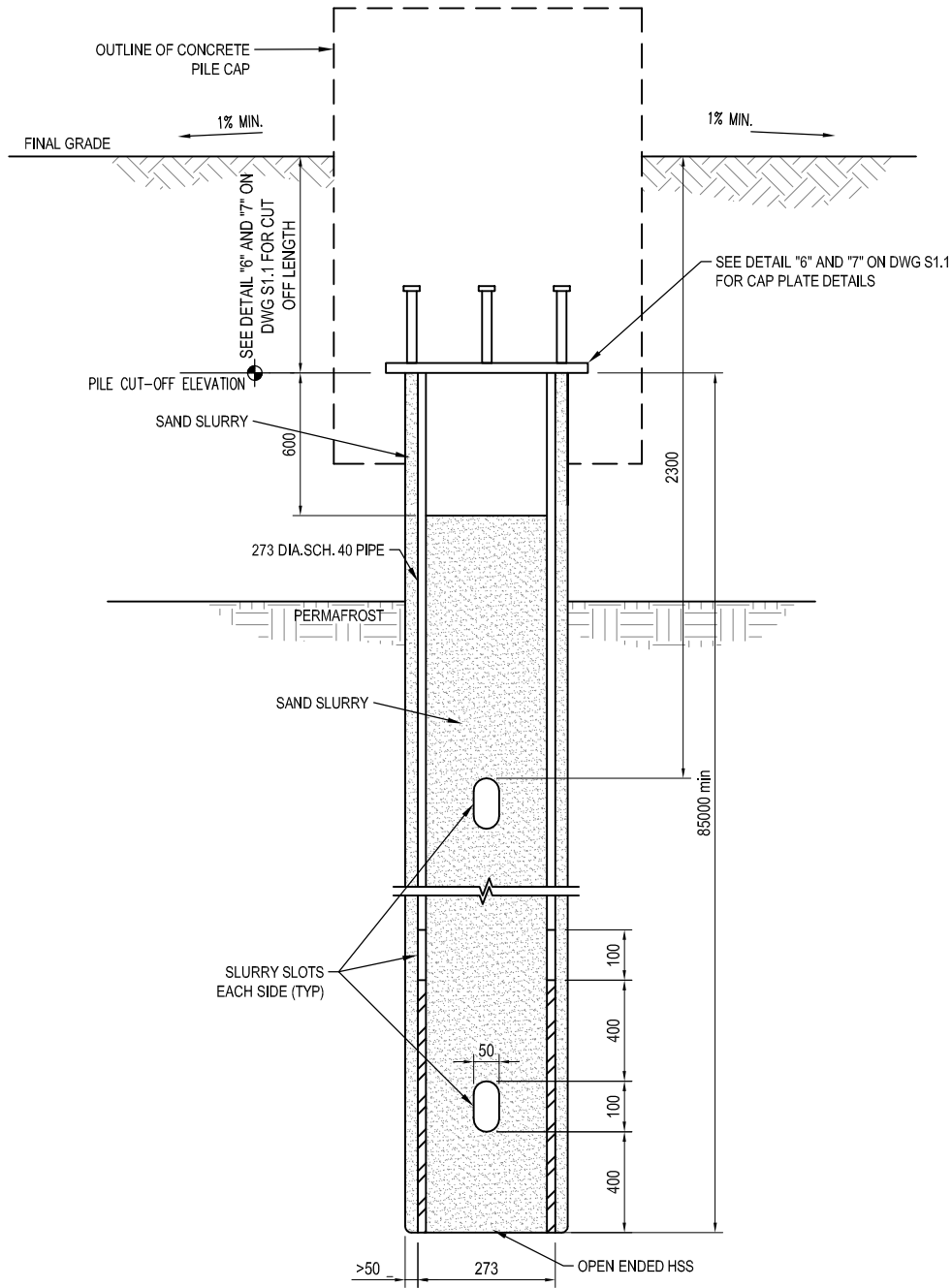
7 TYPICAL LIGHT POLE/ FLAG POLE BASE DETAIL  
- N.T.S.

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JOB. TITLE:  
NEW POLICE BUILDING  
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DWG. TITLE:  
REVISED SECTION "7"  
(REF. DWG S1.1)  
(ADD. S-01)

DWN. BY: BB	DES. BY: LS	PROJ. MGR.: BT
PEER REVIEW: LS	DATE: (YY-MM-DD) 2014.04.22	SCALE: AS SHOWN
CLIENT PROJ. #	WE PROJ. # 24950.02	OF REV #
DWG # 24950.02-SSK-03		



15a TYPICAL ADFREEZE STEEL PIPE PILE  
 - N.T.S. (FLAG POLE, LAMP POLES, SIGN BASE)

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JOB. TITLE:

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DWG. TITLE:

TYPICAL ADFREEZE PILE  
 (REF. DWG S1.2)  
 (ADD. S-01)

DWN. BY:

DES. BY:

PROJ. MGR.:

BB

LS

BT

PEER REVIEW:

DATE: (YY-MM-DD)

SCALE:

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2014.04.22

AS SHOWN

CLIENT PROJ. #

WE PROJ. #

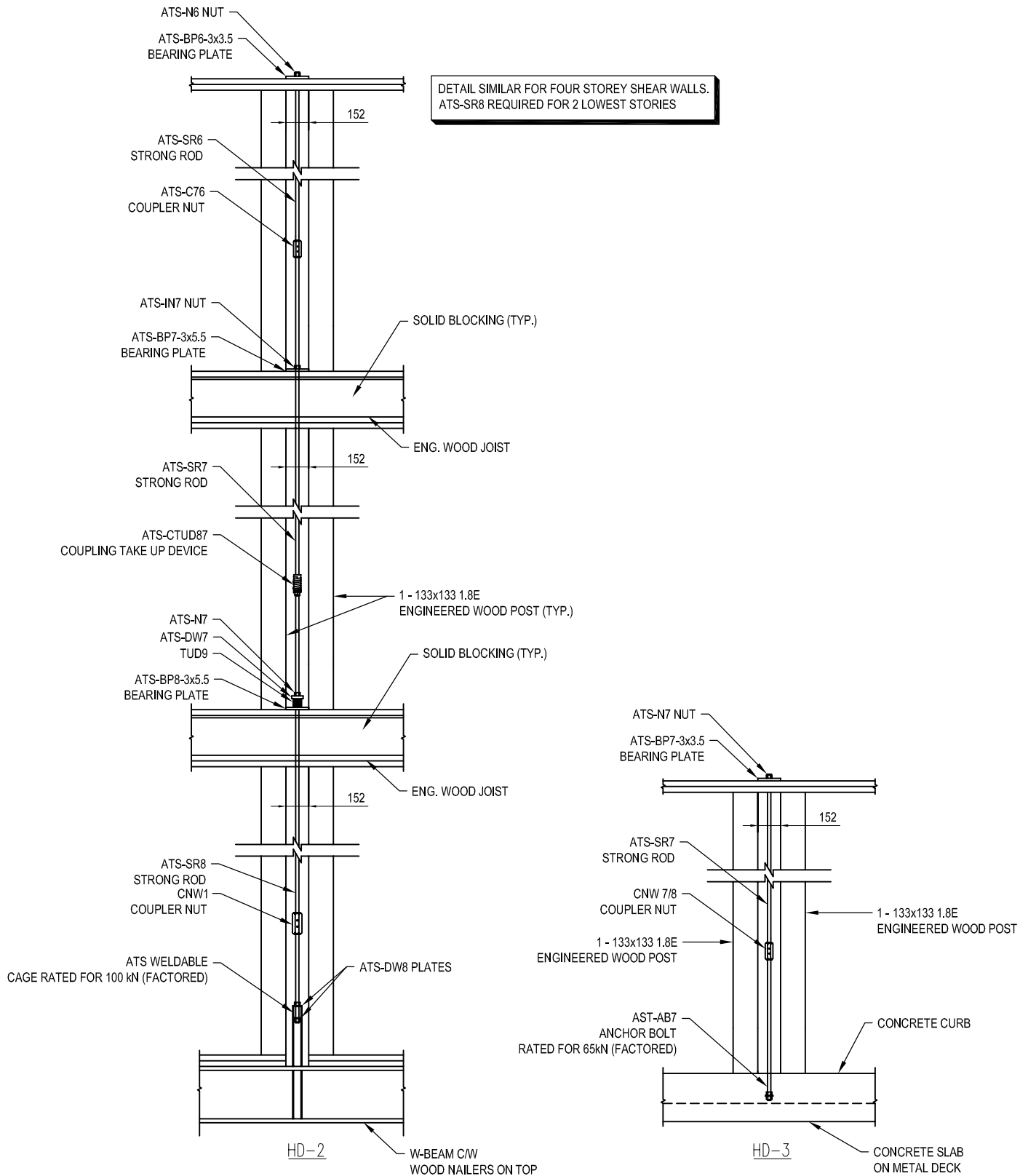
OF

REV #

24950.02

DWG #

24950.02-SSK-04



16 TYPICAL SHEAR WALL ANCHORAGE TIEDOWN SYSTEM DETAIL  
- N.T.S.

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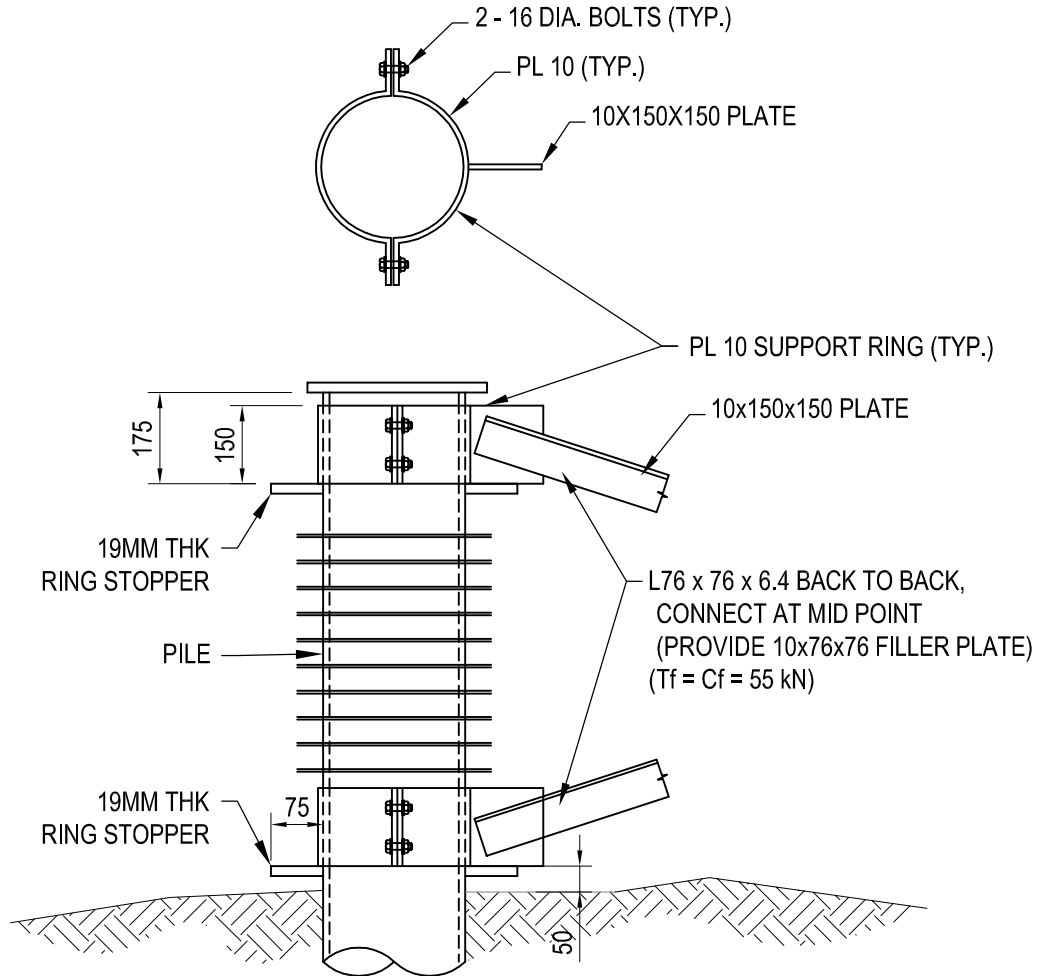
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NEW POLICE BUILDING  
INUUVIK, NWT

DWG. TITLE:

REVISED SHEAR WALL ANCHORAGE  
(REF. DWG S1.2)  
(ADD. S-01)

DWN. BY:	DES. BY:	PROJ. MGR.:	
BB	LS	BT	
PEER REVIEW:	DATE: (YY-MM-DD)	SCALE:	
LS	2014.04.22	AS SHOWN	
CLIENT PROJ. #	WE PROJ. #	OF	REV #
	24950.02		
DWG #		24950.02-SSK-05	



NOTE:  
SEE PLANS FOR CROSS BRACING LOCATIONS.

17 PILE CROSS BRACING (BR-X)  
- NTS

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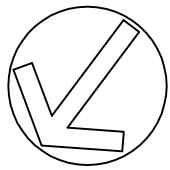
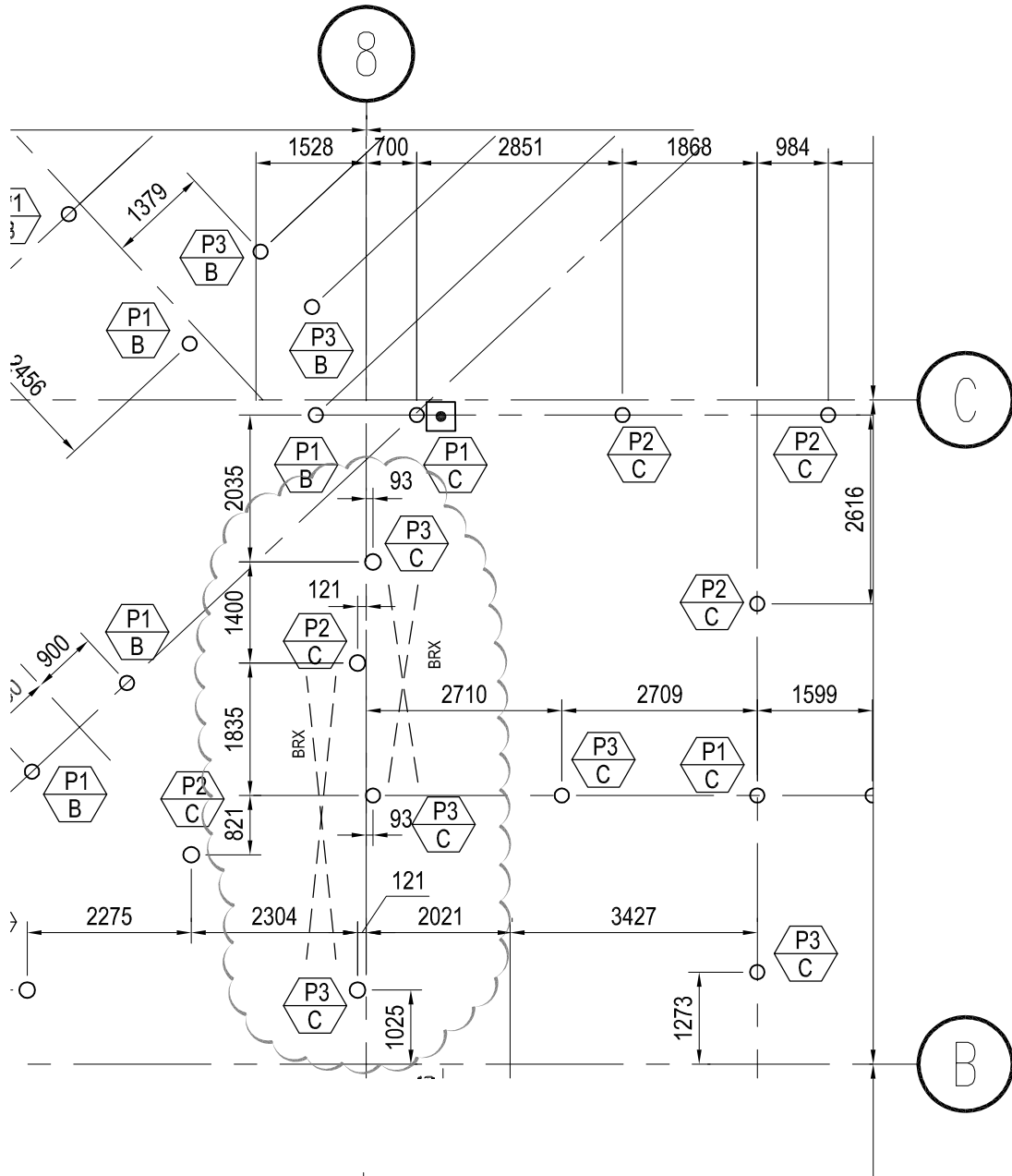
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NEW POLICE BUILDING  
INUUVIK, NWT

DWG. TITLE:

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(REF. DWG S1.2)  
(ADD. S-01)

DWN. BY: BB	DES. BY: LS	PROJ. MGR.: BT	
PEER REVIEW: LS	DATE: (YY-MM-DD) 2014.04.22	SCALE: AS SHOWN	
CLIENT PROJ. #	WE PROJ. # 24950.02	OF	REV #
DWG # 24950.02-SSK-06			



NORTH

PILE LAYOUT PLAN

1:100

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NEW POLICE BUILDING  
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DWG. TITLE:

REVISED PILE BRACING PLAN  
(REF. DWG S2.0)  
(ADD. S-01)

DWN. BY:

DES. BY:

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SCALE:

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CLIENT PROJ. #

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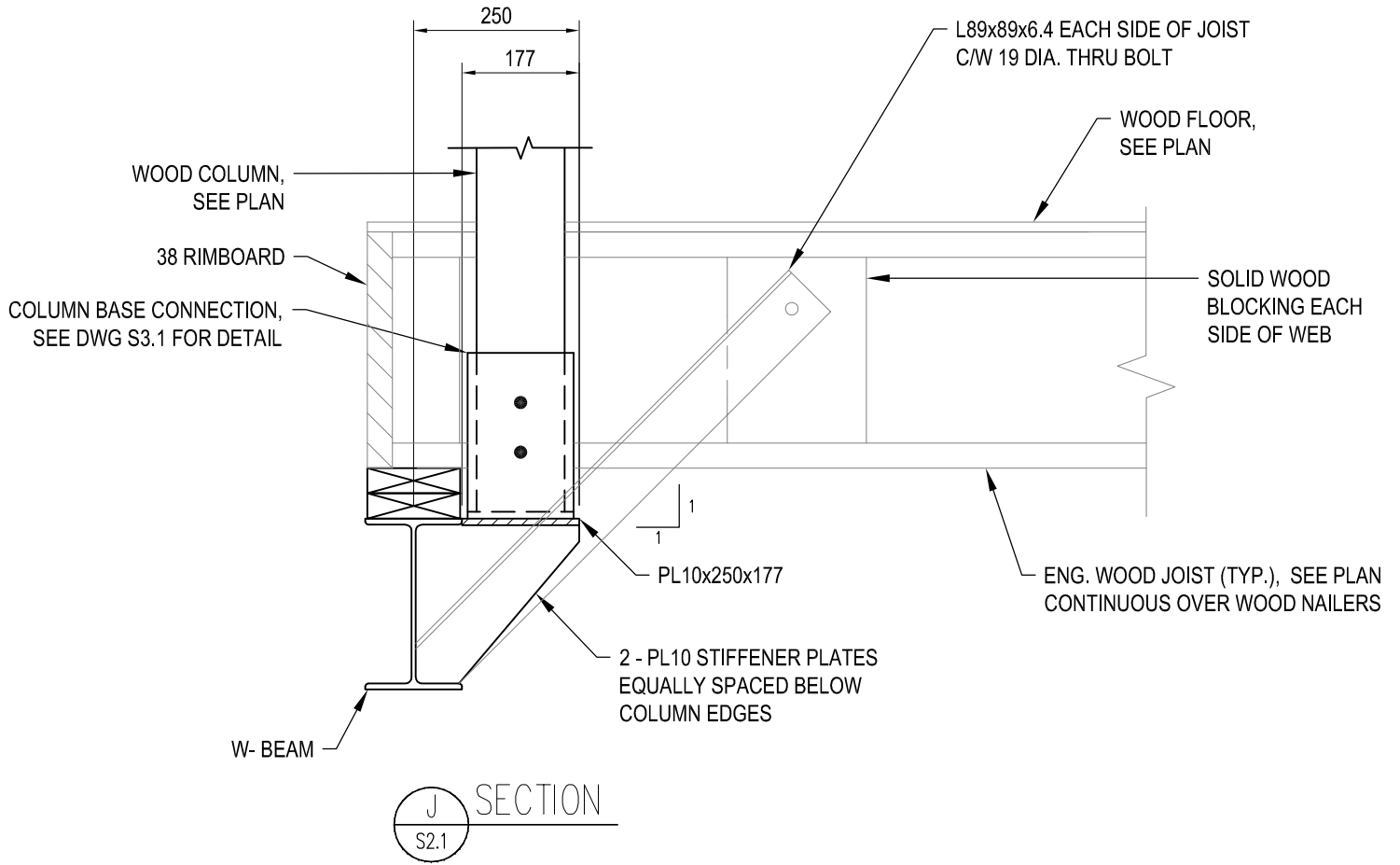
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DWG #

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JOB. TITLE:

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DWG. TITLE:

REVISED SECTION "J"  
(REF. DWG S2.2)  
(ADD. S-01)

DWN. BY:

DES. BY:

PROJ. MGR.:

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PEER REVIEW:

DATE: (YY-MM-DD)

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CLIENT PROJ. #

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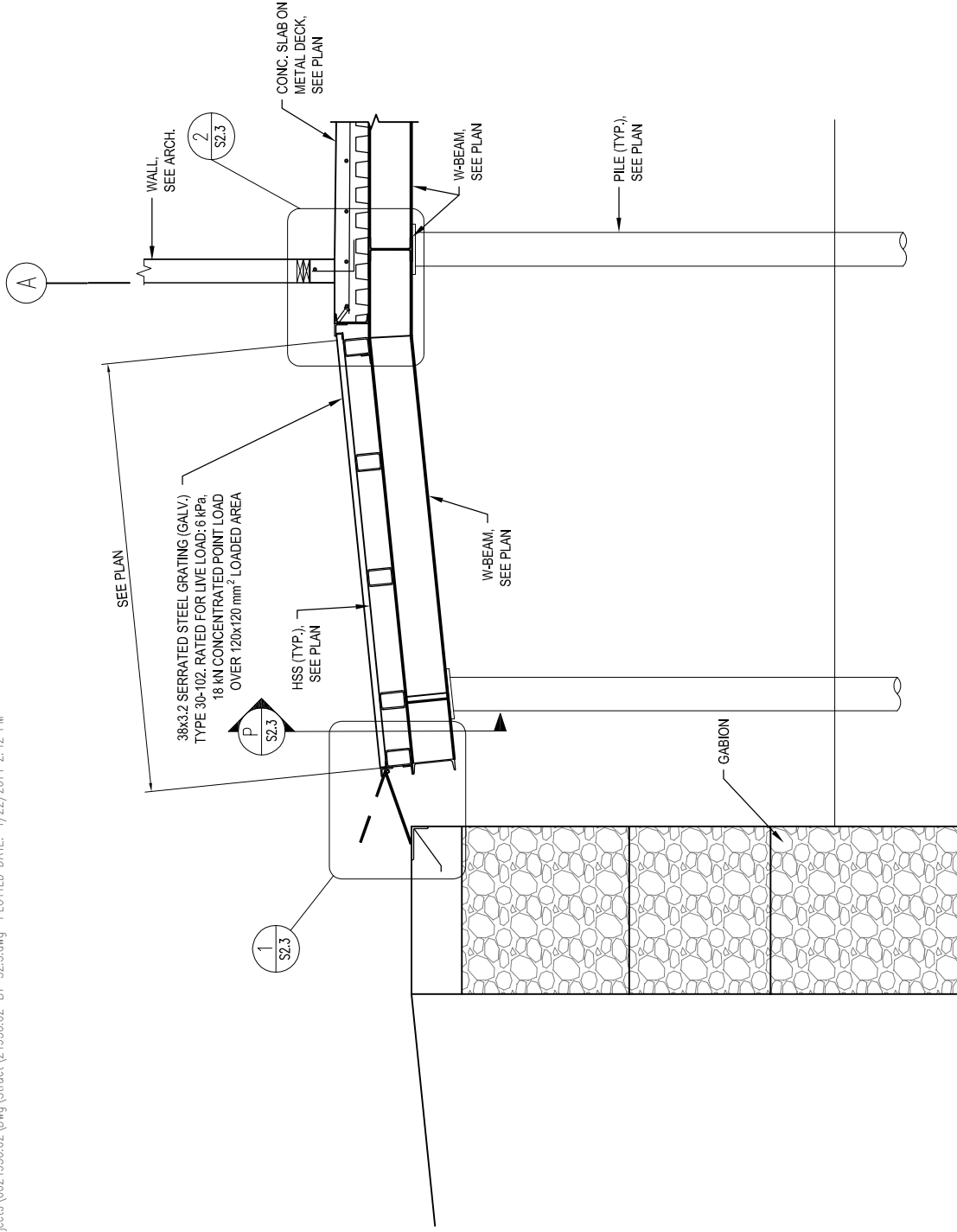
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24950.02

DWG #

24950.02-SSK-08



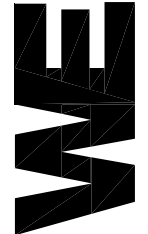
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S3.0

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CLIENT PROJ. #		WE PROJ. #		REV #	24950.02
24950.02-SSK-09				OF	

JOB. TITLE:  
**NEW POLICE BUILDING  
INUUVIK, NWT**

DWG. TITLE:  
**REVISED SECTION "K"  
(REF. DWG. S2.3)  
(ADD. SSK-01)**

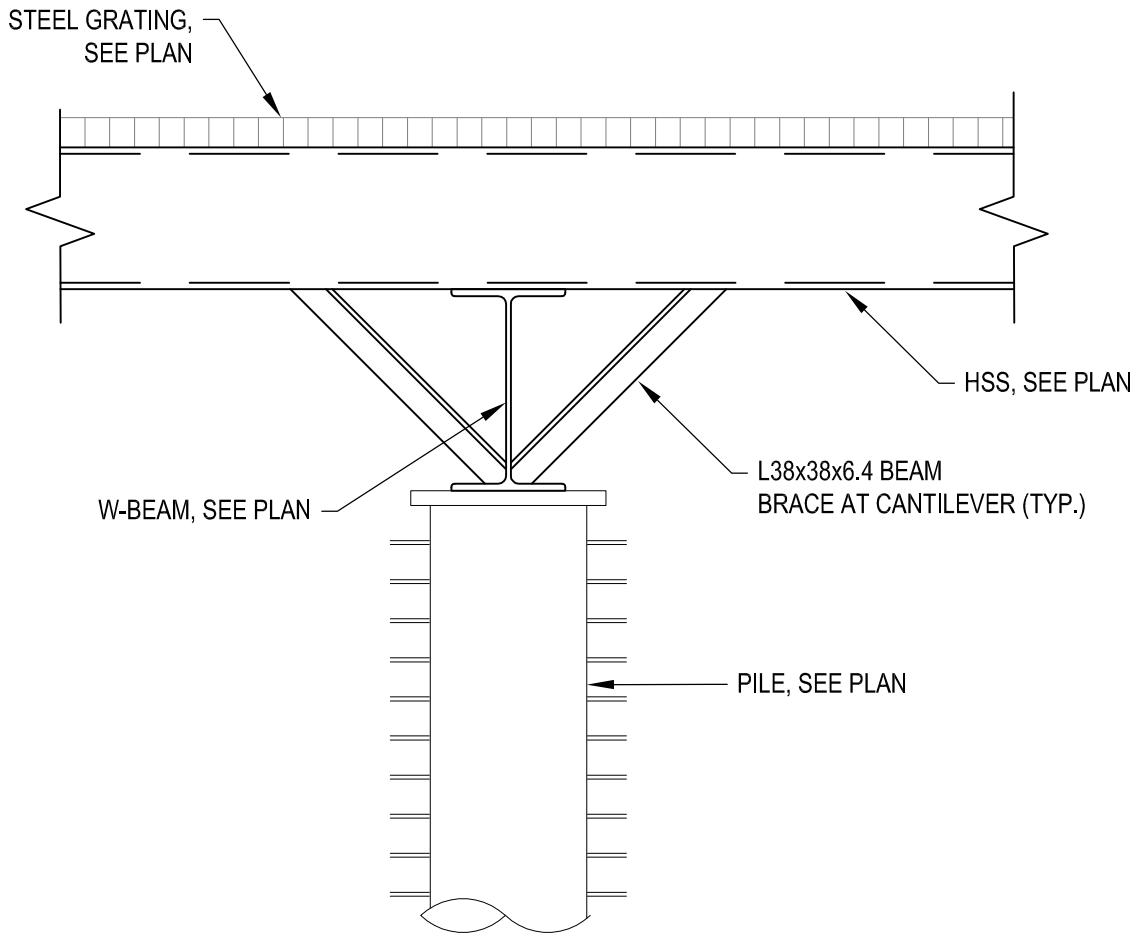
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**P** SECTION  
S2.3 SCALE: 1:10

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DWG. TITLE:

SECTION "P"  
(REF. DWG S2.3)  
(ADD. S-01)

DWN. BY:

DES. BY:

PROJ. MGR.:

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PEER REVIEW:

DATE: (YY-MM-DD)

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2014.04.22

AS SHOWN

CLIENT PROJ. #

WE PROJ. #

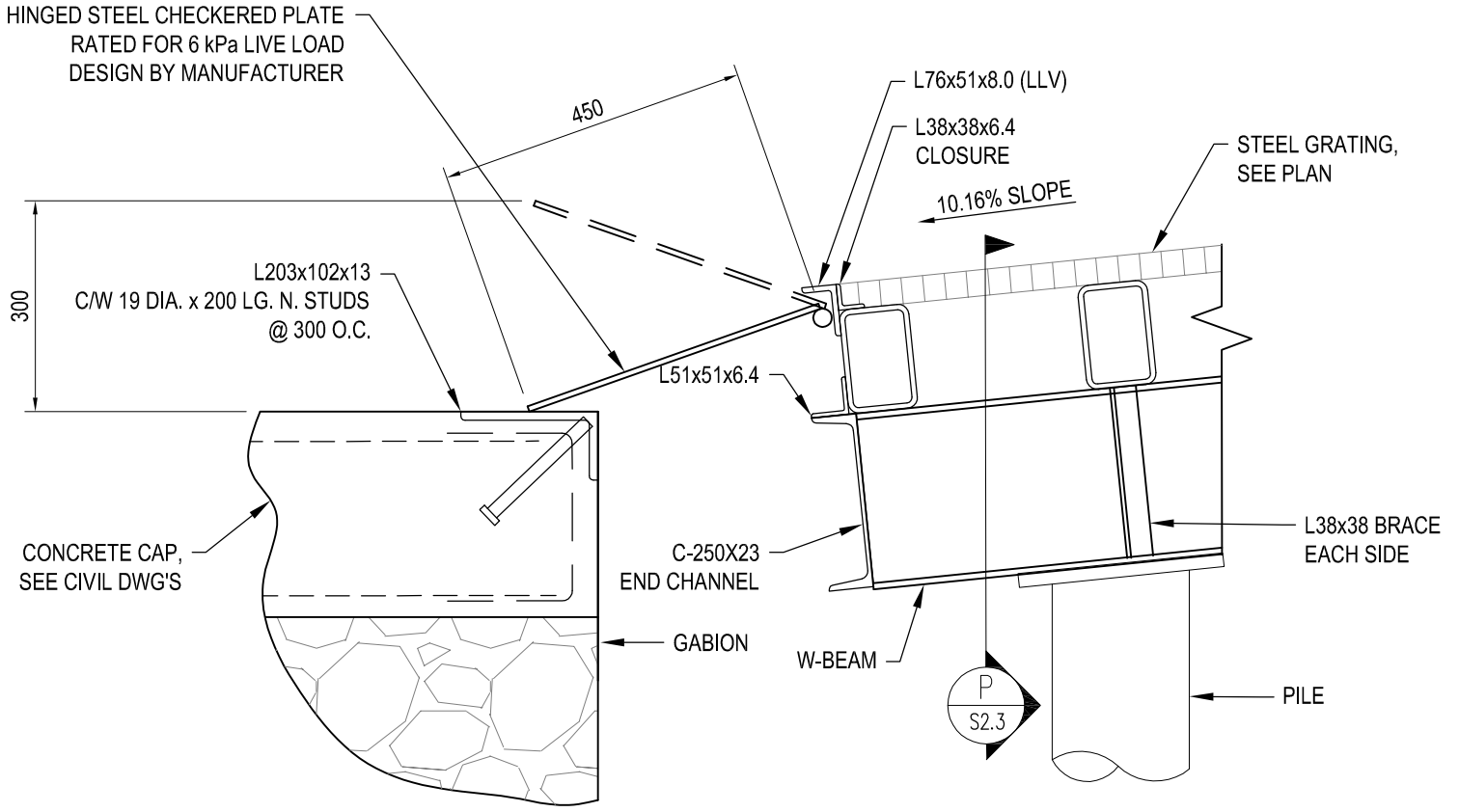
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REV #

24950.02

DWG #

24950.02-SSK-10



1  
S2.3

DETAIL

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DWG. TITLE:

REVISED DETAIL "1"  
(REF. DWG S2.3)  
(ADD. S-01)

DWN. BY:

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CLIENT PROJ. #

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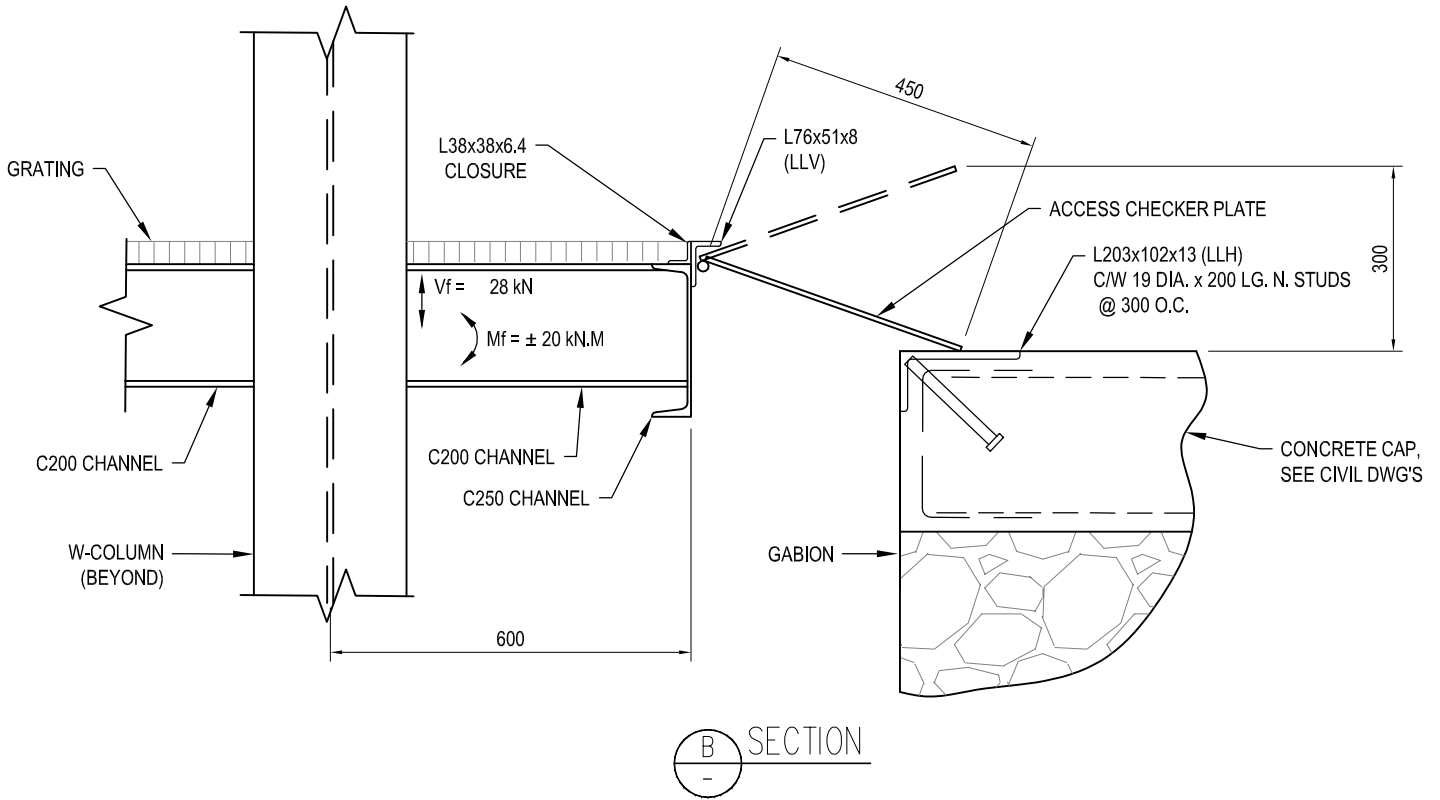
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24950.02

DWG #

24950.02-SSK-11



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DWG. TITLE:

REVISED SECTION "B"  
(REF. DWG S6.2)  
(ADD. S-01)

DWN. BY:

DES. BY:

PROJ. MGR.:

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PEER REVIEW:

DATE: (YY-MM-DD)

SCALE:

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CLIENT PROJ. #

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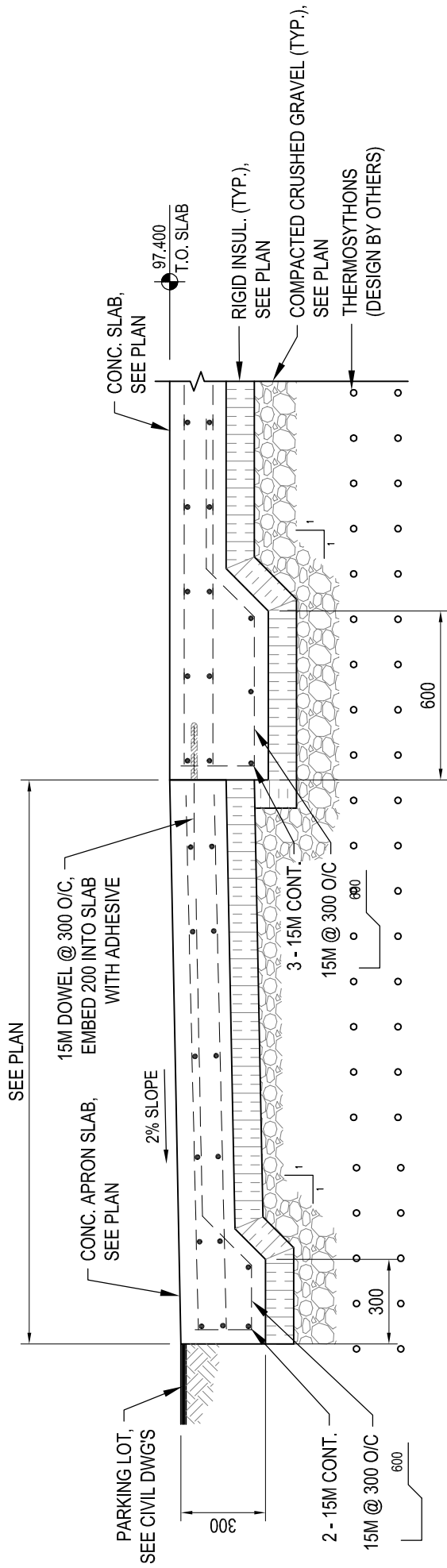
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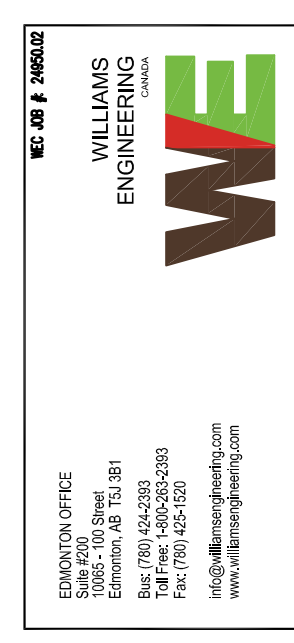
24950.02-SSK-12



D SECTION  
S7.0

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Public Works and Government Services Canada  
**REAL PROPERTY SERVICES**  
 Western Region  
**SERVICES IMMOBILIERS**  
 Région de l'ouest

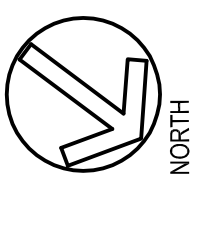


Project title/titre du projet <b>NEW POLICE BUILDING INUVIK, NWT</b>	
Approved by/Apprové par <b>ALLIGSILV</b>	Designed by/Conçue par <b>JKBB</b>
Drawn by/Dessiné par <b>HENRY LEE</b>	Checked by/Vérifié par <b>STEVE BANSEE</b>
Client/Client <b>PUBLIC WORKS AND GOVERNMENT SERVICES CANADA</b>	

Project No./No. du projet <b>R.050563</b>	Sheet/Feuille <b>S2.0A</b>	Revision/ Révision <b>0</b>
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EXISTING/NEW PILE LAYOUT PLAN  
 1:100



# Mechanical Addendum M-01

Date: May 15, 2014

This addendum forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts. The cost of all work contained herein is to be included in the Contract Sum. The specifications and drawings are complementary. Items listed under the specification in this addendum and having influence on the drawings are so deemed to alter the drawings. Items listed under the drawings in this addendum and having influence on the specification are so deemed to alter the specification.

## **1. Revisions to Specifications**

### **1.1 Section 23 05 48**

.1 Clause 3.3:

DELETE: Manufacturer's Field Inspection is not required.

### **1.2 Section 23 11 13**

.1 Clause 3.8:

CLARIFY: Field Quality Control is required.

### **1.3 Section 22 11 16**

.1 Clause 2.1:

CLARIFY: All domestic water piping to be Type K. Any copper piping for heating branch lines to terminal units to be Type K.

## **2. Revisions to Drawings**

### **2.1 Drawing M1.0 Site Plan**

.1 CLARIFY:

Temporary diesel fired boiler(s) to be match efficiency of existing boilers Weil McLain BL-478-W.



## **2.2 Drawing M3.0 Main Floor Plumbing**

### **.1 CLARIFY:**

Sump in Vehicle Bay requires no piping or pumps.

### **.2 CLARIFY:**

All rainwater leaders exiting building to have heat trace as per Keynote 6.

## **2.3 Drawing M7.0 Main Floor Fire Protection**

### **.1 CLARIFY:**

Sprinklers are not required in the Crawlspace.

## **2.4 Drawing M9.0 Mechanical Room Plans**

### **.1 CLARIFY:**

Silencer S-1 selection to be based on final air handling unit selection and sound power data, and PWGSC indoor room noise criteria.

## **2.5 Drawing M9.2 Schematics**

### **.1 CLARIFY:**

All pump by-pass lines to be 20ø.

End of Addendum No. M-01

# Electrical Addendum E1

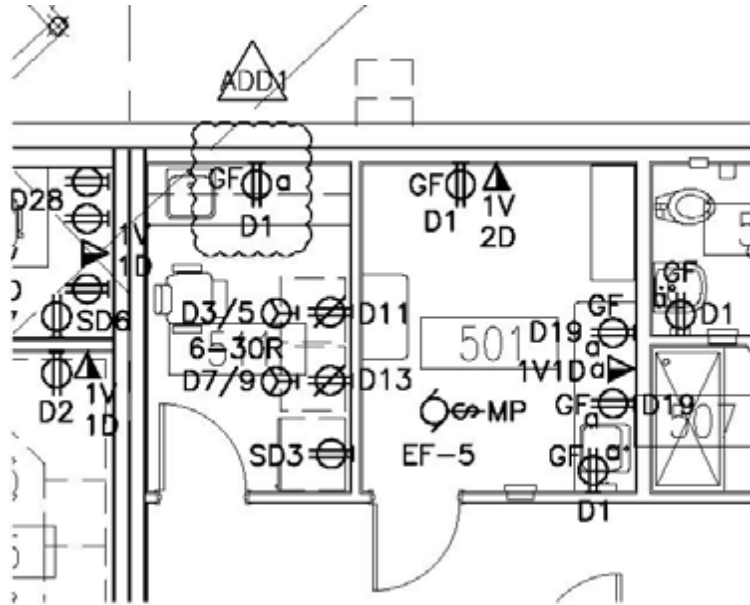
Date

April 11, 2014

This addendum is issued to address the comments received on April 7, 2014

1. Drawing E1.05:

Revise the above-counter receptacle in room 511 at gridlines C-8 to a GF receptacle as shown on the following partial print:



2. Specification section 26 05 20 Wire and Box Connectors 0-1000 V, article 1.2 – References – Add dates to the reference standards as shown below in red:

- .1 Canadian Standards Association (CSA International):
  - .1 CAN/CSA C22.2 No. 18 - 2013, Outlet Boxes, Conduit Boxes and Fittings and Associated Hardware.
  - .2 CSA C22.2 No. 65 - 2013, Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC):
  - .1 EEMAC 1Y-2 - 1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA).

**End of Addendum E1**