



602-2018 ADDENDUM 1

Empress Street Project, Pavement Reconstruction, Portage Avenue to St. Matthews Avenue, Empress Overpass Rehabilitation, Accessibility Ramps and Associated Works

ISSUED: October 10, 2018
BY: Wayne Jaworski
TELEPHONE NO. 204-977-8370

URGENT

PLEASE FORWARD THIS DOCUMENT TO WHOEVER IS IN POSSESSION OF THE BID OPPORTUNITY

THIS ADDENDUM SHALL BE INCORPORATED INTO THE BID OPPORTUNITY AND SHALL FORM A PART OF THE CONTRACT DOCUMENTS

Template Version: A20160708

Please note the following and attached changes, corrections, additions, deletions, information and/or instructions in connection with the Bid Opportunity, and be governed accordingly. Failure to acknowledge receipt of this Addendum in Paragraph 10 of Form A: Bid may render your Bid non-responsive.

PART A – BID SUBMISSION

Replace: 602-2018 Bid Submission with 602-2018 Addendum 1 - Bid Submission. The following is a summary of changes incorporated in the replacement Bid Submission:

- Form B(R1): Add Items A.2, A.55, G.12, L.7 v), L.26 thru L.30
- Revised Quantities of Items A.22, F.41, L.8, L.9
- Revised Description L.14 ii)
- Reorganized Section H
- Revised Spec Ref. and Quantities of K.8 and K.9
- Deleted L.17

Page numbering on some forms may be changed as a result.

PART B – BIDDING PROCEDURES

Revise: B2.1 to read: The Submission Deadline is 12:00 noon Winnipeg time, October 19, 2018.

PART D – SUPPLEMENTAL CONDITIONS

- Revise: D2.2(g)(i) to read: Installation of steel H-piles and construction of reinforced concrete pile caps
- Revise: D2.2(h)(i) to read: Excavation for construction of modular block retaining walls
- Revise: D2.2(h)(ii) to read: Design and construction of modular block retaining walls

PART E – SPECIFICATIONS

Revise: E1.3 to read: The following added Drawings are applicable to the Work:

<u>Drawing No.</u>	<u>Drawing Name/Title</u>
P-3494-167	Bill of Reinforcing 2
P-3494-168	Bill of Reinforcing 3
P-3494-168	Bill of Reinforcing 4

Revise: E1.4 to read: The following added Drawings are applicable to the Work and provided for reference:

<u>Drawing No.</u>	<u>Drawing Name/Title</u>
U200-95-36	Portage Ave. Roadworks Details
U200-95-37	Precast Concrete Shoulder Barrier Details
U200-95-38	Balanced Aluminum Barrier Standard Details

E2. GEOTECHNICAL AND STRUCTURAL REPORTS

Add: E2.4 to read: Further to C3.1, the report on revised recommendations for driven steel H-piles is provided to aid the Contractor's evaluation. The report is contained in Appendix "G".

E8. TRAFFIC MANAGEMENT

Revise: E8.1.4 to read: Maintain a minimum of two lanes of traffic in each direction and one sidewalk on Portage Avenue at all times during construction.

E32. TREE AND SHRUB PLANTING

Revise: E32.2.2(a) to read: Wood Chip Mulch shall be Commercial grade wood chip mulch, free of branches, leaves, stones and other deleterious materials. Varying in size from 15 mm to 75 mm long and 5mm to 20mm thick. Submit sample of mulch for approval by the Contract Administrator prior to shipping to site.

Delete: E32.2.2(b)

Delete: E32.2.2(c)

Revise: E32.4.1 to read: Installation of trees and shrubs shall be measured on a unit basis. The amount to be paid for shall be the total number of each type of trees and shrubs supplied and installed in accordance with this Specification and the Drawings, and as acceptable to the Contract Administrator. Two year maintenance and Mulch (other than Wood Chip Mulch specified in Traffic Island) is considered incidental to the supply and installation of all plant material.

Add: E32.4.2: Mulch in Traffic Island shall be measured on an area basis. The area to be paid for shall be the total square meters of Wood Chip Mulch supplied and installed in accordance with this Specification and the Drawings, and as acceptable to the Contract Administrator.

Add: E32.5.2: Mulch in Traffic Island will be paid for at the Contract Unit Prices per square meter for Item "Mulch in Traffic Island" on Form B: Prices and measured as specified herein. This price shall be payment in full for supplying all labour, equipment and materials, and

performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E36. STRUCTURAL EXCAVATION

Revise: E36.3.1 (a) to read: Protection

- (i) The Contractor shall ensure no damage to existing facilities and equipment and provide protection if required. The facilities include:
 - (a) Close to South Pedestrian Accessibility Ramp:
 - (i) Manitoba Hydro 5 of 4 Way underground ductline and manhole;
 - (ii) Shaw underground fiber and coax line;
 - (iii) BellMTS underground copper cable;
 - (iv) Gas service to 1460 Portage Avenue;
 - (v) City of Winnipeg water line; and
 - (vi) Secondary cables to street lights.
 - (b) Close to North Pedestrian Accessibility Ramp:
 - (i) Manitoba Hydro 115 kV underground primary cable;
 - (ii) Underground primary Manitoba Hydro cable to transformer;
 - (iii) Manitoba Hydro Secondary cables to street lights;
 - (iv) BellMTS underground copper cable; and
 - (v) City of Winnipeg water line.
 - (c) Close to Empress St Retaining Wall
 - (i) Shaw conduit;
 - (ii) 3 of 3 way of 4in ducts with a 4 in reinforced concrete envelope; and
 - (iii) Gas line.

Add: E 36.4.1(h): The Contractor shall excavate material for construction of the North Pedestrian Accessibility Ramps within three (3) metres of the 115 kV line using only the Hydro-Excavation method in accordance with E12 "Hydro-Excavation". Excavation using the Hydro-Excavation method will be completed to a depth that is at the underside of the 115 kV line.

Add: E 36.4.1(i): Excavation beyond the thickness of the formwork on the south face of the pile caps at SU-1, SU-2, SU-3, and SU-4 is not allowed. Formwork may still in place on approval of the Contract Administrator.

Add: E 36.4.1(j): The Contractor shall note that there is an approximately 150 mm thick layer of concrete approximately 1.5 m below ground elevation at SU-4. This concrete is to be removed by sawcutting and lifting the concrete away from the ground.

Add: E 36.4.1(k): Hydro-Excavation of earthen material and removal of the concrete at SU-4 including its recovery and disposal shall be considered incidental to Structural Excavation. No separate measurement or payment will be made.

E37. STRUCTURAL BACKFILL

Revise: E37.2.1 (b) (v) to read: All granular backfill for the Empress Overpass Rehabilitation Works, construction of Pedestrian Accessibility Ramps, and Empress St. Retaining Wall shall be Material in accordance with the following gradation requirements:

CANADIAN METRIC SIEVE SIZE	PERCENT PASSING BY WEIGHT
50 000	100
20 000	75 – 100
5 000	45 – 85

2 500	35 – 55
315	15 – 35
160	5 – 20
80	0 – 7

E39. TURF REINFORCEMENT MAT (TRM)

Revise: E 39.7.3(a) to read: TRM shall be Recyclex TRM, as manufactured by American Excelsior Company, Arlington, TX (1-866-9FIBERS), Landlok 450 TRM, as manufactured by Propex, Chattanooga, TN (1-423-855-1466), or equivalent as accepted by the Contract Administrator in accordance with B6.

E40. STRUCTURAL CONCRETE

Add: E 40.2.1(b) (v): Pile caps

Revise: E 40.4.3(b) to read: Concrete shall have nominal compressive strengths (f'c) and meet the requirements for hardened concrete as specified in the following Table.

Requirements for Hardened Concrete

Type of Concrete	Location	Nominal Compressive Strength [MPa]	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Post Residual Cracking Index
Type 1	Deck, abutment backwalls, and approach slabs partial depth repair Bridge traffic barriers Expansion slabs and roadway slabs South Pedestrian Accessibility Ramp slabs on grade, drainage channel, North Pedestrian Accessibility Ramp piers and slabs on grade	35 @ 28 Days	C-1	1	20 mm	Synthetic Fibres	0.15
Type 2	North Pedestrian Accessibility Ramp diaphragms	40 @ 28 Days					
Type 3	Empress Street Retaining wall and North Pedestrian Access Ramp pile caps	35 @ 28 Days	F-1 S-1	2			

Delete: E 40.4.24

Delete: E 40.4.29

E41. SELF COMPACTING CONCRETE

Revise: 41.6.3(b) to read: Concrete shall be Agilia Vertical, LaFarge North America, proprietary ready-mix concrete, or accepted equal and meet the requirements for hardened concrete as specified in the following:

Concrete Mix Design Requirements

Location	Nominal Compressive Strength MPa	Class of Exposure	Air Content Category	Max Aggregate Size	Special Requirements	Slump-Flow
Centre Pier Column Jackets	35 @ 28 Days	C-1	1	10 mm	Self-Compacting Concrete 28-Day Moist Cured Electrical Resistivity < 15,000 ohm-cm Low-Shrinkage Concrete according to the definition of CAN/CSA-A23.1, Clause 8.9.2	550-650 mm
Steel Pile Concrete Encasement	35 @ 28 Days	F-1, S-1	2	20 mm	Self-Compacting	550 – 650 mm

Revise: E41.11.1(c) to read: The supply and placing of self-compacting concrete for the Steel Pile Concrete Encasement shall be paid for under Specifications E67, "STEEL PILE CONCRETE ENCASUREMENT"

E42. SUPPLYING AND PLACING REINFORCING STEEL

Revise: E42.2.1 to read: The Work under this Specification shall involve supplying and placing all steel reinforcing, as shown on the Drawings for the following Works:
Scope of Work

	Item	Type Of Steel Reinforcing
Empress Overpass	Deck	Stainless Steel
	Abutment Backwalls	Stainless Steel
	Approach Slabs	Stainless Steel
	Traffic Barriers	Stainless Steel
	Expansion Slabs	ChrōmX 9100 Steel
	Roadway Slabs	ChrōmX 9100 Steel
North Pedestrian Accessibility Ramp	Diaphragms	ChrōmX 9100 Steel
	Piers	ChrōmX 9100 Steel
	Precast Prestressed Concrete Slabs	ChrōmX 9100 Steel
	Pile Caps	ChrōmX 9100 Steel
	Slabs On Grade	ChrōmX 9100 Steel
South Pedestrian	Slabs On Grade	ChrōmX 9100 Steel

Accessibility Ramp	Drainage Channel	Plain Steel
Empress Street Retaining Wall		ChrōmX 9100 Steel
Centre Pier Column Jackets		Plain Steel

E45. HOT-POURED RUBBERIZED ASPHALT WATERPROOFING

Revise: E45.8.3(a) to read: 1.2 thick by 300 mm wide butyl rubber shall be placed as shown in drawings prior to placement of waterproofing membrane in accordance with the Manufacturer's requirements.

E46. RIPRAP (STRUCTURAL)

Revise: E46.1.1 to read: These Specifications govern all operations necessary for and pertaining to the supplying and placing of approved riprap as a protective covering as indicated on the Drawings or designated by the Contract Administrator in the field. This riprap is noted as Random Riprap on the drawings. This Specification also applies to grouted riprap pads.

E47. STRUCTURAL REMOVALS

Revise: E47.12(a) to read: The Contractor shall complete a survey of the existing bridge deck on a 1 m x 1 m grid prior to commencing any deck removals. The elevations shall be submitted to the Contract Administrator for comparison with the final deck surface elevations to determine the final extent of removals

E48. SUPPLY AND INSTALLATION OF BEARINGS

Revise: E48.1.1(b) to read: Supply, fabrication, delivery and installing North Pedestrian Accessibility Ramps Plain Elastomeric Bearings Strip Bearing, shown on the Drawings and in this Specification;

Revise: E48.3.1(b) to read: Plain Elastomeric Strip Bearings shall be plain elastomeric as shown on the Drawings.

Revise: E48.5.2 to read: All metallic, non-sliding bearing surfaces shall be galvanized in accordance with E48.3.2(c).

Delete: E48.5.3

Revise: E48.7.1(b)(iii) to read: Plain Elastomeric Bearings

E49. TEMPORARY PROTECTION SYSTEM

Revise: E49.4.2(d) to read: The Contractor shall construct temporary protective systems to prevent debris, tools, forms, waste products, construction materials and equipment, and any material whatsoever from falling into the adjacent travelled lanes. The Contractor shall take all necessary safety precautions to ensure that no materials leave the construction work areas and subsequently enter the roadway envelope during the Contractor's construction operations. The roadway envelope of any travelled lane is defined as follows: horizontally, it is the space occupied from hypothetical lane edge to lane edge.

Revise: E49.4.2(h) to read: The Contractor is advised that construction work including but not limited to: dismantling, general demolition and removals, hydro demolition, reinforcing bar installation, concrete forming, concrete pouring, and related construction works will be occurring in close proximity to the travelling public.

E52. DRILLING AND PLACING DOWELS

Add: E 52.1(b)(iii): Dowels for anchoring concrete overlay, abutment backwall, approach slabs and all other dowels shown on the Drawings.

Revise: E52.4.1 to read: Drilling and Grouting Dowels

Revise: E52.4.1(a) to read: Drilling and grouting dowels will not be measured. This Item of Work shall be paid for at the Contract Lump Sum Price for "Drilling and Placing Dowels", which price shall be payment in full for performing all operations herein described and all other items incidental to the Work included in this Specification and accepted by the Contract Administrator.

E53. SELF CONSOLIDATING CONCRETE REPAIRS

Revise: E53.2.2(c) to read: The concrete mix shall have an electrical resistivity less than 15,000 ohm-cm.

Revise: E53.4.1(a) to read: The Contractor may consider form and pour, pressure grouting, or low velocity spraying as applicable methods for concrete repairs. Methods shall be subject to the approval of the Contract Administrator.

Add: E53.4.5(c): Method of bonding shall not impact the electrical resistivity of the concrete.

E54. ALUMINUM PEDESTRIAN HANDRAIL/BICYCLE RAIL

Add: E54.3.1(d): Alteration to existing South Stairwell at South Pedestrian Accessibility Ramp junction

Delete: **E57. STEEL BEARING PILES**

Delete: **E59. ROCK-SOCKETED CAISSONS**

E60. PRECAST PRESTRESSED CONCRETE SLABS

Add: E60.4.13(b): Sole plates to be hot-dip galvanized in accordance with ASTM A123 and CSA G164 to a minimum net retention of 610 g/m².

Add: E60.6.2(h): Temporary formwork of pier cap diaphragms and precast slabs should be supported off the ground during erection and casting. Eccentric loading on piers shall not be permitted anytime during construction.

Add:

E65. STEEL BEARING PILES FOR NORTH PEDESTRIAN ACCESSIBILITY RAMP

E65.1 Description

- (a) This Specification shall cover the supply and driving of steel bearing piles.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.

E65.2 Scope of Work

- (a) The Work under this Specification shall involve:
 - (i) Supplying and driving steel H piles for the Empress North Pedestrian Accessibility Ramp structure.

E65.3 Referenced Specifications

- (a) The latest edition and all subsequent revisions to the following Standards:

- (i) CAN/CSA G40.20/G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;
- (ii) CSA W59 – Welded Steel Construction (Metal Arc Welding); and
- (iii) AASHTO/AWS D1.5M / D1.5 Bridge Welding Code.

E65.4 Submittals

E65.4.1 General

- (a) The Contractor shall submit to the Contract Administrator for review and approval at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.

E65.4.2 Steel Mill Certificates

- (a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on site, the steel mill certificates.

E65.4.3 Pile Driving System

- (a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, details of the proposed pile driving system and hammers used.

E65.4.4 Welding Certification

- (a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, proof of qualification for the Contractor and the welders conducting the Work (if applicable).
 - (i) The Contractor shall produce evidence that all welding operators to be employed on the Work are currently qualified by the C.W.B. in the processes in which they are to be employed on the Work.
 - (ii) The Contractor shall produce evidence relative to each operator, that he has been executing satisfactory welding in the required processes within the six month period previous to the award of this Contract.

E65.4.5 Welding Procedures

- (a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, the welding procedures specific to the Work (if applicable). The procedures shall include the following information: joint type, welding process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment.
- (b) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, Shop Drawings for pile tip and cutting shoe installations.

E65.5 Materials

E65.5.1 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Piling shall be handled, hauled, and stored in a manner that avoids damage to piles and all associated piling material.
- (b) The Contractor shall not be permitted to drag piles along the ground.
- (c) Any piles excessively damaged through negligence or improper handling operations shall be immediately removed from the site and replaced with sound piles. This shall be done at the Contractor's own expense.

E65.5.2 Steel "H" Piles

- (a) Steel "H" piles shall be structural HP 310x110 steel members conforming to CSA G40.21, Grade 350W or ASTM A572 Grade 50.

- (b) Pile driving points shall be Point No. HPP-S-12, by Titus Steel Co. Ltd., Mississauga, Ontario, or Pruyt HP75750, by Associated Pile and Fitting Corporation, Clifton, NJ, USA or equal as accepted by the Contract Administrator.
- (c) All welding shall conform to CSA Standard W59, electric arc method.
- (d) Splice plates shall conform to the requirement of CAN/CSA 40.21M, Grade 300W.

E65.6 Equipment

- (a) Pile driving system to be used by the Contractor shall be of such a capacity that the required bearing and pile penetration shall be obtained without damaging the piles.
- (b) The pile driving hammer used to install steel H piles shall be a hydraulic hammer capable of delivering a minimum energy of 35 kJ to the pile head, with the ability to reliably operate at different energy levels (i.e. variable stroke, variable ram weight, etc.). The amount of energy delivered to the pile head may need to be increased to reach refusal or decreased to prevent pile damage.
- (c) Pile driver leads shall be used to support the piles while they are being driven.
- (d) The heads of steel bearing piles shall be cut squarely if required and protected by a pile helmet. The pile helmet shall be designed to hold the axis of the pile in line with the axis of the hammer. The top of the helmet shall have a timber or polyethylene shock block (ie. capblock or hammer cushion).

E65.7 Construction Methods

E65.7.1 Preconstruction Meeting

- (a) Prior to pile driving a preconstruction meeting with the Contractor, Piling Subcontractor, Geotechnical Engineer, and Contract Administrator shall be held to review the Pile Driving submission and review the proposed pile driving system, sequence of work, driving criteria, and energy settings.

E65.7.2 Geotechnical Report

- (a) The geotechnical reports, test hole logs and core photos are included in Appendix A and G. Core samples are available for bidders to view during the tender period by contacting the Contract Administrator identified in D3.1.

E65.7.3 Location and Alignment of Piles

- (a) The piles shall be located to the positions shown on the Drawings. Pile lengths shall be assumed to be 18.3 m (60 feet) for tendering purposes. Final pile lengths shall be confirmed by the Contract Administrator for SU-1 to SU-4 during the preconstruction meeting. Pile lengths for SU-5 and SU-6 will be determined after the Contractor has completed drilling to locate the bedrock elevations. The Contractor shall be responsible for reviewing all boring logs and geotechnical information for the verification of required supply pile lengths to support their driving equipment and operations.
- (b) Piles shall not be jacked or pulled into their final positions.

E65.7.4 Access for Pile Driving

- (a) The Contractor may remove the existing stair handrail as well as the barrier between the roadway and the sidewalk on Portage Avenue to facilitate access. The Portage Avenue barriers are designed to be removable. The Contractor shall remove and reinstall as required. Drawings for the Portage Avenue barrier have been included in the reference drawings.

E65.7.5 Vibration Monitoring

- (a) The Contractor is advised that the Contract Administrator will be undertaking a vibration monitoring program during pile driving activities. The Contractor shall work with the Contract Administrator to complete pile driving activities in such a way that vibration monitoring equipment is not damaged or disturbed.

E65.7.6 Installing Pile Tips and Drilling Holes

- (a) All pile driving points shall be welded by the Contractor prior to commencement of pile driving operations.
- (b) Material to be welded shall be preheated in accordance with CSA W59.

- (c) All holes shall be drilled by the Contractor after all the H Piles have been driven to refusal and re-driven and cut to cut-off elevation.

E65.7.7 Pile Termination Requirements

- (a) H piles for SU-1 and SU-2 shall be driven to practical refusal on the bedrock layer. Refusal criteria shall be considered to be three consecutive sets of ten (10) to fifteen (15) blows per 25mm of pile penetration, provided that a well maintained hammer capable of delivering the required energy to the pile head per blow is utilized. Final refusal criteria will be confirmed by the Contract Administrator following submission of the items noted in E65.4, and following driving of the first pile to refusal.
- (b) H-piles for SU-3 to SU-6 shall be driven to a nominal capacity 1,000 kN or greater based on dynamic pile load testing using the Pile Driving Analyser (PDA) at the Beginning of Restrike (BOR). Bedrock core samples obtained in PC18-03 and PC18-04 indicate that refusal of H-piles may not occur at these locations, and therefore final pile lengths shall be based on the pile capacity as determined by PDA testing of each pile. Final refusal criteria and driving energy will be confirmed by the Contract Administrator following submission of the items noted in E65.4 and the collection of PDA data as per this Specification.

E65.7.8 Dynamic Testing Program

- (a) A Dynamic Testing Program will be carried out by the Contract Administrator to confirm pile capacity, validate design assumptions, monitor driving system performance, and assess pile installation stresses and integrity.
- (b) The Contractor shall facilitate dynamic testing by the Contract Administrator using the Pile Driving Analyser. Upon request by the Contract Administrator, the Contractor shall provide the necessary support equipment for the verification of pile integrity by dynamic pile load testing using the Pile Driving Analyser (PDA) carried out by the Contract Administrator.
- (c) Dynamic testing involves attaching two (2) strain transducers and two (2) accelerometers to the pile approximately five (5) pile diameters below the pile head and dynamically monitoring the piles during driving. A cable connects the gauges with the Pile Driving Analyzer (PDA) located at ground level and at a safe place near the pile.
- (d) The dynamic testing work will be carried out using the Contractor's pile driving equipment and the Pile Driving Analyzer (PDA) equipment provided by the Contract Administrator.
- (e) The power supply to be provided by the Contractor for PDA testing shall consist of a regular power source (line power or portable generator) providing 1,800 watts of 115 volt AC power with a frequency of 60 Hz. Direct current welders or non-constant power sources will be considered unacceptable.
- (f) All eight (8) piles for substructure units SU-3, SU-4, SU-5 and SU-6 shall be monitored using the PDA throughout the initial drive (ID), at the end of initial drive (EOID) and throughout restriking a minimum 12 hours after the EOID.
- (g) Termination criteria for the initial drive for each pile tested will be provided by the Contract Administrator based on the field results of the PDA testing.
- (h) Pile Acceptance will be based on measured capacities at the Beginning of Restrike (BOR) based on PDA measurements and CAPWAP signal-matching analysis. The Contract Administrator will provide confirmation of pile acceptance for each pile within 24 hours of restrike testing.
- (i) The Contractor shall provide the pile driving equipment, operators, labour, and power supply to the test pile locations for the duration of the dynamic testing. The Contractor shall provide safe lifting means to enable attachment of cables to the pile head.
- (j) The pile driving hammer energy delivered to the pile during Dynamic Testing at EOID and at BOR shall be such that the required nominal pile capacity can be mobilized in a single blow without additional data interpretation.
- (k) The Contract Administrator will use the test results to determine the subsequent refusal criteria, requirements for modification of driving procedures or equipment, and pile acceptance. Pile acceptance shall be determined based on the measured capacities at BOR. Any work completed on the foundation elements (pile caps, cutoff, welding etc.) prior to receiving approval of test results and pile acceptance from the Contract Administrator will be at the Contractor's own risk.

E65.7.9 Driving of Piles

- (a) The Contractor shall build temporary access ramps and platforms, as required, to complete pile driving. Upon completion of pile driving, temporary access ramps and platforms shall be removed and any damage to underlying infrastructure, including, but not limited to, barriers, sidewalks, etc. shall be repaired. Temporary access works as well as areas requiring repairs will not be measured as these repair works will be considered incidental to the costs of pile driving.
- (b) Piles shall not deviate more than two (2) percent for battered piles, nor more than two (2) percent out-of-plumb for vertical piles. Piles shall not be more than 50 mm off centre, measured at time of cut off.
- (c) The Contractor is responsible for determining a method to hold the pile plumb within the pre-bored zone.
- (d) The method of driving shall be such as not to impair the strength of the pile. The Contractor will be required to remove any surface and/or shallow depth obstruction(s) to obtain the required penetration of the pile.
- (e) Piles shall be driven in the most practicable manner to ensure that the piles at the boundaries are in their correct final positions.
- (f) Driving stresses shall not exceed 90% of the yield stress of the steel.
- (g) Upon driving a pile, all adjacent piles exhibiting heave of 6mm or more should be re-driven to a minimum of one set of the refusal criteria.
- (h) Driving of all piles shall be continuous without intermission until the pile has been driven to final elevation, unless splices are required.
- (i) Where boulders or other obstructions prevent certain piles to be driven in the location shown and to the proper bearing strata or depth, the Engineer may direct the Contractor to install a replacement pile.
- (j) Any piles that are excessively crushed or bent through negligence or carelessness the Contractor shall be removed or otherwise replaced, unless, in the opinion of the Contract Administrator, the damage is so slight that the pile can be repaired properly, which repairs shall be done by this Contractor.
- (k) Pile driver leads shall be used to support the piles while they are being driven and shall be braced to the supporting crane, to be used for securely and accurately support the pile in its required position during driving. Leads shall be of sufficient length to be supported firmly on the ground. The use of hanging or swinging leads will not be allowed. Battered piles shall be driven with inclined leads.
- (l) For pile installation monitoring purposes, the Contractor shall paint markings on each pile at 0.25 metre intervals, with a label at each 1.0 metre interval, starting from the toe of the pile.
- (m) Pre-boring and pile sleeve installation shall be completed as shown on the drawing and in accordance with specifications.
- (n) For practical refusal of piles, the final set shall be determined by three consecutive readings meeting the set criterial identified by the Contract Administrator. Final set will be measured and recorded in blows per 25mm by the Contract Administrator. Refer also to E57.7.5 regarding refusal requirements.

E65.7.10 Splicing of Piles and Installing Pile Tips

Full-length piles shall be used where practicable. In exceptional circumstances, splicing of piles may be permitted. The method of splicing shall be as shown on the Drawings, welding procedures, shop drawings and the following:

- (a) Field splices shall be located at least four (4) metres below the underside of the footing foundations.
- (b) The butting ends of the driven pile and its extension or the pile and the pile tip shall be cut square to give reasonable bearing between the matting surfaces.
- (c) All butting surface shall be 100 per cent butt welded.
- (d) The butting surface of the extension piece shall be bevel cut at 45° to facilitate a full-penetration butt weld. Temporary clamping plates may be used as required.
- (e) Before welding over previously-deposited metal, the slag shall be cleaned off. This requirement shall apply to successive layers, to successive bead, and to the cratered area when welding is resumed after any interruption.

- (f) All butt welds shall have the root of the initial weld gouged, chipped, or otherwise removed to sound metal before welding is started from the second side.
- (g) The piles shall not have more than one splice per pile unless otherwise approved by the Contract Administrator.
- (h) Material to be welded shall be preheated in accordance with CSA W59.
- (i) The pile material shall be preheated to a minimum of 100°C for a distance of 80 mm beyond the weld and shall be sheltered from the wind if the air temperature is below freezing.
- (j) When the air temperature is below -18°C, welding will not be permitted unless suitable hoarding is in place.

E65.7.11 Cut-Off of Piles

- (a) After piles have been driven to the required penetration or capacity, the Contractor shall mark the required cut-off elevation on each pile. The top of all piles shall be neatly cut off (true and level) at the cut-off elevation specified on the Drawings upon, but not before, pile acceptance by the Contract Administrator.

E65.8 Quality Control

E65.8.1 Inspection

- (a) The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given.

E65.8.2 Pile Driving Records

- (a) The Contract Administrator will keep a record of each and every pile driven. The records shall give the driving date, installation time, pile type, size, length, location, final penetration depth, rate of penetration (i.e. number of blows per 250mm of pile penetration), final three sets meeting refusal criteria, hammer type and fuel setting (drop height). Any unusual phenomena shall be noted and recorded, especially if they indicate possible damage to the pile.
- (b) Energy output of driving equipment at the time of final set shall be reported immediately to the Contract Administrator.

E65.9 Measurement and Payment

E65.9.1 Steel H Piles

- (a) Supplying of steel H piles shall be measured per lineal metre of steel piling supplied as measured by the Contract Administrator. This Item of Work shall be paid for at the Contract Unit Price per metre for "Supply Steel H Piles", performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.
- (b) Driving of steel H piles shall be measured per linear metre of driven steel piling. The length to be paid for shall be the total number of lineal metres of piling shown on the Drawings or authorized by the Contract Administrator, less fifty (50) percent of the total number of lineal metres of piling cut off after driving as measured in the field by the Contract Administrator. This Item of Work shall be paid for at the Contract Unit Price per metre for "Drive Steel H Piles", performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.
- (c) Supplying and installing all the listed materials, equipment, construction methods, and quality control measures including the facilitation of dynamic testing by the Contractor associated with this Specification and Drawings shall be considered incidental to "Supply Steel H Piles", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

E65.9.2 Splicing Steel Bearing Piles

- (a) Splicing of steel bearing piles shall be measured on a unit basis and the number to be paid for shall be the total number of splices performed by the Contractor and accepted by the Contract Administrator. Splicing of steel bearing piles shall be paid for at the Contract Unit Prices for "Splicing

Steel Piles” for supplying steel for performing all operations herein described and all other items incidental to the work included in this specification.

Add:

E66. STEEL BEARING PILES FOR EMPRESS ST. RETAINING WALL

E66.1 Description

- (a) This Specification shall cover the supply and driving of steel bearing piles.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all other things necessary for and incidental to the satisfactory completion of all Work as hereinafter specified.

E66.2 Scope of Work

- (a) The Work under this Specification shall involve:
 - (i) Supplying and driving steel H piles for the Empress St. Retaining Wall.

E66.3 Referenced Specifications

- (a) The latest edition and all subsequent revisions to the following Standards:
 - (i) CAN/CSA G40.20/G40.21 – General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;
 - (ii) CSA W59 – Welded Steel Construction (Metal Arc Welding); and
 - (iii) AASHTO/AWS D1.5m / D1.5 Bridge Welding Code.

E66.4 Submittals

E66.4.1 General

- (a) The Contractor shall submit to the Contract Administrator for review and approval at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.

E66.4.2 Steel Mill Certificates

- (a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement Work on site, the steel mill certificates.

E66.4.3 Pile Driving System

- (a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, details of the proposed pile driving system and Manufacturer’s specifications and catalogue for all mechanical hammers used, showing the data necessary for computing the bearing value of the pile driven.

E66.4.4 Welding Certification

- (a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, proof of qualification for the Contractor and the welders conducting the Work (if applicable).
 - (i) The Contractor shall produce evidence that all welding operators to be employed on the Work are currently qualified by the C.W.B. in the processes in which they are to be employed on the Work.
 - (ii) The Contractor shall produce evidence relative to each operator, that he has been executing satisfactory welding in the required processes within the six month period previous to the award of this Contract.

E66.4.5 Welding Procedures

- (a) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, the welding procedures specific to the Work (if applicable). The procedures shall include the following information: joint type, welding

process, welding position, base metal specification, welding consumable specification and size, preheat requirements, amperage and voltage requirements, speed, polarity, and welding equipment.

- (b) The Contractor shall submit to the Contract Administrator for review and acceptance, at least ten (10) Business Days prior to the commencement of Work on Site, Shop Drawings for pile tip and cutting shoe installations.

E66.5 Materials

E66.5.1 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Piling shall be handled, hauled, and stored in a manner that avoids damage to piles and all associated piling material.
- (b) The Contractor shall not be permitted to drag piles along the ground.
- (c) Any piles excessively damaged through negligence or improper handling operations shall be immediately removed from the site and replaced with sound piles. This shall be done at the Contractor's own expense.

E66.5.2 Steel "H" Piles

- (a) Steel "H" piles shall be structural HP 250X85 steel members conforming to CSA G40.21, Grade 350W or ASTM A572 Grade 50.
- (b) Pile driving points shall be Point No. HPP-S-10, by Titus Steel Co. Ltd., Mississauga, Ontario, or Pruyne HP75750, by Associated Pile and Fitting Corporation, Clifton, NJ, USA or equal as accepted by the Contract Administrator.
- (c) All welding shall conform to CSA Standard W59, electric arc method.
- (d) Shear stud connectors shall conform to the requirements of ASTM A108, Grade 1020, and shall be of a design suitable for end welding using automatic stud welding equipment.

E66.6 Equipment

- (a) Pile driving system to be used by the Contractor shall be of such a capacity that the required bearing and pile penetration shall be obtained without damaging the piles.
- (b) The pile driving hammer used to install steel H piles shall be capable of delivering a minimum energy of 25 kJ to the pile head, with the ability to reliably operate at different energy levels (i.e. different fuel settings, variable strokes, variable ram weight, etc.). The amount of energy delivered to the pile head may need to be increased to reach refusal or decreased to prevent pile damage.
- (c) Pile driver leads shall be used to support the piles while they are being driven.
- (d) The heads of steel bearing piles shall be cut squarely if required and protected by a pile cap. The pile cap shall be designed to hold the axis of the pile in line with the axis of the hammer. The top of the cap shall have a timber or polyethylene shock block (ie. capblock or hammer cushion).

E66.7 Construction Methods

E66.7.1 Preconstruction Meeting

- (a) Prior to pile driving a preconstruction meeting with the Contractor, Piling Subcontractor, Geotechnical Engineer, and Contract Administrator shall be held to review the Pile Driving submission and review the proposed pile driving system, sequence of work, driving criteria, and energy settings.

E66.7.2 Geotechnical Report

- (a) The geotechnical reports and test hole logs are included in Appendix A.

E66.7.3 Location and Alignment of Piles

- (a) The piles shall be located to the positions shown on the Drawings. Pile lengths shall be calculated based on estimated tip elevation and pile cut-off elevations. The Contractor shall be responsible for reviewing all boring logs and geotechnical information for the verification of required supply pile lengths to support their driving equipment and operations.

- (b) Piles shall not be jacked or pulled into their final positions.

E66.7.4 Installing Pile Tips and Shear Stud Connectors

- (a) All pile driving points shall be welded by the Contractor prior to commencement of pile driving operations.
- (b) Material to be welded shall be preheated in accordance with CSA W59.
- (c) All Shear Stud Connectors shall be welded by the Contractor after all the H Piles have been driven to refusal and re-driven and cut to cut-off elevation.

E66.7.5 Pile Refusal Requirements

- (a) H piles shall be driven to practical refusal on the bedrock layer or to the elevations indicated on the Drawings, whichever is achieved first.
- (b) Refusal criteria for all piles shall be considered to be three consecutive sets of ten (10) to fifteen (15) blows per 25mm of pile penetration, provided that a well maintained hammer capable of delivering the required energy to the pile head per blow is utilized. Final refusal criteria will be confirmed by the Contract Administrator following submission of the items noted in E66.4, and following driving of the first pile to refusal.

E66.7.6 Driving of Piles

- (a) Pile driving equipment shall be operated from existing grade.
- (b) Piles shall not deviate more than two (2) percent for battered piles, nor more than two (2) percent out-of-plumb for vertical piles. Piles shall not be more than 75 mm off centre, measured at time of cut off.
- (c) The method of driving shall be such as not to impair the strength of the pile. All piles shall be driven to practical refusal. The Contractor will be required to remove any surface and/or shallow depth obstruction(s) to obtain the required penetration of the pile.
- (d) Piles shall be driven in the most practicable manner to ensure that the piles at the boundaries are in their correct final positions.
- (e) Driving stresses shall not exceed 90% of the yield stress of the steel.
- (f) Upon driving a pile, all adjacent piles exhibiting heave of 6mm or more should be re-driven to a minimum of one set of the refusal criteria.
- (g) Driving of all piles shall be continuous without intermission until the pile has been driven to final elevation, unless splices are required.
- (h) Where boulders or other obstructions prevent certain piles to be driven in the location shown and to the proper bearing strata or depth, the Engineer may direct the Contractor to install a replacement pile.
- (i) Any piles that are excessively crushed or bent through negligence or carelessness the Contractor shall be removed or otherwise replaced, unless, in the opinion of the Contract Administrator, the damage is so slight that the pile can be repaired properly, which repairs shall be done by this Contractor.
- (j) Pile driver leads shall be used to support the piles while they are being driven and shall be braced to the supporting crane, to be used for securely and accurately support the pile in its required position during driving. Leads shall be of sufficient length to be supported firmly on the ground. The use of hanging or swinging leads will not be allowed. Battered piles shall be driven with inclined leads.
- (k) For pile installation monitoring purposes, the Contractor shall paint markings on each pile at 0.25 metre intervals, with a label at each 1.0 metre interval, starting from the toe of the pile.
- (l) Pre-boring of piles is not permitted, unless approved by the Contract Administrator.
- (m) For practical refusal of piles, the final set shall be determined by three consecutive readings meeting the set criterial identified by the Contract Administrator. Final set will be measured and recorded in blows per 25mm by the Contract Administrator. Refer also to E57.7.5 regarding refusal requirements.

E66.7.7 Splicing of Piles

- (a) Splicing of piles will not be permitted for any of the Work, unless approved by the Contract Administrator. If splices are required at the Contract Administrator's direction, the Contractor shall be reimbursed for the cost of providing a splice as specified in C7.4(d).

E66.7.8 Cut-Off of Piles

- (a) After piles have been driven to the required penetration, the Contractor shall mark the required cut-off elevation on each pile. The top of all piles shall be neatly cut off (true and level) at the cut-off elevation specified on the Drawings upon, but not before, pile acceptance by the Contract Administrator.

E66.8 Quality Control

E66.8.1 Inspection

- (a) The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given.

E66.8.2 Pile Driving Records

- (a) The Contract Administrator will keep a record of each and every pile driven. The records shall give the driving date, installation time, pile type, size, length, location, final penetration depth, rate of penetration (i.e. number of blows per 250mm of pile penetration), final three sets meeting refusal criteria, hammer type and fuel setting (drop height). Any unusual phenomena shall be noted and recorded, especially if they indicate possible damage to the pile.
- (b) Energy output of driving equipment at the time of final set shall be reported immediately to the Contract Administrator.

E66.9 Measurement and Payment

E66.9.1 Steel H Piles

- (a) Supplying of steel H piles shall be measured per lineal metre of steel piling supplied as measured by the Contract Administrator. This Item of Work shall be paid for at the Contract Unit Price per metre for "Supply Steel H Piles", performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.
- (b) Driving of steel H piles shall be measured per linear metre of driven steel piling. The length to be paid for shall be the total number of lineal metres of piling shown on the Drawings or authorized by the Contract Administrator, less fifty (50) percent of the total number of lineal metres of piling cut off after driving as measured in the field by the Contract Administrator. This Item of Work shall be paid for at the Contract Unit Price per metre for "Drive Steel H Piles", performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and performing all operations herein described and all other items incidental to the Work.
- (c) Supplying and installing all the listed materials, equipment, construction methods, and quality control measures associated with this Specification and Drawings shall be considered incidental to "Supply Steel H Piles", unless otherwise noted herein. No measurement or payment shall be made for this Work unless indicated otherwise.

Add:

E67. STEEL PILE CONCRETE ENCASEMENT

E67.1 Description

E67.1.1 General

- (a) This Specification covers all operations relating to the supply and installation of steel pile concrete encasement for the North Pedestrian Accessibility Ramp piers including but not limited to overburden drilling, water control, supply and installation of temporary steel pile sleeves, supply and installation of permanent steel pipe sleeves supply and placement of self-compacting concrete, stabilized fill, removal of temporary steel pipe sleeves and disposal of excavated materials.
- (b) The Work to be done by the Contractor under this Section shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

E67.1.2 Definition

- (a) Overburden: All material encountered above the bedrock including imported fill and native soils.

E67.2 Submittals

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any tremie concrete operations the proposed tremie concrete procedures.
- (b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any steel pile concrete encasement construction operations the proposed drilling and pipe sleeving procedures.

E67.3 Materials

E67.3.1 General

- (a) The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and acceptance by the Contract Administrator.

E67.3.2 Handling and Storage

- (a) Storage of materials shall be in accordance with CSA Standard CAN/CSA A23.1. Materials damaged by careless or negligent handling or storage by the Contractor shall be replaced at the Contractor's expense.

E67.3.3 Testing

- (a) All materials supplied under this Specification shall be subject to inspection by the Contract Administrator and testing by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.
- (b) All materials shall be approved by the Contract Administrator at least twenty-one (21) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specification detailed herein or are found to be defective in manufacture or have become damaged in transit, storage or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at their own expense.

E67.3.4 Self-Compacting Concrete

- (a) The concrete shall conform to the Specification E41.
- (b) The concrete shall be placed by the tremie method.

E67.3.5 Flowable Cement Stabilized Fill

- (a) Flowable Cement Stabilized Fill shall conform to the requirements of CW2160, Clause 2.16.

E67.3.6 Steel Pipe Sleeves

Steel pipe sleeves shall be as follows:

- (a) 559 mm outside diameter x 10 mm thick sleeve as indicated on the Drawings, conforming to the requirements of ASTM A252 Grade 3, with a minimum yield strength of 310 MPa.
- (b) When mill test certificates originate from a mill outside of Canada or the United States of America, the Contractor shall have the information on the mill test certificate tested and verified by independent testing by a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of ISO/IEC 17025 for the specific tests or types of tests required by the material standard specified on the mill test certificate.
- (c) Splicing of steel pipe sleeves is not permitted.

E67.4 Equipment

E67.4.1 All equipment shall be of a type accepted by the Contract Administrator and shall be kept in good working order

E67.4.2 Tremie Equipment

- (a) The tremie pipe shall consist of a tube, having a diameter of not less than 200 mm, constructed with sections having flange couplings fitted with gaskets. The discharge end shall have a proper seal so that water will not enter the tube at any time.

E67.5 Construction Methods

E67.5.1 Location and Alignment of Pile Sleeves

- (a) The pipe sleeves shall be installed in the positions shown on the Drawings or as directed by the Contract Administrator. The Contractor will be required to remove obstructions in order to achieve the proper alignment.
- (b) Alignment shall not deviate more than two percent (2%) of caisson length out of plumb and not more than 50 mm off centre at the top.
- (c) Clear distance between permanent limits of the pipe sleeve shaft and 115 kV line must be 1.0 m minimum.

E67.5.2 Buried Utilities

- (a) The Contractor shall exercise extreme caution when constructing the pipe sleeves in the vicinity of existing buried utilities and buildings. The Drawings show the approximate locations of the existing buried utilities. The Contractor shall be responsible for determining the exact location of the buried utilities from the appropriate Utility Authorities or through hydro-excavation methods prior to constructing the pipe sleeves. The 115 kV line shall not be hydro-excavated.
- (b) The Contractor shall be responsible for all costs that may be incurred for repair/rectification of any damage caused to the existing buried utilities as a result of the Contractor's operation in constructing caissons, as determined by the Contract Administrator.

E67.5.3 Installation

- (a) The Contractor shall install shaft holes and permanent or temporary steel pipe sleeves as indicated on the Drawings at each steel pile location. The steel pipe sleeves and shaft holes shall be advanced to the depth indicated on the Drawings or as determined by the Contract Administrator. Telescoping temporary casings are considered acceptable provided they do not adversely impact buried utilities or the design intent.
- (b) Protection boards, i.e. swamp mats, are to be installed on the ground above the 115 kV line prior to starting any steel pipe sleeve installation activities. Protection boards are to remain until the completion of all steel pile concrete encasement installation activities.
- (c) Manitoba Hydro requires a minimum of two weeks' notice prior to commencement of hydro-excavation or drilling activities. As much notice as possible shall be provided.
- (d) For steel pipe sleeves located within 1.5 m of the 115 kV buried Hydro cable, it is Manitoba Hydro's preference that the 115 kV line be de-energized, if at all possible. Please contact Darryl Stocki at Manitoba Hydro at 204-918-0341 to coordinate.
- (e) Upon acceptance of the shaft hole, permanent and temporary steel pipe sleeve, the contractor shall commence installation of steel bearing pipe in accordance with E65.
- (f) Upon acceptance of the steel bearing pile installation by the Contract Administrator in accordance with E67.3.5, "Flowable Cement Stabilized Fill", the Contractor shall place the flowable cement stabilized fill concrete with tremie as indicated on the Drawings.

E67.5.4 Placing Flowable Cement Stabilized Fill Concrete

- (a) Concrete shall not have a free fall of more than 2.0 m and shall be placed so that the aggregates will not separate or segregate. The slump of the concrete shall not exceed 110 mm. The concrete shall be vibrated throughout the entire length.
- (b) Concrete shall be placed to the elevations as shown on the Drawings. The top surface shall be finished smooth with a hand float.
- (c) All concrete, during and immediately after deposition, shall be consolidated by mechanical vibrations so that the concrete is thoroughly worked around the embedded items; eliminating all air or stone pockets that may cause honeycombing, pitting, or planes of weakness.

- (d) Temporary sleeve removal shall be conducted such that the cross-section of the caisson is not compromised through necking or sloughing of the caisson hole.

E67.5.5 Tremie Concrete

- (a) The shaft hole shall be pumped clear of water. Concrete shall then be placed by means of a tremie pipe. The tremie pipe shall have a suitable gate in the bottom to prevent water from entering the pipe. The bottom of the pipe shall be maintained below the surface of the freshly placed concrete. The pipe shall be capable of being raised or lowered quickly in order to control the flow of concrete.

E67.5.6 Protection of Newly Placed Concrete

- (a) Newly laid concrete threatened with damage by rain, snow, fog, or mist shall be protected with a tarpaulin or other approved means.

E67.5.7 Curing Concrete

- (a) The top of the freshly finished concrete shall be covered and kept moist by means of wet polyester blankets immediately following finishing operations and shall be maintained at above 10°C for at least seven (7) consecutive days thereafter.
- (b) After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.
- (c) Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four hours after the end of the curing period.
- (d) Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3° in one hour or 20° in twenty-four hours.

E67.5.8 Cold Weather Concreting

- (a) Protection of concrete shall be considered incidental to its placement. The temperature of the concrete shall be maintained at or above 10°C for a minimum of three (3) days or till the concrete has reached a minimum compressive strength of 20 MPa, by whatever means are necessary. Concrete damaged as a result of inadequate protection against weather conditions shall be removed and replaced by the Contractor at their own expense. Also, concrete allowed to freeze prior to the three (3) days will not be accepted for payment

E67.6 Quality Control

E67.6.1 All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator, including all operations from the selection and production of materials, through to final acceptance of the Work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or Works that are not in accordance with the requirements of this Specification.

E67.6.2 The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Contract. All material shall be free of surface imperfections and other defects.

E67.7 Measurement and Payment

E67.7.1 Construction of Steel Pile Concrete Encasement

- (a) Construction of steel pile concrete encasement will not be measured and shall be paid for at the Contract Lump Sum Price for "Steel Pile Concrete Encasement", which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification, accepted and measured by the Contract Administrator. Supply, installation and removal of temporary steel sleeves are incidental to the Work.

Add:

E68. BOARD INSULATION

E68.1 Description

- (a) This Specification shall cover the supply and installation of board insulation, and shall amend and supplement CW 2110.
- (b) The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

E68.2 Referenced Specifications

- (a) The latest edition and subsequent revisions of the following:
 - (i) ASTM D1621 – Standard Test Method for Compressive Properties Of Rigid Cellular Plastics;
 - (ii) CGSB 71 – Adhesive, Flexible, for Bonding Cellular Polystyrene Insulation
 - (iii) CW 2110 – Watermains; and
 - (iv) CAN/ULC-S701 – Thermal Insulation, Polystyrene, Boards and Pipe Coverings.

E68.3 Submittals

- (a) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, a proposed schedule, including methods and sequence of operations.
- (b) The Contractor shall submit to the Contract Administrator for review and approval, at least ten (10) Business Days prior to the commencement of any scheduled Work on the Site, the proposed material(s) to undertake the Work.

E68.4 Materials

E68.4.1 General

- (a) All materials supplied under this Specification shall be of a type approved by the Contract Administrator, and shall be subject to inspection and testing by the Contract Administrator.
- (b) The Contractor shall be responsible for the supply, safe storage and handling of all materials as set forth in this Specification. All materials shall be handled in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

E68.4.2 Handling and Storage of Materials

- (a) All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

E68.4.3 Board Insulation

- (a) Board insulation shall be moisture resistant closed cell extruded polystyrene designed for direct burial underground.
 - (i) Total insulation thickness shall be as specified on the Drawings.
 - (ii) Minimum compressive strength shall be 275 kPa (40 psi), in accordance with ASTM D1621.

E68.4.4 Adhesive for Insulation

- (a) Adhesive (for polystyrene insulation): to CGSB 71 GP 24.
 - (i) Type: One part polyurethane.
 - (ii) VOC emission: 0

E68.5 Equipment

E68.5.1 General

- (a) All equipment shall be of a type acceptable to the Contract Administrator and shall be kept in good working order.

E68.6 Construction Methods

E68.6.1 Insulation Installation

- (a) Supply and install rigid insulation at locations identified on the Drawings or where directed by the Contract Administrator. Construct as noted on the Drawings.
- (b) Prior to installation of insulation boards, ensure that substrates are firm, straight, smooth, dry, free of snow, ice or frost and clean of debris. If necessary, install a levelling layer of sand to surface to achieve a smooth substrate.
- (c) Install installation to completely maintain the continuity of thermal protection.
- (d) Cut and trim insulation to fit all spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- (e) Offset both vertical and horizontal joints in multiple layer applications.
- (f) In concealed spaces, do not cover insulation until it has been observed by the Contract Administrator.
- (g) At joints between rigid insulation boards and at other small voids, fill gaps with closed cell spray foam insulation to achieve a continuous insulated surface.

E68.7 Quality Control

E68.7.1 Inspection

- (a) All workmanship and materials furnished and supplied under this Specification are subject to the close and systematic inspection by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified Work.
- (b) The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works which are not in accordance with the requirements of this Specification.

E68.7.2 Access

- (a) The Contractor shall allow the Contract Administrator free access to all parts of the Work at all times.

E68.8 Measurement and Payment

E68.8.1 Board Insulation

- (a) Supplying and installing board insulation shall be measured on an area basis based on the plan view area in square metres, as noted on the Drawings. Supplying and installing board insulation shall be paid for at the Contract Unit Price per square metre for the "Board Insulation", measured as specified herein, performed in accordance with this Specification and accepted by the Contract Administrator, which price shall be paid in full for supplying all materials and for performing all operations herein described and all other items incidental to the Work.

Add:

E69. PROTECTION OF INSTRUMENTATION

E69.1 The Contractor is advised that geotechnical instrumentation (slope inclinometers and piezometers) have been installed in test holes as shown on the Drawings. During the course of the Work, the Contract Administrator will install additional instrumentation to monitor riverbank and structure performance.

E69.2 The Contractor shall take necessary precautions to prevent damage to the existing or any newly installed geotechnical instrumentation as a result of their Work, as shown on the Drawings.

- (a) TH16-01 is near the limits of the clay toe berm on the Assiniboine Riverbank and shall be located by the Contractor prior to commencement of clay toe berm construction. The Contractor shall develop temporary access to avoid this instrument. If temporary access works cannot avoid TH16-01, the Contractor shall provide a minimum 5 business days notice to the Contract Administrator. The Contract Administrator shall cut off the instruments below grade and provide a temporary cover plate for use during construction.

Following completion of riverbank works, the Contractor shall facilitate instrument repair by the Contract Administrator to permit continued use of the instruments.

- (b) TH16-02 is located within the extent of the proposed sidewalk and cycle track along Omand's Creek and contains a standpipe piezometer and vibrating wire piezometer and shall be located by the Contractor prior to commencement of Omand's creek stabilization works. The standpipe shall be abandoned by the Contract Administrator. The Contractor shall protect the vibrating-wire cable leads from damage during construction and shall facilitate trenching of vibrating-wire piezometer cable leads to a nearby location outside the limits of the sidewalk and cycle track prior to constructing surface paving works and fill placement on the creek bank.

E69.3 The Contractor shall facilitate any work by others necessary to modify existing instrumentation, to maintain operation of the instrumentation or to install new instrumentation.

E69.4 The Contractor shall repair or replace instrumentation damaged as a result of his Work at no cost to the City.

E69.5 The Contractor is advised that monitoring of geotechnical instrumentation will be undertaken by the Contract Administrator during construction. Every effort will be made to schedule monitoring to avoid interruptions of the Contractor's work activities, however it may be necessary to temporarily suspend operation of equipment to reduce ground vibrations during monitoring.

E69.5 No measurement or payment will be made for the work of this Specification.

DRAWINGS

Replace: 602-2018_Drawing_P-3494-01-RB with 602-2018_Addendum_1-Drawing_P-3494-01-RC
602-2018_Drawing_P-3494-11-RB with 602-2018_Addendum_1-Drawing_P-3494-11-RC
602-2018_Drawing_P-3494-18-RB with 602-2018_Addendum_1-Drawing_P-3494-18-RC
602-2018_Drawing_P-3494-69-RB with 602-2018_Addendum_1-Drawing_P-3494-69-RC
602-2018_Drawing_P-3494-70-RB with 602-2018_Addendum_1-Drawing_P-3494-70-RC
602-2018_Drawing_P-3494-71-RB with 602-2018_Addendum_1-Drawing_P-3494-71-RC
602-2018_Drawing_P-3494-72-RB with 602-2018_Addendum_1-Drawing_P-3494-72-RC
602-2018_Drawing_P-3494-73-RB with 602-2018_Addendum_1-Drawing_P-3494-73-RC
602-2018_Drawing_P-3494-74-RB with 602-2018_Addendum_1-Drawing_P-3494-74-RC
602-2018_Drawing_P-3494-75-RB with 602-2018_Addendum_1-Drawing_P-3494-75-RC
602-2018_Drawing_P-3494-76-RB with 602-2018_Addendum_1-Drawing_P-3494-76-RC
602-2018_Drawing_P-3494-77-RB with 602-2018_Addendum_1-Drawing_P-3494-77-RC
602-2018_Drawing_P-3494-78-RB with 602-2018_Addendum_1-Drawing_P-3494-78-RC
602-2018_Drawing_P-3494-79-RB with 602-2018_Addendum_1-Drawing_P-3494-79-RC
602-2018_Drawing_P-3494-80-RB with 602-2018_Addendum_1-Drawing_P-3494-80-RC
602-2018_Drawing_P-3494-81-RB with 602-2018_Addendum_1-Drawing_P-3494-81-RC
602-2018_Drawing_P-3494-82-RB with 602-2018_Addendum_1-Drawing_P-3494-82-RC
602-2018_Drawing_P-3494-83-RB with 602-2018_Addendum_1-Drawing_P-3494-83-RC
602-2018_Drawing_P-3494-84-RB with 602-2018_Addendum_1-Drawing_P-3494-84-RC

602-2018_Drawing_P-3494-85-RC with 602-2018 _Addendum_1-Drawing_P-3494-85-RD
602-2018_Drawing_P-3494-86-RD with 602-2018 _Addendum_1-Drawing_P-3494-86-RE
602-2018_Drawing_P-3494-94-RD with 602-2018 _Addendum_1-Drawing_P-3494-94-RE
602-2018_Drawing_P-3494-96-RD with 602-2018 _Addendum_1-Drawing_P-3494-96-RE
602-2018_Drawing_P-3494-107-RD with 602-2018 _Addendum_1-Drawing_P-3494-107-RE
602-2018_Drawing_P-3494-108-RB with 602-2018 _Addendum_1-Drawing_P-3494-108-RC
602-2018_Drawing_P-3494-112-RD with 602-2018 _Addendum_1-Drawing_P-3494-112-RE
602-2018_Drawing_P-3494-116-RB with 602-2018 _Addendum_1-Drawing_P-3494-116-RC
602-2018_Drawing_P-3494-117-RC with 602-2018 _Addendum_1-Drawing_P-3494-117-RD
602-2018_Drawing_P-3494-118-RC with 602-2018 _Addendum_1-Drawing_P-3494-118-RD
602-2018_Drawing_P-3494-119-RC with 602-2018 _Addendum_1-Drawing_P-3494-119-RD
602-2018_Drawing_P-3494-120-RC with 602-2018 _Addendum_1-Drawing_P-3494-120-RD
602-2018_Drawing_P-3494-121-RC with 602-2018 _Addendum_1-Drawing_P-3494-121-RD
602-2018_Drawing_P-3494-122-RC with 602-2018 _Addendum_1-Drawing_P-3494-122-RD
602-2018_Drawing_P-3494-123-RC with 602-2018 _Addendum_1-Drawing_P-3494-123-RD
602-2018_Drawing_P-3494-124-RC with 602-2018 _Addendum_1-Drawing_P-3494-124-RD
602-2018_Drawing_P-3494-125-RC with 602-2018 _Addendum_1-Drawing_P-3494-125-RD
602-2018_Drawing_P-3494-126-RC with 602-2018 _Addendum_1-Drawing_P-3494-126-RD
602-2018_Drawing_P-3494-127-RA with 602-2018 _Addendum_1-Drawing_P-3494-127-RB
602-2018_Drawing_P-3494-128-RB with 602-2018 _Addendum_1-Drawing_P-3494-128-RC
602-2018_Drawing_P-3494-129-RB with 602-2018 _Addendum_1-Drawing_P-3494-129-RC
602-2018_Drawing_P-3494-130-RB with 602-2018 _Addendum_1-Drawing_P-3494-130-RC
602-2018_Drawing_P-3494-131-RB with 602-2018 _Addendum_1-Drawing_P-3494-131-RC
602-2018_Drawing_P-3494-132-RB with 602-2018 _Addendum_1-Drawing_P-3494-132-RC
602-2018_Drawing_P-3494-133-RB with 602-2018 _Addendum_1-Drawing_P-3494-133-RC
602-2018_Drawing_P-3494-134-RB with 602-2018 _Addendum_1-Drawing_P-3494-134-RC
602-2018_Drawing_P-3494-135-RB with 602-2018 _Addendum_1-Drawing_P-3494-135-RC
602-2018_Drawing_P-3494-136-RB with 602-2018 _Addendum_1-Drawing_P-3494-136-RC
602-2018_Drawing_P-3494-137-RA with 602-2018 _Addendum_1-Drawing_P-3494-137-RB
602-2018_Drawing_P-3494-138-RC with 602-2018 _Addendum_1-Drawing_P-3494-138-RD
602-2018_Drawing_P-3494-139-RC with 602-2018 _Addendum_1-Drawing_P-3494-139-RD
602-2018_Drawing_P-3494-140-RC with 602-2018 _Addendum_1-Drawing_P-3494-140-RD

602-2018_Drawing_P-3494-141-RC with 602-2018 _Addendum_1-Drawing_P-3494-141-RD
602-2018_Drawing_P-3494-142-RB with 602-2018 _Addendum_1-Drawing_P-3494-142-RC
602-2018_Drawing_P-3494-143-RC with 602-2018 _Addendum_1-Drawing_P-3494-143-RD
602-2018_Drawing_P-3494-144-RB with 602-2018 _Addendum_1-Drawing_P-3494-144-RC
602-2018_Drawing_P-3494-145-RC with 602-2018 _Addendum_1-Drawing_P-3494-145-RD
602-2018_Drawing_P-3494-146-RB with 602-2018 _Addendum_1-Drawing_P-3494-146-RC
602-2018_Drawing_P-3494-147-RC with 602-2018 _Addendum_1-Drawing_P-3494-147-RD
602-2018_Drawing_P-3494-148-RB with 602-2018 _Addendum_1-Drawing_P-3494-148-RC
602-2018_Drawing_P-3494-149-RB with 602-2018 _Addendum_1-Drawing_P-3494-149-RC
602-2018_Drawing_P-3494-151-RB with 602-2018 _Addendum_1-Drawing_P-3494-151-RC
602-2018_Drawing_P-3494-154-RB with 602-2018 _Addendum_1-Drawing_P-3494-154-RC
602-2018_Drawing_P-3494-155-RB with 602-2018 _Addendum_1-Drawing_P-3494-155-RC
602-2018_Drawing_P-3494-156-RB with 602-2018 _Addendum_1-Drawing_P-3494-156-RC
602-2018_Drawing_P-3494-157-RB with 602-2018 _Addendum_1-Drawing_P-3494-157-RC
602-2018_Drawing_P-3494-158-RB with 602-2018 _Addendum_1-Drawing_P-3494-158-RC
602-2018_Drawing_P-3494-159-RB with 602-2018 _Addendum_1-Drawing_P-3494-159-RC
602-2018_Drawing_P-3494-160-RC with 602-2018 _Addendum_1-Drawing_P-3494-160-RD
602-2018_Drawing_P-3494-161-RC with 602-2018 _Addendum_1-Drawing_P-3494-161-RD
602-2018_Drawing_P-3494-163-RB with 602-2018 _Addendum_1-Drawing_P-3494-163-RC
602-2018_Drawing_P-3494-166-RB with 602-2018 _Addendum_1-Drawing_P-3494-166-RC
Add: 602-2018_Addendum_1-Drawing_P-3494-167-RA
602-2018_Addendum_1-Drawing_P-3494-168-RA
602-2018_Addendum_1-Drawing_P-3494-169-RA
602-2018 _Addendum_1-Drawing_U200-95-36-R0
602-2018 _Addendum_1-Drawing_U200-95-37-R0
602-2018 _Addendum_1-Drawing_U200-95-38-R1

APPENDICES

Add: Appendix F Manitoba Hydro Gas Requirements

Add: Appendix G Revised Recommendations for Driven Steel H-Piles