



TECHNICAL ADDENDUM

The following changes in the tender documents are effective immediately. This addendum will form part of the contract documents.

1 DRAWINGS

1. Refer to attached sketch SK-C01:
Sketch SK-C01 indicates changes to the pavement cross sections at the North Portal: Port of Entry site.
 - a. Select areas of pavement are to be converted from Concrete Pavement to Heavy Asphalt Pavement.
 - b. Select areas of the pavement type change are within the wetland limits and require additional sub-base work.
 - c. Proposed surface grades do not change except for some minor adjustments at transitions from concrete to asphalt to better align with grade breaks.
 - d. Due to the change in pavement type the Contractor shall note the following changes to the various other components of the site, such as:
 - i. Adjusted cross sections provided on SK-C01 indicating modifications to the sub-base thickness.
 - ii. Where concrete is converted to asphalt the Contractor shall change the associated curb from integral curb to curb & gutter.
 - iii. All transitions from asphalt to concrete shall include a transition slab that will slope away from the asphalt / concrete joint in order to promote drainage away from the joint.
 - iv. Shape the subgrade and adjust the locations of sub drains as required to ensure that the subgrade has positive drainage to the low points.
 - v. Changes to the limits of concrete will require modifications to the saw cuts for the concrete pavement work.
 - e. A revised 'Issued for Construction' set of Civil drawings will be provided to the successful proponent following award and shall replace the currently posted Civil drawings and shall be the drawings used for construction. The new drawings will incorporate the design intent illustrated on sketch SK-C01.
2. Refer to Drawing C1.6 and C2.6
 - a. The 'Safety Curb' indicated on the east side of highway between CB12 and CB31 shall have a fully developed length of 15.0 meters not including the tapers which shall each be 1.5 meters long.
3. Refer to Drawing C6.1 and C6.2
 - a. Change the LDS pipe between CB5 and MH10 (Sta 6+23.73 to Sta 6+61.23)
 - vi. from 39.5 - 900 mm dia. Concrete LDS pipe Class III



Addendum No. 01

3. Refer to Drawing A1.1 and EC1.1:
 - a. Camera pole supporting camera CE-18 (shown on Electrical drawing) is to be relocated to position indicated on attached sketch ASK-05.
 - b. Camera pole supporting camera CE-35 is to be deleted and camera turned over to owner. Refer to sketch ASK-05
4. Refer to Drawing A1.3
 - a. Wall shown enclosing existing room 102 does not currently exist and will be a new wall. Refer to attached ASK -01 and ASK-02
 - b. Door T102A does not exist and will be a new door. New door and hardware schedule will be issued in subsequent addendum.
5. Refer to Drawing A1.5, A2.0, and A4.0
 - a. Exterior door D228 into room 228 is not shown on the plans or exterior building elevations. Refer to ASK-03 for door location. Door D228 is correctly indicated on the door schedule.
 - b. A non-fixed bench is to be provided in room 220. Refer to revised specification below.
6. Refer to Drawing A1.8:
 - a. Temporary PILs shall be revised per attached ASK-04.
7. Refer to Drawing E1.0:
 - a. Symbol Schedule:
 - i. Door contact definition shall include " Double Pole/Double Throw (DPDT)" to facilitate both access control and intrusion alarm systems.
8. Refer to Drawing E1.1:
 - a. Modify Note 1 by including the following addition:
 - i. Provide with the luminaire shop drawing submission computer generated photometric lighting levels, confirming for the identified site and beyond to the centre line of adjacent streets and highway, the maintained light levels from all site pole mounted luminaires and all building mounted luminaires. Provide luminaire cut off and luminaire adjustment such that all light levels shall reduce to nil at the centre line of adjacent streets and highway.
 - b. Modify Note 2 by deleting the following text:
 - i. 'or decrease'.
9. Refer to Drawing E1.2:
 - a. Clarification for Notes 1 & 5: 'Duct shall be buried ...' & 'concrete encased' do not apply within the crawlspaces; they only apply underground from Commercial Building edge to Travellers Building edge. Rack/unistrut supported wire & conduit within the crawlspaces is acceptable.
 - b. IPLC receptacle at future VACIS site shall be 20A T-slot and shall be fed from Panel Y, circuit Y-34.
 - c. Lift station shall be fed from 30A/3P circuit breaker in CDP-100.



Addendum No. 01

10. Refer to Drawing EL2.1
 - a. Room 229
 - i. Five (5) Type 2 luminaires shown along gridline 4 on the drawing should be replaced with 5 weather proof linear wall mounted side lights FCD 7002 – 120 volt-LED SYM FWL (or equivalent) on the opposite side of the bay and shall be recessed in the concrete wall 600mm AFF.
11. Refer to Drawing EL2.2
 - a. Note 5 shall read 'Buried conduit shall drop into crawlspace'.
12. Refer to Drawing EP 2.1:
 - a. Note 4: Retractable cord reel shall be Hubbel Industrial Duty Model GCA 12345- SR or equal;
 - b. Notes 1 and 12: Delete unintended strike out of note;
 - c. Room 228: Delete reference to 'HRV'.
13. Refer to Drawing ES2.1:
 - a. Room 229:
 - ii. Delete keypad at Door 229C;
 - iii. Add keypad at Door 229B.
14. Refer to Drawing ES2.2:
 - a. Note 13: Shall read 'laptop' in lieu of 'desktop';
 - b. Room 116: Delete Note 1 (TYP);
 - c. Room 119: Add Note 1(TYP).
15. Refer to Drawing ES2.3
 - a. Second Note 5 shall be retagged to Note 6;
 - b. Note 6 shall be retagged Note 7.
16. Refer to Drawing ET2.1:
 - a. IT cabling provided by others.
17. Refer to Drawings EC1.1, EC2.1 and EC2.2 and associated Specifications:
 - a. Cameras shall be ordered as late as possible in order to protect the warranty period and installations shall occur only after site work is substantially complete.
18. Refer to Drawing EC2.4
 - a. Add Note 4 as follows:
 - i. Provide two (2) 27mm underground conduits (one for power, one for data) between device posts as shown by dashed lines. Stub up into J-Box on posts or as otherwise indicated.
19. Refer to Drawing EC2.5: (Refer to attached Detail RE1.1)
 - a. Delete five (5) posts complete with associated junction boxes and related underground conduits.



Addendum No. 01

20. Refer to Drawing E4.1
 - a. Locate lightning arrestors immediately adjacent to the associated board to facilitate the absolute shortest wiring length as possible.
21. General Note: Refer to Drawings ME1.1 and ME1.2 for electrical work.

2 SPECIFICATION

1. Refer to Section 01 11 00 – Summary of Work
 - a. Item 1.4.2 shall read as: Civil work (including pavement, pavement structure, pavement demolition, curbs, sidewalks, line painting and storm water drainage system) in the zone identified on Dwg A1.1 as being funded by Sask. Hwy, shall be broken out separately in the cost breakdown.
 - b. Item 1.5.7 to be revised as follows: Contact person for Sask. Power is:

Diane Borys
SaskPower I Customer Relations
1665 Ebel Road – Weyburn, SK S4H 1V3
Phone 306.848.7108
Fax: 306.848.0000
Toll free face: 1.888.757.6937
Email Dborys@saskpower.com
2. Refer to Section 01 51 00 – Temporary Utilities
 - a. Item 1.5.2 shall read: Exterior Lighting: level of illumination for PILs, roadways, and parking lots shall not be less than 50 Lux.
3. Refer to Section 10 51 13 – Metal Lockers and Benches
 - a. Item 2.4.1 shall read: 'Non-Fixed' Pedestals: fabricated from stainless steel tubing
4. Refer to Section 26 09 43 - Site Lighting Controls:
 - a. Delete Item 2.5 Dimming Device Control;
 - b. Delete Item 2.8 Dimmer Switch.
5. Refer to Section 28 31 31.1 - Fire Alarm System Single Stage:
 - a. Approved equal manufacturer:
 - i. Notifier to match or exceed product specified.
 - ii. Simplex to match or exceed product specified.
6. Refer to Section 26 32 13.04 - Natural Gas Generating Units – Liquid Cooled
 - a. Item 2.2.1.1: Total load shall be 250Kw in lieu of 400Kw.
7. Refer to Section 26 36 23:
 - a. Item 2.3.2: Shall read '4 pole' in lieu of '3 pole';



Addendum No. 01

- b. Item 2.3.3: Shall read, '400A' in lieu of '600A';
 - c. Item 2.3.9: Shall read, '400A' in lieu of '600A';
 - d. Item 2.3.9: Shall read, 'Switched neutral' in lieu of 'solid rated' and '400A' in lieu of '600A'.
8. Refer to Section 26 41 13 – Lighting Protection of Structures:
- a. Add Section as attached.
9. Replace Section 33 32 13.13 – Lift Station Pumps & Piping, Wet Well Type in its entirety with attached section.

-----END-----

3 TENDER INQUIRY

- .1 Where specific products and models have been listed in the specification, we will review Request for Equals on a case by case basis. All other products should be bid as per the performance requirements and no specific products will be reviewed. It is up to the general contractor to determine whether a product meets the performance specification.
- .2 Please provide specifications for Door T100 at PIL 1. This door appears to be missing from the door/hardware schedule.
- Revised Door and Hardware Schedule to be provided in subsequent addendum.**
- .3 Does the owner have a preferred location for the following: laydown area, lunch rooms, subcontractor trailers, construction personnel parking area?
- Is the space between Highway 39 & The existing visitors centre building (grassed area) available to be used as such?
No
 - Is street parking permitted on the adjacent offsite streets?
Revise 01 52 00 1.6 to read: approx. 12 spaces onsite parking spaces will be provided in front of the existing tourism building for construction parking. Also refer to Section 01 11 00 1.6.1.4.1.5.3 Temporary Parking Lot for additional construction parking. Consult with Village of North Portal regarding side street parking.
- .4 RE: Section 01 11 00 – 1.10.2 – Clarify if costs for relocating Gas, Elec & Data are to be carried in the contractors bid submission.
- The Owner will pay the Utility companies to bring utilities to the site. The contractor is responsible for any utility-related work on-site.**



Addendum No. 01

- .5 RE: Section 01 14 00 – 1.2.2 – This specification states that noise generating activities be carried out during evening/night hours. Please clarify exactly what scopes of work this applies to as almost everything in construction generates noise.

Activities such as prolonged sawing, cutting, drilling inside the building which would disrupt operations.

- .6 RE: Section 01 14 00 – 1.4 – Please clarify ‘Secure areas’

- Are security clearances required for all workers? If so, what the procedure for obtaining clearance?

To be clarified in future addendum

- .7 RE: Section 01 52 00 – 1.7 OFFICES: Please confirm which building (visitors center, travelers building, etc.) is the ‘Tourism building’ and the approximate square footage and layout of the proposed contractors office. Will this space be available for viewing at the site visit?

Space is approximately 120sm, includes large open area, vestibule, 2 smaller rooms and 3 washrooms.

- .8 RE: Section 01 52 00-1.10 & 5.R.R2810D-GC1.12: – Is contractor branded signage available to be erected on site?

Yes, site signage is permitted.

- .9 RE: Section 01 52 00 – 1.11.14 – Please confirm if the contractor *is* or *is-not* responsible for snow removal on operating public roads ‘on-site’ during construction. I.e. The operating through roads during the various phases.

Is NOT responsible.

- .10 RE: Section 01 51 00 Temp Water (Potable) by Owner. Hookup by GC – Please confirm the source location and connection type of the construction water supply.

Hose bib at existing commercial warehouse.

- .11 RE: 5.R.R2850D-GC5.10 – This section refers to the contractor being required to pay money to Canada in the event that the project is not completed on the day fixed for completion, based on the criteria in GC5.10.2. This clause poses an incalculable risk to the contractor. The contract documents also don’t disclose the ‘fixed day for completion’

Fixed day for completion will be calculated as 30 months after award of contract.

- If late completion penalties or Liquidated damages *are* required as part of this contract, please provide a precise numerical, daily or weekly, value.

Refer to Bid Documents



Addendum No. 01

- If late completion penalties or liquidated damages **are not** required as part of this contract, please clarify as such.

Refer to Bid Documents

- .12 Please advise what material is required for the roof sheathing between the insulation and the roof membrane as it is not typically required between these two layers of assembly.

The protection board indicated on the drawings can be reduced in thickness from 13mm to 5mm.

- .13 Regarding the generator on this project, the drawings indicate a 250KW, however the specifications indicate a 400KW. The wiring shown on the drawings would likely be a 250KW however I would just like to confirm.

400Kw is incorrect. Generator is 250 Kw. See above correction under Specifications.

- .14 RE: Section 10 51 13 – 2.4. This section calls for Manufactured locker room benches. The location and quantity of the benches are not indicated within the tender package.

Refer to Specification Item 2 above, Drawing item 5b above, and attached ASK

- .15 Drawings call for manual override stations in Commercial & Travellers Building. Will there be an underground conduit connecting the buildings for low voltage cable?

Note 6 / E1.1 indicated – Provide On/Off pushbutton control for site lighting. Coordinate installation on site with owner prior to rough in. Contractor to provide underground conduit.

- .16 Drawings include building lighting layouts, are building interior, exterior and canopy lights to be included in the low voltage controls system or is it limited to Poles and PIL Booth Canopy only?

All lights fed from Panel S1, S2 and S3.

- .17 Is there any need to provide a Bacnet tie in for connection to a BMS system?

Not Required

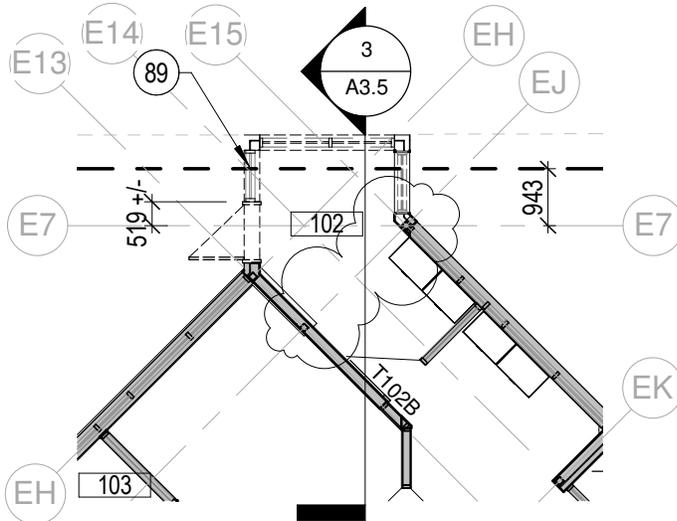
- .18 RE: Existing Wheat Sign: Please advise where the sign is currently and how it is currently installed.

Shown on C1.2 on the triangular island east of the Duty Free building and noted as “Relocate Statue and Foundation” We do not have details on anchorage. New location TBD

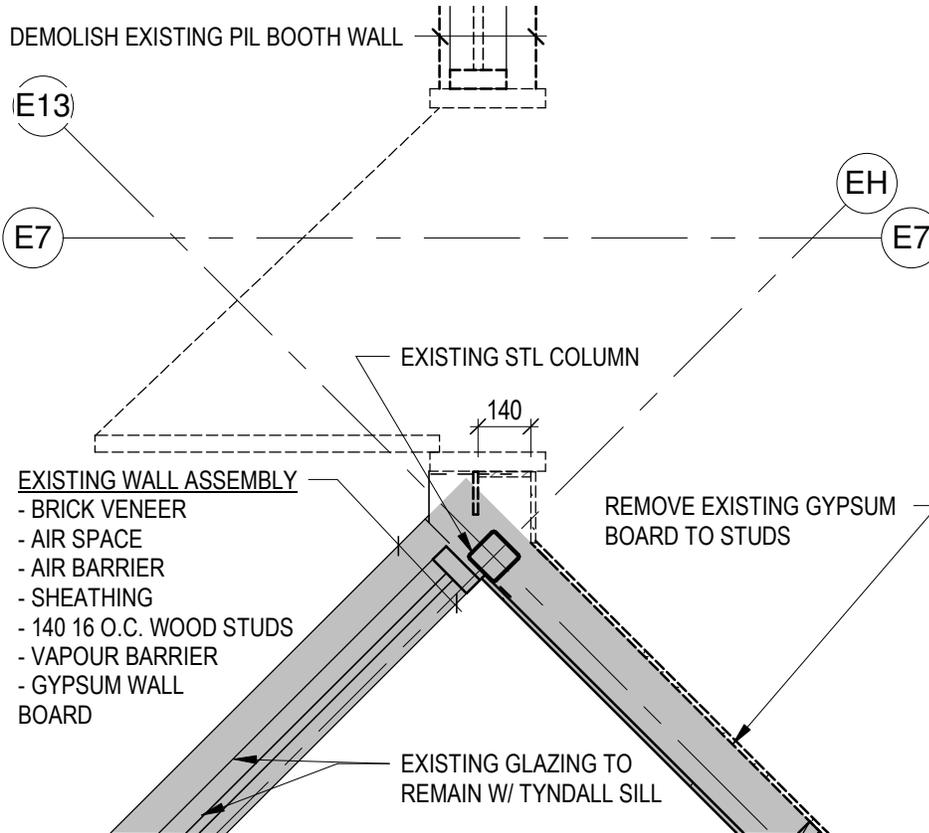


Addendum No. 01

-
- .19 RE: Section 01 51 00 1.5 TEMPORARY POWER AND LIGHT: This spec calls for 500 Lux everywhere (roads, parking, PIL booths), which is different than the permanent lighting requirements outlined on the electrical Site plan, E1.1. Which is correct for course of construction lighting? Maintaining 500 Lux on the whole site during construction will be very costly.
Specification should be revised to read: Exterior lighting: level of illumination for PIL lanes, roadways, and parking lots not less than 100 Lux.
- .20 RE: Bid validity: obviously time is of the essence on the project as the bulk of work is summer work. Can the owner provide a more defined award date for this tender?
Award will be shortly after Tender Close. Precise date TBD.



1 EXISTING TRAVELERS BLDG - FOR DEMOLITION & DOOR IDENTIFICATION
ASK-01 1 : 125
DRAWING REFERENCE: 2/A1.3 EXISTING TRAVELERS BLDG - FOR DEMOLITION & DOOR IDENTIFICATION



2 TRAVELERS BUILDING - EXISTING PIL DEMO
ASK-01 1 : 20
DRAWING REFERENCE: 1/A4.2 TRAVELERS BUILDING - EXISTING PIL DEMO

Project title

**Expansion and Redevelopment of the
North Portal Port of Entry
North Portal, Saskatchewan**

Drawn by **DH**

Designed by **RB**

Approved by **RB**

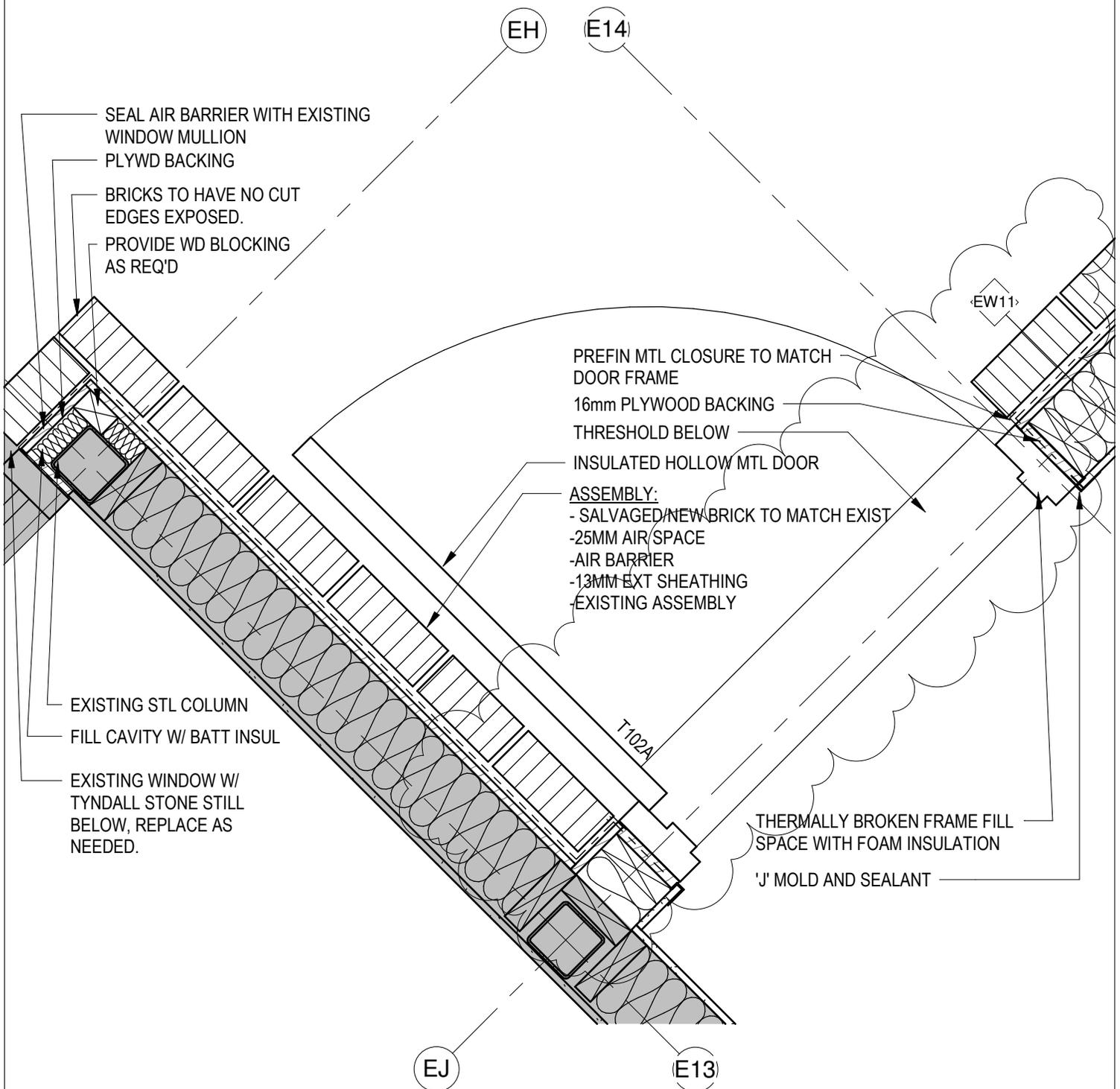
PWGSC
Proj. man. **James Hutchings**

Project no. **16-00200**

Date **2018-03-09**

Sheet **ASK-01**

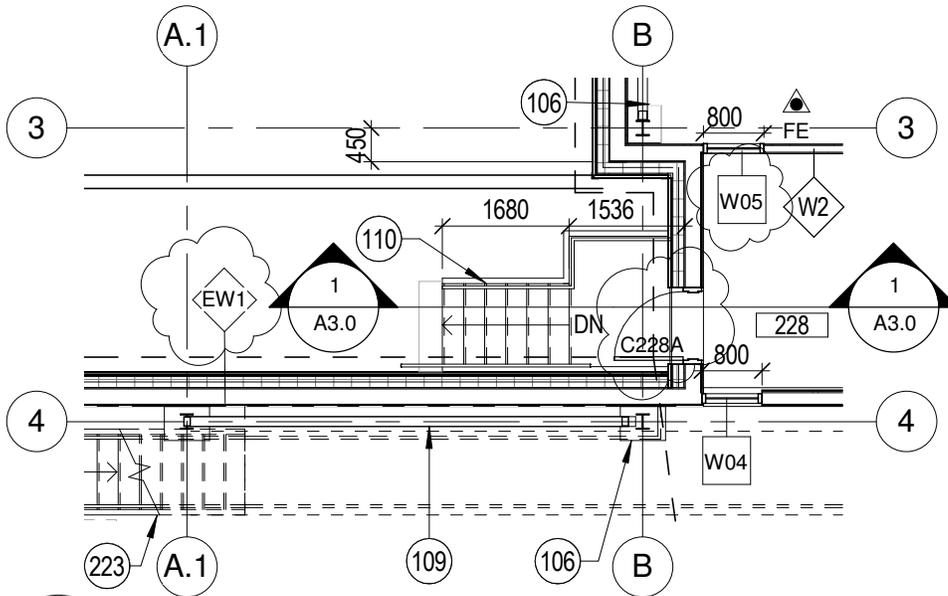
Revision **0**



1 TRAVELERS BUILDINGS - REPAIR OF DEMOLISHED PIL BOOTH
ASK-02 1 : 10

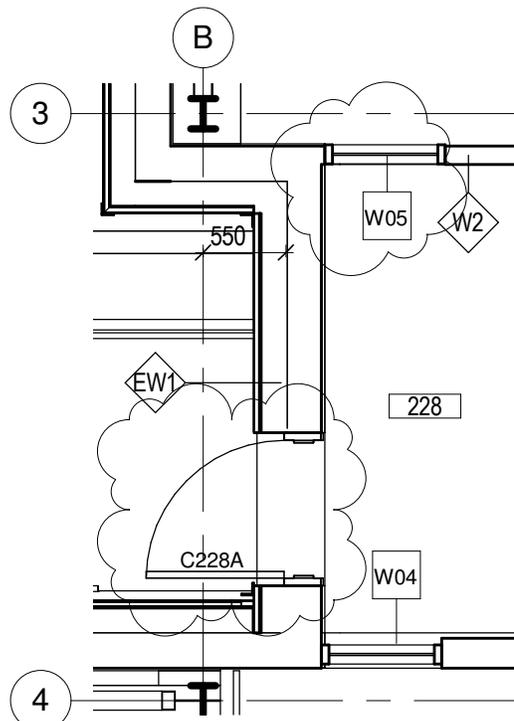
DRAWING REFERENCE: 2/A4.2 TRAVELERS BUILDINGS - REPAIR OF DEMOLISHED PIL BOOTH

Project title Expansion and Redevelopment of the North Portal Port of Entry North Portal, Saskatchewan	Drawn by DH	PWGSC Proj. man. James Hutchings		
	Designed by RB	Project no. 16-00200		
	Approved by RB	Date 2018-03-09	Sheet ASK-02	Revision 0



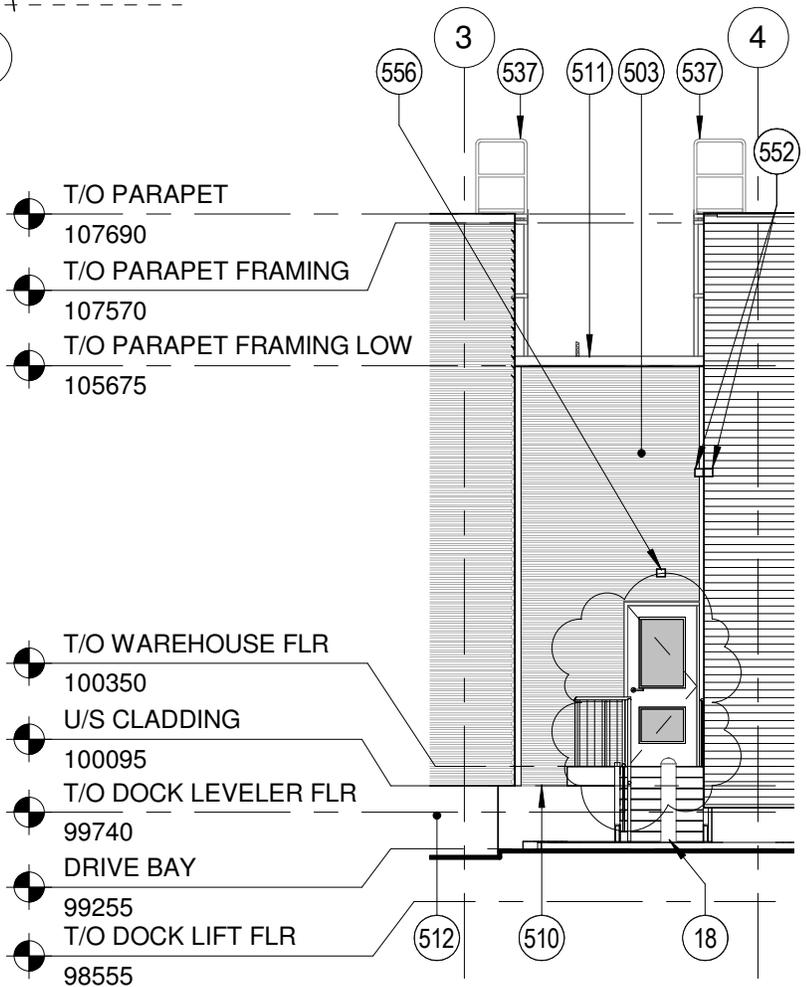
1 COMMERCIAL BUILDING ADDITION
ASK-03 1 : 100

DRAWING REFERENCE: 1/A1.5 COMMERCIAL
BUILDING ADDITION FLOOR PLAN



2 ENLARGED PARTIAL COMMERCIAL FLOOR PLAN
ASK-03 1 : 50

DRAWING REFERENCE: 1/A4.0 ENLARGED PARTIAL
COMMERCIAL ADDITION



3 ELEV COMMERCIAL NORTH WEST
ASK-03 1 : 100

DRAWING REFERENCE: 4/A2.0 ELEV COMMERCIAL
NORTH WEST

Project title

**Expansion and Redevelopment of the
North Portal Port of Entry
North Portal, Saskatchewan**

Drawn
by

DH

PWGSC

Proj. man. **James Hutchings**

Designed
by

RB

Project
no.

16-00200

Approved
by

RB

Date

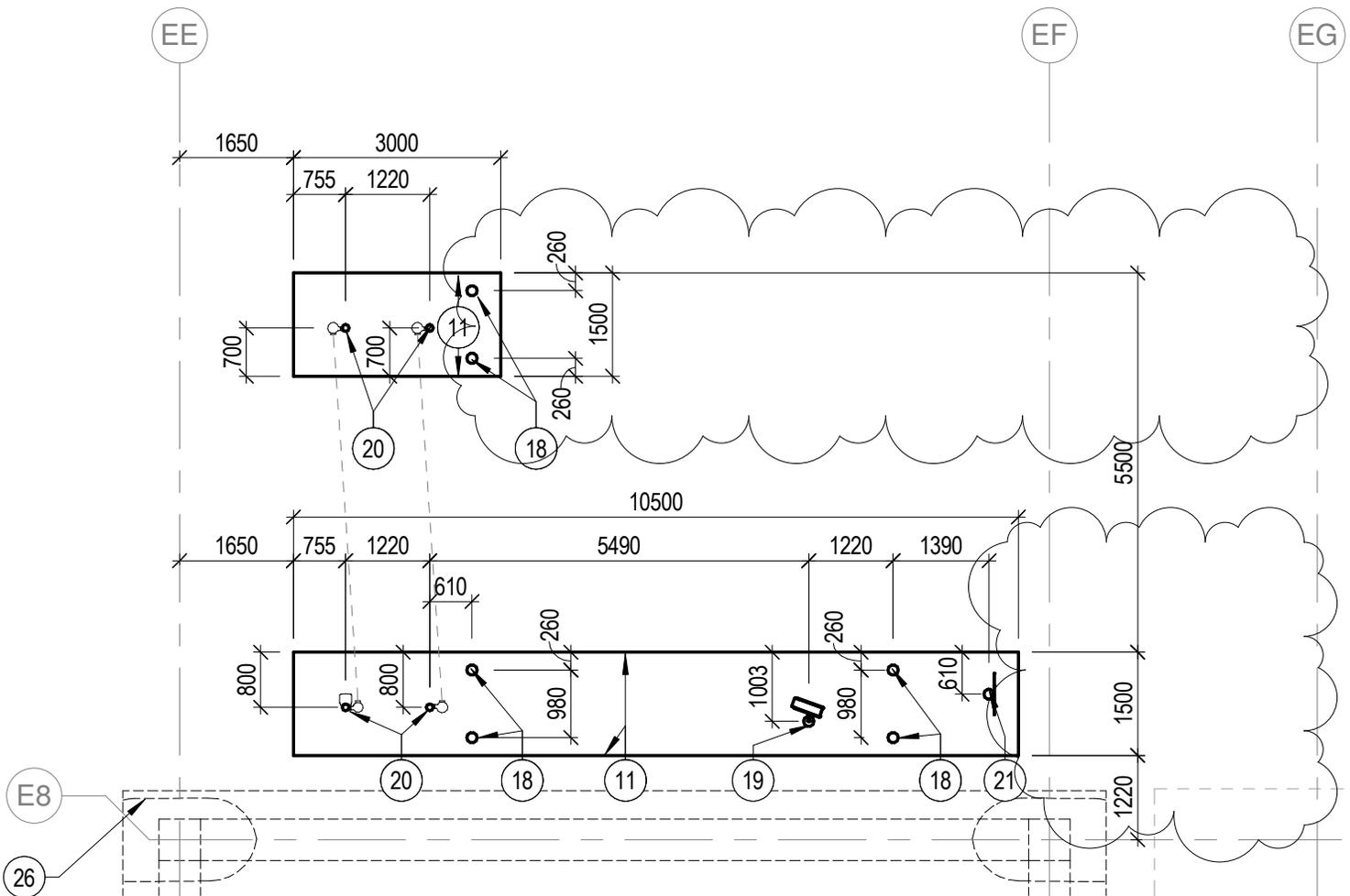
2018-03-09

Sheet

ASK-03

Revision

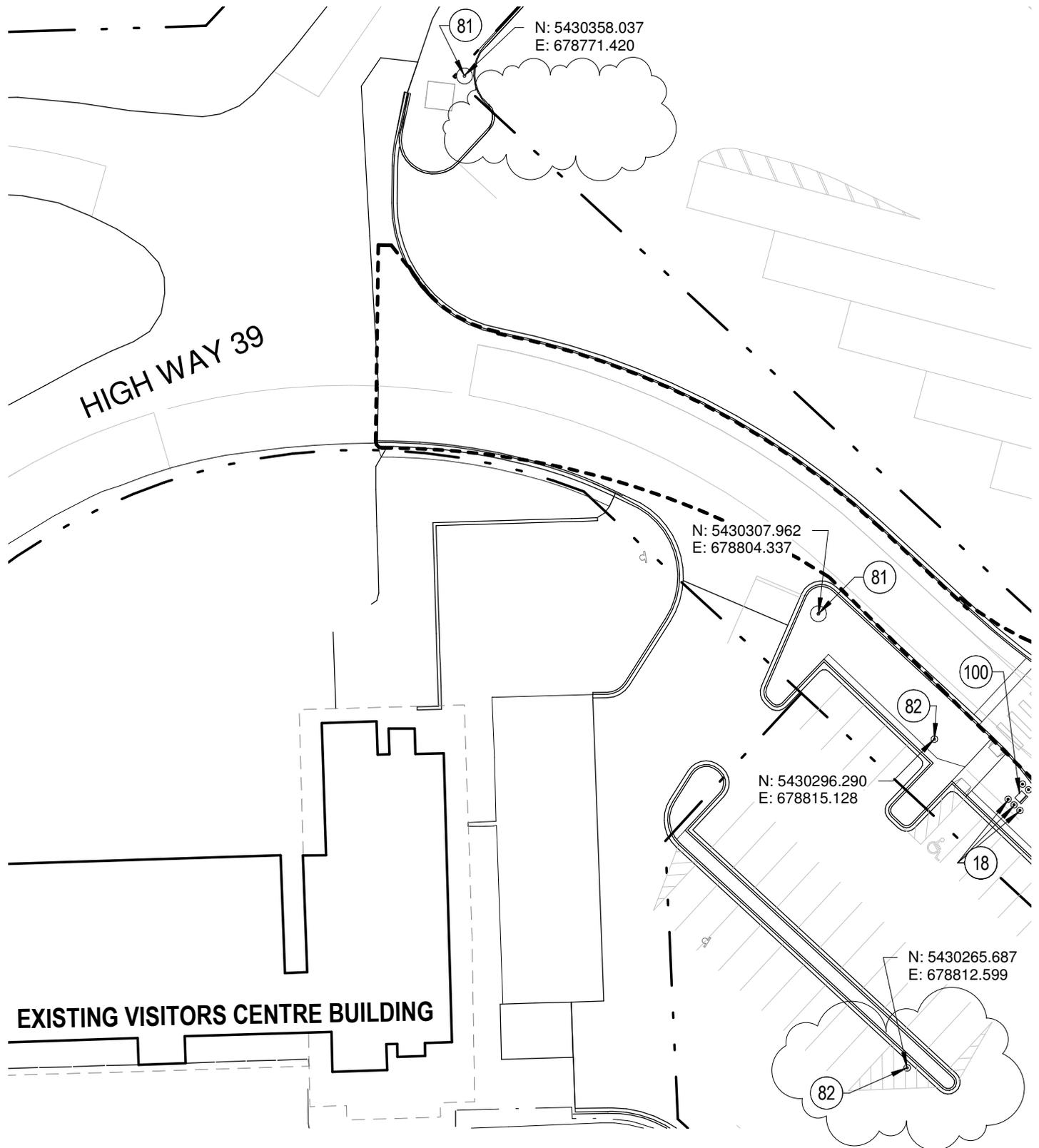
0



1 TEMPORARY PRIMARY INSPECTION LANE
ASK-04 1 : 100

DRAWING REFERENCE: 1/A.1.8 TEMPORARY INSPECTION LANE

Project title Expansion and Redevelopment of the North Portal Port of Entry North Portal, Saskatchewan	Drawn by DH	PWGSC Proj. man. James Hutchings		
	Designed by RB	Project no. 16-00200		
	Approved by RB	Date 2018-03-09	Sheet ASK-04	Revision 0

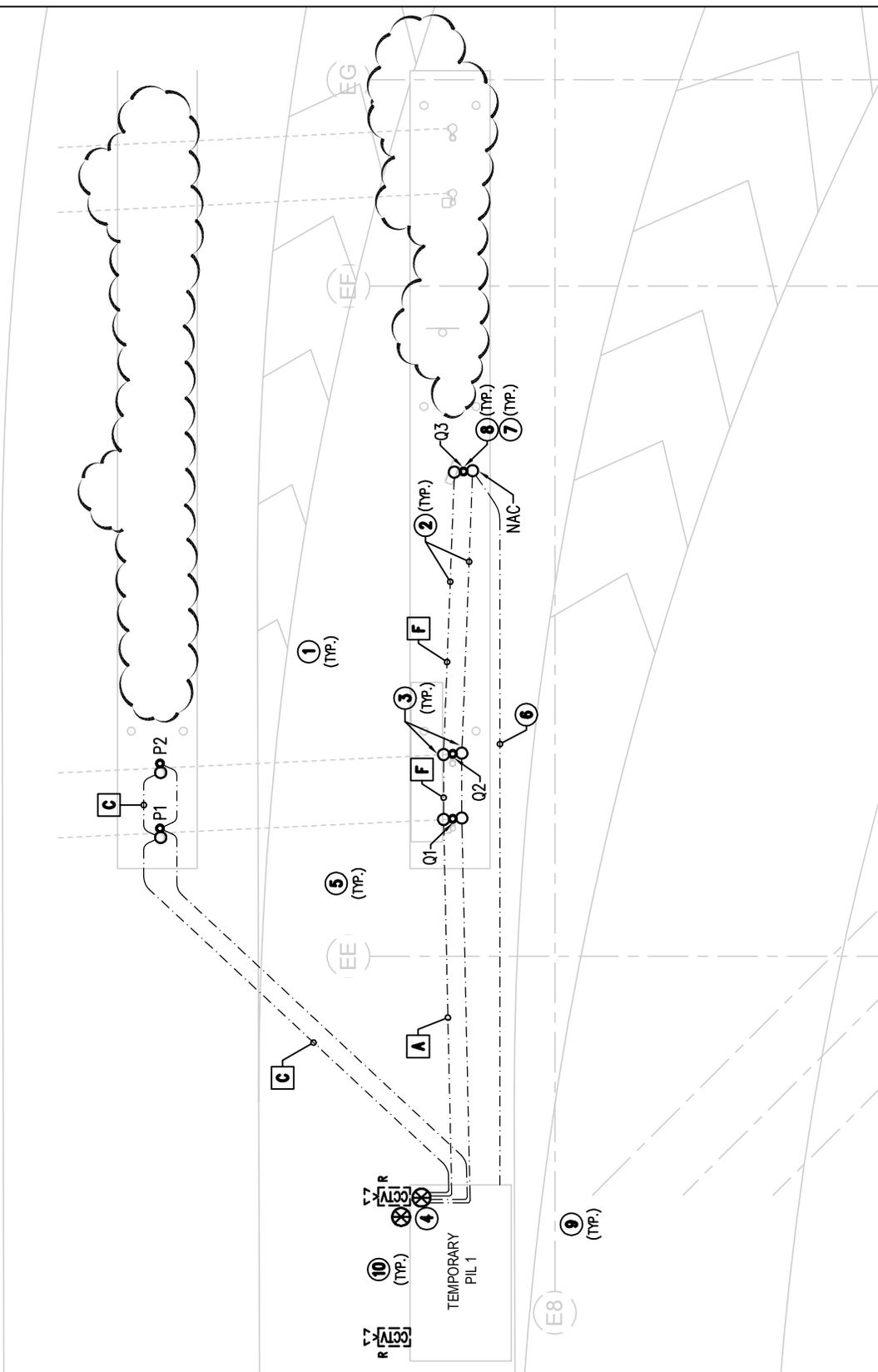


1 LIGHT AND CAMERA POLE LOCATIONS
ASK-05 1 : 500

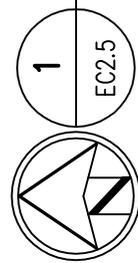
DRAWING REFERENCE: 1/A1.1 LIGHT POLE, CAMERA
POLE & BOLLARD LOCATIONS

Project title Expansion and Redevelopment of the North Portal Port of Entry North Portal, Saskatchewan	Drawn by DH	PWGSC Proj. man. James Hutchings		
	Designed by RB	Project no. 16-00200		
	Approved by RB	Date 2018-03-09	Sheet ASK-05	Revision 0

PLOTTED ON 2018-3-7 BY ISAGANI (GANI) ALEJANDRO
 DOCUMENT SAVED IN H: \10896\10896\00\00 DRAWINGS\ELEC\10896_EC2.5.DWG



TEMPORARY PIL BOOTHS - LICENCE PLATE READER & IT LAYOUT



SCALE: N.T.S.

10896

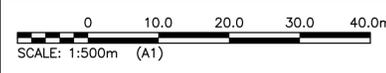
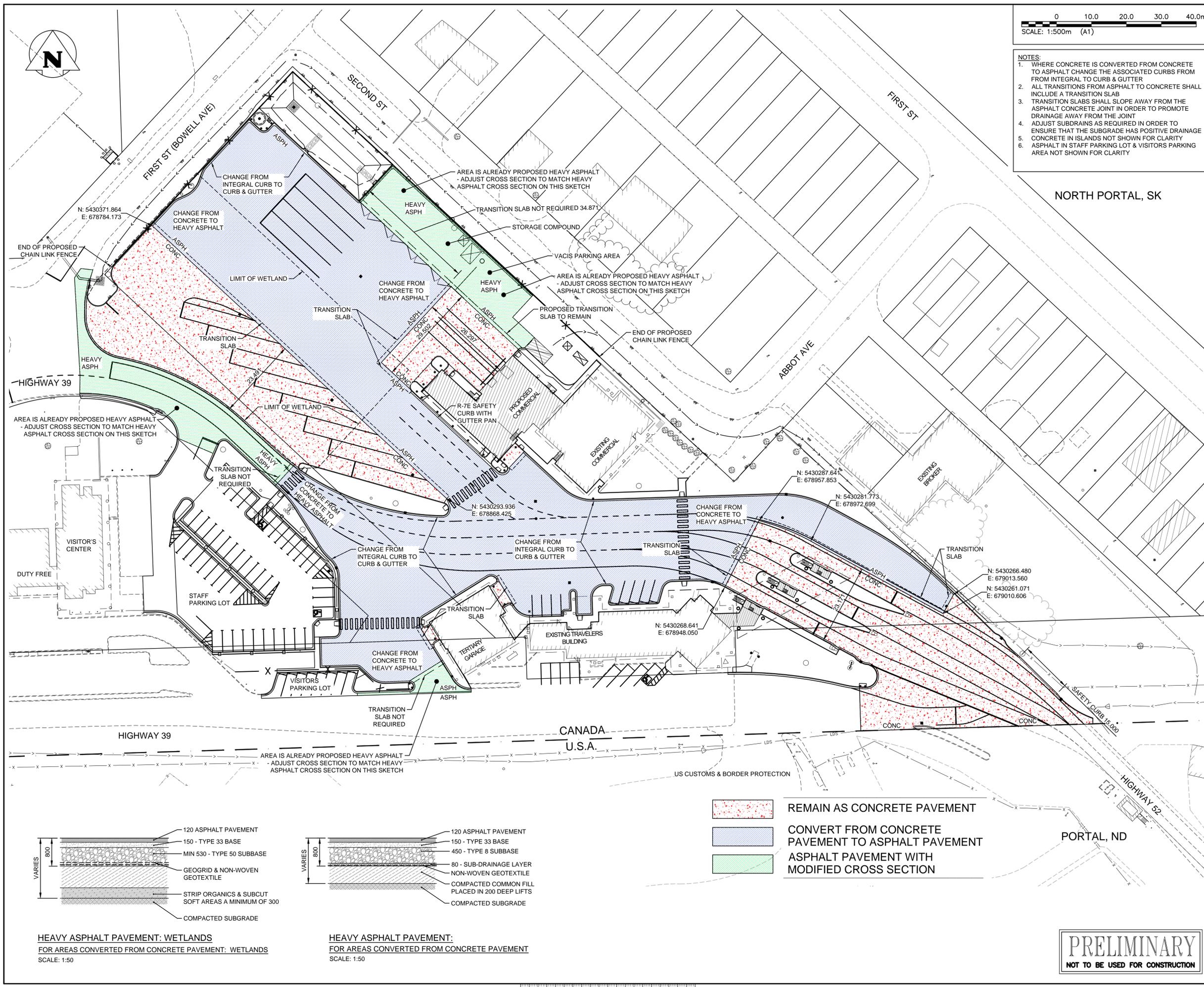


MCW / AGE
 Consulting Professional Engineers
 210-1821 Wellington Avenue
 Winnipeg, Manitoba, R3H 0G4
 Phone - (204) 779-7900 Fax - (204) 779-1119
 E-Mail: mcw_wpg@mcw.com

PROJECT:		EXPANSION & REDEVELOPMENT OF THE NORTH PORTAL: PORT OF ENTRY
DESCRIPTION:		TEMPORARY PIL BOOTHS - LICENCE PLATE READER & IT LAYOUT
DATE:	DRAWN BY:	SCALE:
2018-03-07	GA	N.T.S.

REF. DWG. NO.	1/EC2.5
DWG. NO.	RE1.1
ISSUED WITH:	ADD#01E

File name: P:\Projects\2016\16-1962-001\DWG\Mun\16-1962-001_SK-C01 - Tab:SK-C01 Plotted By: gsmalley 18/03/09 [Fri 12:08pm]



- NOTES:**
1. WHERE CONCRETE IS CONVERTED FROM CONCRETE TO ASPHALT CHANGE THE ASSOCIATED CURBS FROM INTEGRAL TO CURB & GUTTER
 2. ALL TRANSITIONS FROM ASPHALT TO CONCRETE SHALL INCLUDE A TRANSITION SLAB
 3. TRANSITION SLABS SHALL SLOPE AWAY FROM THE ASPHALT CONCRETE JOINT IN ORDER TO PROMOTE DRAINAGE AWAY FROM THE JOINT
 4. ADJUST SUBDRAINS AS REQUIRED IN ORDER TO ENSURE THAT THE SUBGRADE HAS POSITIVE DRAINAGE
 5. CONCRETE IN ISLANDS NOT SHOWN FOR CLARITY
 6. ASPHALT IN STAFF PARKING LOT & VISITORS PARKING AREA NOT SHOWN FOR CLARITY

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada
REAL PROPERTY SERVICES
 Western Region
SERVICES IMMOBILIERS
 Région de l'ouest

VERNE REIMER ARCHITECTURE
INCORPORATED

KGS GROUP
CONSULTING ENGINEERS

PROPERTY LIMITS DELINEATION

DELINEATION OF PROPERTY LIMITS AS SHOWN ON THIS DWG DOES NOT REPRESENT A "LEGAL SURVEY". KGS GROUP MAKES NO REPRESENTATION OR WARRANTY AS TO THE ACCURACY OF PROPERTY LIMITS DELINEATED ON THIS DWG, NOR ON THE DIMENSIONAL ACCURACY OF DWG FEATURES RELATIVE TO THOSE PROPERTY LIMITS.

UNDERGROUND STRUCTURES

LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE, BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.

METRIC

WHOLE NUMBERS INDICATE MILLIMETRES
 DECIMALIZED NUMBERS INDICATE METRES
DO NOT SCALE DRAWINGS

Revision/	Description/Description	Date/Date
A	ISSUED FOR TENDER	18/03/09

PUBLIC WORKS GOVERNMENT & SERVICES CANADA
 Project title/Titre du projet
NORTH PORTAL, SASKATCHEWAN HIGHWAY 39, UNITED STATES BORDER EXPANSION AND REDEVELOPMENT OF THE NORTH PORTAL: PORT OF ENTRY

Approved by/Approve par
 CR
 Designed by/Concept par
 GES
 Drawn by/Dessine par
 GES
 PWGSC Project Manager/Administrateur de Projets TPSGC
JAMES HUTCHINGS
 PWGSC, Architectural and Engineering Resources Manager/
 Ressources Architectural et de Directeur d'ingénierie, TPSGC

Client/client
 Drawing title/Titre du dessin
PAVEMENT REVISION INTENT

Project No./No. du projet R.065684.001	Sheet/Feuille SK-C01 OF	Revision no./ La Révision no. A
--	--------------------------------------	--

PRELIMINARY
 NOT TO BE USED FOR CONSTRUCTION

Part 1 General

1.1 REFERENCES

- .1 Institute of Electrical and Electronics Engineers, Inc. (IEEE)
 - .1 IEEE 837-2002, Standard for Qualifying Permanent Connections Used in Substation Grounding.
- .2 CSA International
 - .1 CAN/CSA-B72-M87(R2008), Installation Code for Lightning Protection Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Saskatchewan, Canada.
 - .2 Indicate materials and methods of attachment of conductors to air terminals sky wire and electrodes.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements 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 indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect lighting protection from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Lightning Rods: copper solid rod.
- .2 Conductor: copper stranded #2/0 gauge.
- .3 Fastenings and attachment straps: copper.
- .4 Ground electrodes: 3m x 19mm diameter copper coated steel.
- .5 Use copper conductors, terminals, connectors and fastenings for buildings sheathed in other than aluminum.
- .6 Connections: copper connections formed by thermit process.

2.2 DESCRIPTION

- .1 System to consist of metallic air terminals, lightning conductors connecting air terminals to ground and interconnected ground electrodes, and/or ground cables.

2.3 REGULATORY REQUIREMENTS

- .1 System subject to: approval by authority having jurisdiction.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for lightning protection 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 Departmental Representative.

3.2 INSTALLATION

- .1 Install lightning protection to CAN/CSA-B72.
- .2 Bond discharge conductors to service mast or other non-current-carrying electrical parts.
- .3 Submit certificate of installation to Departmental Representative.
- .4 Provide protection of copper from non galvanically compatible materials.

3.3 INSPECTION

- .1 Obtain inspection certificate from Departmental Representative for discharge conductor passing through any fire supporting membrane.

3.4 CLEANING

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

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)/American Water Works Association (AWWA)
 - .1 ANSI/AWWA C500-09, Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).
 - .2 ANSI/AWWA C508-09, Swing-Check Valves for Waterworks Service, 2 inch (50 mm) through 24 inch (600 mm) NPS.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's instructions, printed product literature and data sheets for products specified herein and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings for mechanical and electrical elements.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Provide operation and maintenance data for pumps, valves, piping, etc. for incorporation into manual.
- .3 Include information as follows:
 - .1 Record drawings, wiring diagrams, electrical schematics of equipment as installed.
 - .2 Interconnections with numbers and wire sizes.
 - .3 Certified pump characteristic curves.
 - .4 Detailed operation and maintenance instructions.
 - .5 Parts list comprising complete schedule clearly identified to facilitate re-ordering.

1.4 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 accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 DESCRIPTION

- .1 Furnish, two submersible non-clog wastewater pumps. Each pump shall be supplied with a mating cast iron 150mm (6 inch) discharge connection and be capable of delivering **34.8 L/s (551 U.S. GPM)** at a total dynamic head of **74.7 kPa (25 feet)**. Shut off head shall be 233 kPa (78 feet) (minimum). The motor shall be an integral part of the pump unit. The motor shall be **4.5 kW (6.0 HP)** connected for operation on a 575 volt, 3 phase, 60 hertz electrical supply service. Pumps intended for wet pit installation shall be supplied with a cast iron guide rail system with an integrated 150 mm (6 inch) discharge elbow. Each pump unit shall be fitted with a guide rail assembly for lifting each pump. The working load rating of the lifting system shall be a minimum of 50% greater than the pump weight. Each pump motor shall be equipped with 15 m (50 feet) of power and control cable sized in accordance with NEC and CSA standards.
- .2 **Each pump shall provide the following performance under the given conditions:**
 - .1 **Dead head – 0.0 L/s (0 U.S. GPM) at a total dynamic head of 137.5 kPa (46 feet).**
 - .2 **Normal operating – 34.8 L/s (551 U.S. GPM) at a total dynamic head of 74.7 kPa (25 feet).**
 - .3 **Run out - 63.4 L/s (1005 U.S. GPM) at a total dynamic head of 23.9 kPa (8 feet).**

2.2 PUMPS

- .1 Pump Design: The heavy duty submersible wastewater pumps shall be capable of handling raw unscreened sewage, storm water, and other similar solids-laden fluids without clogging. The pump shall be driven by a Premium Efficiency motor, providing the highest levels of operational reliability and energy efficiency.
- .2 Pump Construction: Major pump components shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) with smooth surfaces devoid of porosity or other irregularities. All exposed fasteners shall be stainless steel 1.4401 (AISI type 316) construction. All metal surfaces coming into contact with the pumped media (other than the stainless steel components) shall be protected by a factory applied spray coating of zinc phosphate primer followed by a high solids two part epoxy paint finish on the exterior of the pump. The pump shall be equipped with an open lifting hoop suitable for attachment of standard chain fittings, or for hooking from the wet well surface. The hoop shall be stainless steel 1.4401 (AISI 316), and shall be rated to lift a minimum of four times the pump weight.
- .3 Pump Seals: Sealing design for the pump/motor assembly shall incorporate machined surfaces fitted with Nitrile (Buna-N) rubber O-rings. Sealing will be the result of controlled compression of rubber O-rings in two planes of the sealing interface. Housing interfaces shall meet with metal to metal contact between machined surfaces, and sealing shall be accomplished without requiring a specific torque on the securing fasteners. Rectangular cross sectioned gaskets requiring specific torque limits to achieve

compression shall not be considered equal. No secondary sealing compounds shall be required or used.

- .4 Pump Impeller: The impeller shall be of gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The impeller shall be of the semi-open, non-clogging, single vane design and capable of passing a minimum of 100 mm (4 inch) diameter spherical solids as are commonly found in waste water. The impeller shall have a slip fit onto the motor shaft and drive key, and shall be securely fastened to the shaft by a stainless steel bolt which is mechanically prevented from loosening by a positively engaged ratcheting washer assembly. The head of the impeller bolt shall be effectively recessed within the impeller bore to prevent disruption of the flow stream and loss of hydraulic efficiency. The impeller shall be dynamically balanced to the ISO 10816 standard to provide smooth vibration free operation. Impeller designs that rely on fins or pins protruding into the suction path to assist in the handling of fibrous material shall not be considered equal.
- .5 Pump Self Cleaning Wear Plate: The wear plate shall be constructed from gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B). The wear plate shall be designed with an inlet incorporating strategically placed cutting grooves and an outward spiral V-shaped groove on the side facing the impeller, to shred and force stringy solids outward from the impeller and through the pump discharge. The wear plate shall be mounted to the volute with three stainless steel securing screws and three stainless steel adjusting screws to permit close tolerance adjustment between the wear plate and impeller for maximum pump efficiency. The wear plate shall be factory mounted to the volute in a fixed position with metal to metal contact on machined surfaces to insure optimal clearance and efficiency at start-up. Future adjustments shall be easily accomplished by removing three securing screws and rotating the plate 45 degrees to the adjustment position. Adjustment to allow for wear and restore peak pumping performance shall then be accomplished using standard tools, and without requiring disassembly of the pump. The use of fixed or non-adjustable wear plates or rings, or systems that require disassembly of the pump or shimming of the impeller to facilitate adjustment shall not be considered equal. The suction flange shall be integrated into the wear plate and its bolt holes shall be drilled and threaded to accept standard 150 mm (6 inch) ANSI class 125 flanged fittings.
- .6 Pump Volute: The pump volute shall be single piece gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) non-concentric design with centerline discharge. Passages shall be smooth and large enough to pass any solids which may enter the impeller. Discharge size shall be as specified on the pump performance curve. The discharge flange design shall permit attachment to standard ANSI or metric flanges/appurtenances. The discharge flange shall be slotted to accept DN150 (PN 10) metric flanged fittings. Proprietary or non-standard flange dimensions shall not be considered acceptable. The minimum working pressure of the volute and pump assembly shall be 10 bar (145 psi).
- .7 Pump Mechanical Seals: Each pump shall be equipped with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydro-dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary industrial duty silicon-carbide seal ring and one rotating industrial duty silicon-carbide seal ring. The stationary ring of the primary seal shall be installed in a seal holding plate of gray cast iron EN-GJL-250 (ASTM A-48, Class 35B). The seal holding plate shall be equipped with swirl disruption ribs to prevent abrasive material from prematurely wearing the seal plate. The upper, secondary seal unit, located between the lubricant chamber and motor housing, shall contain one

stationary industrial duty silicon-carbide seal ring, and one rotating industrial duty silicon-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall not require routine maintenance, or adjustment, and shall not be dependent on the direction of rotation for proper sealing. Each pump shall be provided with a lubricant chamber for the shaft sealing system which shall provide superior heat transfer and maximum seal cooling. The lubricant chamber shall be designed to prevent overfilling, and to provide lubricant expansion capacity. The drain and inspection plug shall have a positive anti-leak seal, and shall be easily accessible from the outside of the pump. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry. Lubricant in the chamber shall be environmentally safe non-toxic material. The following seal types shall not be considered equal:

- .1 Seals of proprietary design, or seals manufactured by other than major independent seal manufacturing companies.
- .2 Seals requiring set screws, pins, or other mechanical locking devices to hold the seal in place, conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces, any system requiring a pressure differential to seat the seal and ensure sealing.
- .8 Mechanical Seal Protection System: The primary mechanical seal shall be protected from interference by particles in the waste water, including fibrous materials, by an active Seal Protection System integrated into the impeller. The back side of the impeller shall be equipped with a sinusoidal cutting ring, forming a close clearance cutting system with the lower submersible motor housing or seal plate. This sinusoidal cutting ring shall spin with the pump impeller providing a minimum of 75 shearing actions per pump revolution. Large particles or fibrous material which attempt to lodge behind the impeller, or wrap around the mechanical seal shall be effectively sheared by the active cutting system into particles small enough to prevent interference with the mechanical seal. The Seal Protection System shall operate whenever the pump operates, and shall not require adjustment or maintenance in order to function. Submersible pump designs which do not incorporate an active cutting system to protect the primary mechanical seal shall not be considered acceptable for wastewater service.
- .9 Seal Failure Early Warning System: The integrity of the mechanical seal system shall be continuously monitored during pump operation and standby time. An electrical probe shall be provided in a sensing chamber positioned between the primary and secondary mechanical seals for detecting the presence of water contamination within the chamber. The sensing chamber shall be filled with environmentally safe non-toxic oil. A solid-state relay mounted in the pump control panel or in a separate enclosure shall send a low voltage, low amperage signal to the probe, continuously monitoring the conductivity of the liquid in the sensing chamber. If sufficient water enters the sensing chamber through the primary mechanical seal, the probe shall sense the increase in conductivity and signal the solid state relay in the control panel. The relay shall then energize a warning light on the control panel, or optionally, cause the pump shut down. This system shall provide an early warning of mechanical seal leakage, thereby preventing damage to the submersible pump, and allowing scheduled rather than emergency maintenance. Systems utilizing float switches or any other monitoring devices located in the stator housing rather than in a sensing chamber between the mechanical seals are not considered to be early warning systems, and shall not be considered equal.

- .10 Shafts: The pump shaft and motor shaft shall be an integral, one piece unit adequately designed to meet the maximum torque required at any normal start-up condition or operating point in the system. The shaft shall have a full shutoff head design safety factor of 1.7, and the maximum shaft deflection shall not exceed 0.05 mm (0.002 inch) at the lower seal during normal pump operation. Each shaft shall be stainless steel 1.4021 (AISI 420) material, and shall have a polished finish with accurately machined shoulders to accommodate bearings, seals and impeller. Carbon steel, chrome plated, or multi piece welded shafts shall not be considered adequate or equal.
- .11 Pump Shaft Bearings: Each pump shaft shall rotate on high quality permanently lubricated, greased bearings. The upper bearing shall be a deep grooved ball bearing and the lower bearings shall be a heavy duty double row angular contact ball bearing. Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize shaft deflection. L-10 bearing life shall be a minimum of 50,000 hours at flows ranging from ½ of BEP flow to 1½ times BEP flow (BEP is best efficiency point). The bearings shall be manufactured by a major internationally known manufacturer of high quality bearings, and shall be stamped with the manufacturer's name and size designation on the race. Generic or unbranded bearings from other than major bearing manufacturers shall not be considered acceptable.

2.3 PUMP LIFTING SYSTEM

- .1 Guide Rail Base Assembly (Wet Pit Installation): There shall be no need for personnel to enter the wet well to remove or reinstall the pumps. In a wet pit installation, the discharge base & elbow assembly shall be permanently installed in the wet well and connected to the discharge piping. In order to prevent binding or separation of the pump from the guide rail system, the pumps shall connect to the guide rail base automatically and firmly, guided by one 50mm (2 inch) guide pipe (two 50mm (2 inch) pipes optional) extending from the base elbow to the top of the station. Systems using guide cable in lieu of rigid guide bars or pipes shall not be considered acceptable. The sliding guide bracket shall be a separate part of the pumping unit, capable of being attached to standard metric DN150 pump flanges, so that the pump mounting is non-proprietary, and any pump with a standard discharge flange can be mounted on the base assembly. Base or bracket assemblies with proprietary or non-standard flange dimensions shall not be considered acceptable.
- .2 Guide Rail Base Assembly Details: A field replaceable Nitrile (Buna-N) rubber profile gasket or O-ring shall accomplish positive sealing of the pump flange/guide rail bracket to the discharge elbow. Base assemblies which rely solely on metal to metal contact between the pump flange and discharge base elbow as a means of sealing are inherently leak prone, and shall not be considered equal. No portion of the pump shall bear directly on the floor of the sump. The guide rail system shall be available in an optional non-sparking version, approved by Factory Mutual for use in NEC Class 1, Division 1, Group C&D hazardous locations.

2.4 SUBMERSIBLE MOTORS

- .1 Premium Efficiency Motor: The Premium Efficiency motor shall meet efficiency standards in accordance with IEC 60034-30, level IE3 and NEMA Premium. Motor rating tests shall be conducted in accordance with IEC 60034-2-1 requirements and shall be certified accurate and correct by a third party certifying agency. A certificate shall be available upon request. IE3 and NEMA Premium efficiency levels are equivalent,

however the NEMA Premium standard is intended to cover dry installed motors only, not integrated submersible motors.

- .2 Motor Construction: The Premium Efficiency motor shall be housed in a water tight gray cast iron, EN-GJL-250 (ASTM A-48, Class 35B) enclosure capable of continuous submerged operation underwater to a depth of 20 meters (65 feet), and shall have an IP68 protection rating. The motor shall be of the squirrel-cage induction design, NEMA type B, Premium Efficiency. The copper stator windings shall be insulated with moisture resistant Class H insulation materials, rated for 180°C (356°F). The stator shall be press fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is unacceptable. The rotor bars and short circuit rings shall be made of cast aluminum.
- .3 Motor Operation: The motor shall be designed for continuous duty. The maximum continuous temperature of the pumped liquid shall be 40°C (104°F), and intermittently up to 50°C (122°F). The motor shall be capable of handling up to 15 evenly spaced starts per hour without overheating. The service factor (as defined by the NEMA MG1 standard) shall be 1.3 in wet pit service. The motor shall have a voltage tolerance of +/- 10% from nominal, and a phase to phase voltage imbalance tolerance of 1%. The motor shall be FM and CSA approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The surface temperature rating shall be T3C. The motor shall meet the requirements of NEMA MG1 Part 30 and 31 for operation on PWM type Variable Frequency Drives. The motor shall be capable of operating, completely submerged, partially submerged, or unsubmerged. For submerged (wet pit) applications, the motor shall be self-cooling via the process fluid surrounding the motor. The motor shall have a NEMA Class A temperature rise for submerged service, providing cool operation under all operating conditions.
- .4 Motor Thermal Protection: Each phase of the motor shall contain a normally closed bi-metallic temperature monitor switch imbedded in the motor windings. These thermal switches shall be connected in series and set to open at 140°C +/- 5°C (284°F). They shall be connected to the control panel, and used in conjunction with, and supplemental to, external motor overload protection.
- .5 Power Cable: **The power cables shall be sized according to NEC and CSA standards and shall be 15 m (50 feet) in length to reach the junction box without requiring splices.** The outer jacket of the cable shall be oil and water resistant, and shall be capable of continuous submerged operation underwater to a depth of 19.8 m (65 feet).
- .6 Cable Entry System: The cable entry system shall consist of a submersible plug assembly which allows the cable be easily disconnected from the pump for service or replacement. Cable sealing shall be accomplished by a Nitrile compression grommet with both cylindrical and conical sealing surfaces, flanked by a stainless steel washer and an integrated strain relief. A brass (C3604) compression nut shall be threaded into to the cast iron EN-GJL-250 (ASTM A-48, Class 35B) cable plug housing, compressing the grommet ID to the cable while the grommet OD seals against the bore of the cable entry housing. Cable conductors shall be terminated in copper pin connectors which are separated and retained by a circular pin retainer fabricated from high dielectric strength Polyamid (30% GF). Each pin shall pass through its own hole in the pin retainer, maintaining perfect alignment with the mating pins in the motor body. The corresponding motor body pin assembly shall be manufactured from high dielectric strength Polyamid (30% GF), with copper connector pins. The pin assembly shall be sealed with an O-ring

to prevent water entry into the motor, and retained in the motor housing bore via a retaining ring. Attachment of the plug assembly to the motor shall engage the corresponding copper pins, creating a complete circuit between the motor and cable. The plug assembly shall be fastened with stainless steel fasteners, and shall be sealed by an O-ring

- .7 The cable plug and sealed entry system as part of the motor shall be FM and CSA approved for use in NEC Class I, Division I, Groups C & D hazardous locations. The system shall be anti-wicking by design, and shall prevent any water that enters the cable through damage to the jacket from entering the motor. Cable entry designs which utilize potting compounds to provide a water tight seal, or those which do not allow the cable to be easily changed in the field shall not be considered equal.

2.5 PUMP CONTROL SYSTEM

- .1 Provide outdoor rated pole mounted control panel with the following features:
 - .1 **Liquid level switches: shock-proof mechanical switches enclosed in leak-proof polypropylene body. Each level switch cable shall be 15 m (50 feet) in length (typ. 4 cables). Each level switch shall feature a twin wall tear drop shape design, two colour housing, and gold cross-point contacts.**
 - .2 **Include independently adjustable control levels as follows:**
 - .1 **Both pumps stop level.**
 - .2 **First pump start level.**
 - .3 **Second pump start level.**
 - .4 **High water level alarm.**
 - .3 **Pumps Operation Sequence:**
 - .1 **First pump starts when water level reaches first pump start elevation (first pump start float switch).**
 - .2 **Second pump starts when water level reaches second pump start elevation (second pump start float switch).**
 - .3 **Both pumps continue to run until water level reaches pump stop elevation (both pumps stop float switch), then both pumps stop.**
 - .4 **Controller shall automatically alternate the primary pump after each time the both pumps off condition is met such that the primary pump alternates equally between pumps 1 and 2.**
 - .5 **In the event of a pump failure, the controller shall automatically start the second pump and generate a pump failure alarm.**
- .4 Sump pump control panel shall incorporate the following features:
 - .1 NEMA 4 steel insulated enclosure with grey paint and stainless steel lockable latches.
 - .2 IEC manual motor protector with adjustable overload.
 - .3 Control transformer to supply 120V control power in the panel.
 - .4 Primary side of control transformer fuse protection.
 - .5 Fuse protection for control circuit.
 - .6 Alternating relay with lead selector switch for Duplex controls.
 - .7 Hand-Off-Auto switch, 22mm, for each pump.

- .8 Green LED cluster pump ON indicator light, 22mm, for each pump.
- .9 Leak/overtemp relay for each pump.
- .10 Red LED cluster seal failure warning light, 22mm, for each pump.
- .11 Flashing red high level alarm beacon.
- .12 Test/Off/On switch for the high level alarm circuit.
- .13 High level auxiliary dry contacts.
- .14 Elapsed time meter for each pump.
- .15 GFCI receptacle with 2 amp fuse.
- .16 Lightning arrestor.
- .17 Power monitor.
- .18 Lag pump delay.
- .19 50W anti-condensation heater.
- .20 Terminals for all field connections.
- .21 UL 508A listing.
- .22 The control panel shall be rated for outdoor installation.

2.6 PIPING AND VALVES

- .1 Stainless Steel Piping
 - .1 Piping
 - .1 NPS 13 mm – 25 mm: schedule 80s, a312 tp316L, welded, threaded ends
 - .2 NPS 40 mm – 300 mm: schedule 40s stainless steel to ASTM A312, ANSI B36.19, welded, bevelled ends
 - .2 Pipe Joints:
 - .1 NPS 13 mm – 25 mm: Threaded with Teflon tape
 - .2 NPS 40 mm – 300 mm: Butt weld or flanged
 - .3 Fittings:
 - .1 Threaded Fittings: Class 150, A351 CF8/304
 - .2 Butt Weld Fittings: Schedule to match pipe, A403 316L, class WP-W
 - .3 Butt weld elbows are long radius (1.5D) unless shown otherwise on the drawings
 - .4 Flanged Joints:
 - .1 Flanges: 150# weld-neck or slip-on, flat-faced, A182 316L stainless steel, weld-neck schedule to match pipe.
 - .2 Gaskets: 150# 1.5 mm thick, compressed non-asbestos.
 - .3 Bolts and Nuts: ASTM A193 Grade B8M Class 1 stainless steel bolts, ASTM A194 Grade 8M stainless steel heavy hex nuts.
- .2 Gate valves: Knife gate, Class 150, flanged, resilient seals bubble tight to full valve rating, complete with extension stem for grade level operation and manual detachable valve operator, to ASME B16.5, AWWA C520.

- .3 Check valves: ASME Class 125 flanges, elastic swing check type, internal epoxy coating, alloy steel SAE grade 5 cover bolts, A536 60-45-12 ductile iron cover and body, Buna-N with steel and fabric reinforcement disc, non-asbestos gasket.
- .4 Ball Valves - NPS 2 and under: Cast high tensile bronze to ASTM B62 body and cap, Class125 pressure rating, screwed ends to ANSI B1.20.1, tamperproof ball drive stem, external to body Stem packing nut, replaceable stainless steel solid ball and Teflon seats, TFE with external packing nut stem seal, removable lever handle.

2.7 SOURCE QUALITY CONTROL

- .1 Perform operational tests on pumps at factory to check for excessive vibration, for leaks in piping or seals and for correct operation of automatic control system and auxiliary equipment. Pump suction and discharge lines to be coupled to reservoir and pumps to recirculate water for minimum of 1 hour under simulated service conditions.
- .2 Provide certification that pumps and controls have been factory tested and deficiencies rectified prior to delivery to site.

Part 3 Execution

3.1 EQUIPMENT INSTALLATION

- .1 Install equipment, piping and controls in accordance with manufacturers' recommendations.

3.2 FIELD QUALITY CONTROL

- .1 After completion of installation, demonstrate functional operation of systems, including sequence of operation, to approval of Departmental Representative.
- .2 Test in presence of Departmental Representative and representative from equipment supplier.
- .3 Provide labour and ancillary equipment necessary to fulfil tests.
- .4 Test to demonstrate that:
 - .1 Pumps and equipment run free from heating, or vibration.
 - .2 Operation meets requirements of these specifications.
 - .3 Pumps and pumping are free and clear of debris and obstructions.
- .5 Replace equipment found defective.
 - .1 Repeat test until equipment is accepted by Departmental Representative.

3.3 DEMONSTRATION

- .1 Operating Personnel Training
 - .1 Provide onsite training by qualified personnel for designated operating personnel prior to final commissioning.
 - .1 Schedule and deliver training in accordance with training plan approved in writing by Departmental Representative.

- .2 Include training for designated personnel on routine maintenance procedures, minor repairs, replacement of parts, including disassembly of major components.
- .3 Include safety precaution procedures for systems.

3.4 SAMPLING AND TESTING

- .1 Unless otherwise specified, test procedures shall be in accordance with Saskatchewan Highways and Transportation's Standard Test Procedures Manual. This is available at:
 - .1 <http://highways.gov.sk.ca/stp-manual/>
- .2 The test procedures in effect on the closing date of the tenders shall apply.
- .3 In accordance with Section 01 45 00 – Quality Control, the Contractor shall be responsible for all compaction testing and sampling.
- .4 All costs related to the sampling and testing of materials and Works shall be borne solely by the Contractor.
 - .1 The Owner may hire an independent inspection agency at random to conduct quality assurance tests.
 - .2 Notify the Departmental Representative of any testing onsite 24 hours in advance of performing the tests.
- .5 All testing to be performed by an agency certified by the Saskatchewan Ministry of Highways.

3.5 CLEANING

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

END OF SECTION