Canada

Project Manual

For

TERRA NOVA NATIONAL PARK
Entrance Rehabilitation Project

Terra Nova National Park
Newfoundland and Labrador

Prepared by

EKISTICS PLANNING & DESIGN
1 Starr Lane, Dartmouth,
NS B2Y 4V7

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Architect "A” **Seal**

Landscape Architect “L” **Seal**

Structural Engineer “S” **Seal**

Electrical Engineer “E” **Seal**

Civil Engineer “C” **Seal**

END OF SECTION

Division 0 – Bidding Documents

END OF SECTION

1.1 DEFINITIONS

.1 Information Documents means information of any type and in any form, related to the Project and identified in this Section as such and do not include the Contract.

1.2 STATUS OF INFORMATION DOCUMENTS

.1 Information Documents, or any part thereof, are not part of the Contract, unless specifically incorporated into Contract by means of copying, transcribing or referencing.

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.2 Information Documents shall not be considered a representation or warranty that information contained therein is accurate, complete or appropriate, and do not form a part of the Contract.

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1.4 INFORMATION DOCUMENTS

.1 Information Documents, in whole or in part, consist of the following:

.1 Geotechnical investigation entitled, *"Geotechnical Investigation: Terra Nova Park Gateways,"* prepared by Amec Foster Wheeler Environment & Infrastructure, dated 8 September 2016, File #TF1692301.

.2 "Basic Impact Analysis (BIA), Park Entrance Recapitalization," September 2016, prepared by Parks Canada.

END OF SECTION

FINAL

Geotechnical Investigation: Terra Nova Park Gateways

Submitted to:

Ekistics Plan and Design

1 Starr Lane
Dartmouth, NS B2Y 4V7

Submitted by:

Amec Foster Wheeler Environment & Infrastructure,

a Division of Amec Foster Wheeler Americas Limited

36 Pippy Place
PO Box 13216
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8 September 2016

Amec Foster Wheeler Project #: TF1692301

IMPORTANT NOTICE

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1.0 INTRODUCTION

1.1 General

Amec Foster Wheeler Environment & Infrastructure has been retained by Ekistics Plan and Design to perform a geotechnical investigation at two sites at the Terra Nova National park in the province of Newfoundland, for the ultimate client of Parks Canada.

The two sites, located at the North Gateway and South Gateway of the Terra Nova National Park, can be seen in Figure 1, below.

1.2 Purpose

The purpose of this investigation was to collect insitu soil data in order to provide geotechnical recommendations to aid in the development of future tourist information sites.

1.3 Scope

The project consisted of geotechnical investigation, lab testing, and geotechnical report.

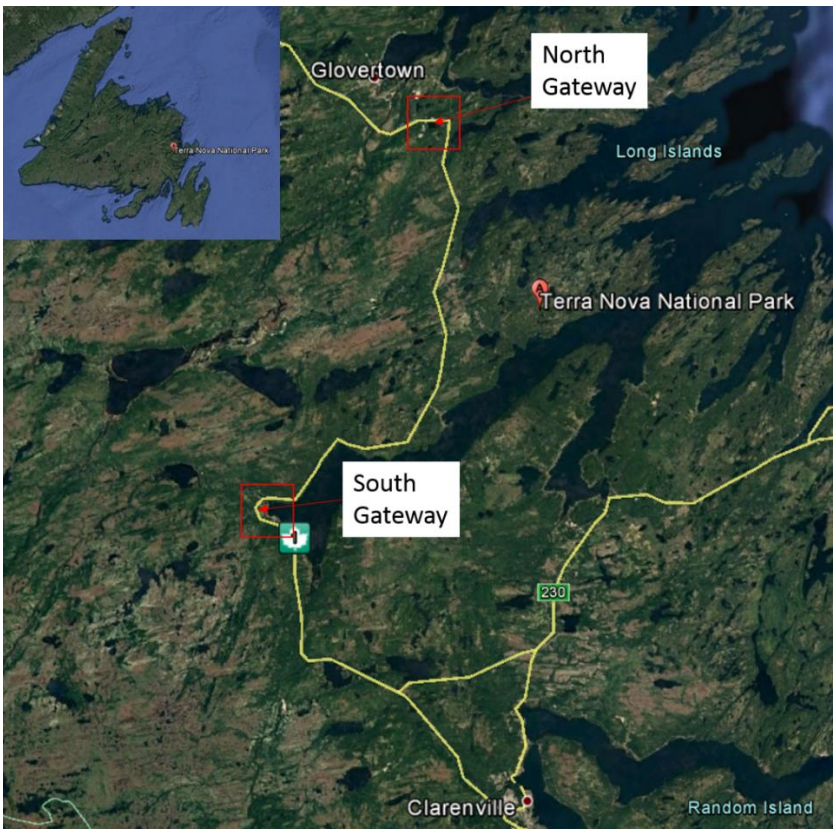

Figure 1: Geotechnical Investigation Sites

2.0 GEOTECHNICAL INVESTIGATION

2.1 Investigation Methodology

The site investigation consisted of performing three (3) test pits/bog probes at the North Gateway Site, and five (5) test pits at the South Gateway Site. The co-ordinates for the test pits were provided by the client. The test pits were excavated using a Yanmar Mini Excavator to a maximum depth of 2.8 m Below Ground Surface (BGS). At locations where the excavator was unable to access, bog probes were performed using a hammer and metal rod to probe for possible bedrock. Soil conditions were described through visual observation.

2.2 North Gateway Site Investigation Findings

The North Gateway site is located approximately 6 km South of Glovertown on the Trans-Canada Highway. A total of three (3) Test Pits were performed at this site. The Test Pit logs for the North Gateway Site can be seen in Appendix A of this report. The relative location of the Test Pit (TP) locations can be seen in Figure 2, below.

Figure 2: North Gateway Test Pit Site Plan

2.2.1 Test Pit 1

Test Pit 1 was located at the potential development of a pond look off location. The site was inaccessible to the excavator and a bog probe was performed in place of an excavation. The bog probe was

performed to a depth of 1.5 m BGS. Conditions showed approximately 0.5 m of bog overlying 1.0 m of interpreted compact sand and gravel.

2.2.2 Test Pit 2

Test Pit was located at a potential "Washroom/Visitor experience Pavilion". The test pit logs indicate that this location consist of granular fill up to a depth of 2.4 m BGS. The granular fill consisting of compacted: 300 mm of Class A sand and gravel, 500 mm of 4" minus rock; and 1500 mm of 12" minus blast rock. Test pit 2 was terminated in this strata.

2.2.3 Test Pit 3

Test Pit 3 is located at a potential parking area. The test pit logs indicate that a granular fill was used at this location. The granular fill consist of approximately 600mm of loose sand, overlying 1300mm of 12" minus blast rock. At approximately 2m BGS, compact sand with gravel was encountered which is interpreted as being the native soil to the site.

2.3 South Gateway Site Investigation Findings

The South Gateway site is located approximately 32 km North of Clarenville on the Trans-Canada Highway. A total of five (5) Test Pits were performed at this site. The Test pit logs for the South Site can be seen in Appendix A of this report. The relative locations of the test pits can be seen in Figure 3, below.

Figure 3: South Gateway Test Pit Site Plan

2.3.1 Test Pit 4

Test Pit 4 was performed at a proposed “Washroom/Pavilion” location. Soil at the location consisted of compact sand with some cobbles and boulders to an observed depth of 2.8 m BGS.

2.3.2 Test Pit 5

Test Pit 5 was performed at a proposed entry for a new parking lot development Soil at the location consisted of compact sand with some cobbles and boulders to an observed depth of 2.8 m BGS.

2.3.3 Test Pit 6

Test Pit 6 was performed at a new parking lot location. Soils encountered at the location appeared to be comprised of a backfill material. The Test Pit log showed the presence of fill down to an approximate depth of 2.8 m BGS. The fill was comprised of approximately 1.7 m of loose to compact sand and gravel with some cobbles, overlying 1.0 m of compact sand and gravel.

2.3.4 Test Pit 7

Test Pit 7 was performed at near an existing parking area that is proposed be removed. It was originally planned to perform the Test Pit in the parking area to assess the depth of asphalt and base granular material. After discussion with the client the location was changed from the parking lot to a site near to the parking lot. The Test Pit log showed the presence of fill down to an approximate depth of 2.8m BGS. The fill material was comprised of approximately 1.7 m of loose to compact sand and gravel, with some cobbles, overlying 1.0 m of compact sand and gravel. Fill was encountered to a depth of 2.5m BGS.

2.3.5 Test Pit 8

Test Pit 8 was performed at a proposed river look-off location. The conditions show a thin surficial layer of moss/peat, up to 0.2 m in areas, overlying interpreted bedrock. Bedrock outcrops were observed at near the location.

3.0 LAB TEST RESULTS

3.1 Lab Test Methodology

A total of two (2) samples were collected for laboratory testing. One sample was taken from Test Pit 4, and one sample from Test Pit 7. A grain size analysis was conducted on each sample, for total of two (2) test conducted. The test were performed in accordance with ASTM standard. The grain size analysis was used to classify the soils to ASTM standard.

3.2 Lab Test Results

The ASTM classification based on the grain size analysis of the soil samples can be seen in Table 1, below. The lab test results are included in Appendix B of this report.

Table 1: Soil Classification from Grain Size Analysis Results

Location	% Gravel	% Sand	% Fines	Group Name	Group Symbol
Test Pit 4	40	48.9	7.1	Well Graded Sand with Silt and Gravel	SW-SM
Test Pit 7	56	40.2	3.8	Well Graded Gravel with Sand	GW

4.0 DISCUSSION AND RECOMMENDATIONS

This following section discusses the geotechnical design parameters and construction considerations for the development of the North and south Gateway sites. The geotechnical design parameters that are considered for the sites are: the allowable bearing capacity, soil frost depth penetration, and seismic design values from the 2010 National Building Code of Canada.

4.1 Estimated Bearing Capacity

Allowable bearing capacity for the soils encountered were estimated based on site observations and guidelines provided in the (Canadian Foundation Engineering Manual, 2006). The bearing capacity values provided assumes a foundation width greater than 1 m, with a burial depth greater than 1 m. The allowable bearing capacity considers a serviceability requirement for settlement not exceeding 25 mm. The factor of safety for the bearing capacity provided is approximately three (3). Bearing capacity of organic material/peat/bog was not considered, it is not advisable to construct on this type of material.

4.1.1 Allowable Bearing Capacity of Soils Encountered

<u>FILL</u>

Loose sand and Gravel

Loose sand was encountered at shallow depths (0 to 1m) in Test Pit: 3, 6, and 7.

Due to the unknown conditions of this material, foundations are not recommended to be placed on this material and no allowable bearing capacity is provided. It is recommended that loose soils be excavated to more competent material or if possible compacted on site.

Compact Sand and Gravel

Compact sand and gravel was encountered at most Test Pit locations. For this report compact sand and gravel includes imported fill.

The estimated allowable bearing capacity of compact sand and gravel encountered on site is 100 kPa.

Compact Granular Fill (Crushed Rock)

Engineered fill was encountered at Test Pit 2, and Test Pit 3. The engineered fill refers to layers of base and sub-base typically found in the construction of roads.

Bearing capacity for engineer fill crushed rock depends partly on the thickness of the crushed rock layer and the underlying native soil. An allowable bearing capacity of 150 kPa is recommended for this type of material.

NATIVE TILL

Compact Sand and Gravel

The native soil encountered on both sites appears to be a Glaciofluvial compact sand and gravel. This material was encountered at Test Pit 1, 3, 4, and 5.

The estimated allowable bearing capacity for this type of material is 150 kPa.

BEDROCK

Bedrock observed from photos on the Test pit log for TP 08 show a highly fractured very thinly bedded shale. An allowable bearing capacity of 500 kPa is recommended for this type of material.

4.2 Soil Frost Depth Penetration

The frost depth penetration for the two sites was calculated using the modified Berggren formula. Historical climate data required for the calculation of frost penetration, such as: Mean Annual Air Temperature, Number of freezing days, and Freezing Index, was obtained from the government of Canada website: http://climate.weather.gc.ca/climate_normals/index_e.html.

4.2.1 North Gateway Site

Historical climate data from the Gambo weather station (~25 km from site) was used to estimate the frost penetration at the North Gateway site. The frost penetration depth was calculated as approximately 2 m.

4.2.2 South Gateway Site

Historical climate data from the Port Blandford weather station (~6 km from site) was used to estimate the frost penetration for the South Gateway Site. The frost penetration depth was calculated as approximately 2 m.

4.3 Seismic Design Parameters

Based on the field observations, the seismic classification of the material observed in the test site is "D" (stiff soil), in conformance with the criteria in Table 4.1.8.4A, Part 4, Division B of the National Building Code (NBC 2010). The four (4) values of the Spectral response acceleration Sa(T) for different periods and the Peak Ground Acceleration (PGA) can be obtained from Table C-2 in Appendix C, Division B of the NBC (2010) or from http://www.earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/index_2010-eng.php, if the location is not in the table. The design values of Fa and Fv for the project site should be calculated in accordance to Table 4.1.8.4 B and C.

4.4 Pavement Design Considerations

Parking areas were identified for Test Pit 3 for the North Gateway Site, and Test Pit 5 and Test Pit 6 for the South Gateway Site.

Test Pit 3 indicates the presence of loose sand to 600 mm, overlying 1300 mm of blast rock (12" minus). Loose sand should be removed and replaced with a competent material. Competent material would consist of engineered base and sub-base material, as determined by design.

Based on the soil types encountered, estimated subgrade design parameters for a flexible pavement system can be seen in Table 2, below. Compacting of the subgrade would be required prior to placement of sub-base and base material. Compaction testing should be performed during testing to verify the CBR and Modulus of Subgrade reaction values.

Table 2: Estimated Subgrade Design Parameters

Soil Type	CBR (%)	Modulus of Subgrade Reaction, K (kN/m2 / m)	Resilient Modulus, Mr (kPa)
Fill – Compact Sand and Gravel	20	8,000	3950
Fill – Compacted Granular Fill (crushed rock)	40	12,000	5900
Native Till – Compact Sand and Gravel	40	12,000	5900

4.5 Geotechnical Construction Consideration

It is understood that the type of site development and construction activities that will be proposed on site are limited to the construction of walkways, sign post, and a visitor's bathroom/pavilion. General Geotechnical construction advice regarding the placement of structures and foundations are as follows:

- All soils used in general construction should be compacted to 95% Standard Proctor Maximum Dry Density (SPMDD) or greater. Sub-base material should be compacted to 98% SPMDD, and base material should be compacted to 100% SPMDD.
- Compaction of sand and gravel material should not be attempted on a saturated soil. Construction should not take place during period of heavy rain. Ditching and grading of the site should be performed to ensure water drains away from the site.
- Organic overburden should be removed, and excavated down to a strong or competent material.
- Foundations should not be placed on frozen soil.
- Where practical, foundations sensitive to frost heave should be founded below the estimated depth to frost penetration. Alternatively, thermal insulation may be used to reduce the burial depth.
- It is recommended that a geotechnical engineer be present to monitor the construction of foundations.
- Should conditions vary significantly from those observed in this report Amec Foster Wheeler should be notified immediately.

5.0 CLOSURE

This report was prepared for the use of Ekistics Plan and Design for specific application to the project site. Work was performed using accepted assessment practices and procedures commonly used in the industry. The limitations of this report are included in Appendix C of this report.

Yours sincerely,

Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited

Prepared by:

Tim Park, M. Eng., P. Eng., CD
Geotechnical Engineer

Reviewed by:

Kevin Penney, M. Sc., P. Eng.
Geotechnical Engineer

6.0 REFERENCES

Canadian Foundation Engineering Manual (4th ed.). (2006). Canadian Geotechnical Society.

APPENDIX A: TEST PIT LOGS

Test Pit Log

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Project No.:	TF1692301	Test Pit No.	TP01 (A,B and C)
Location:	Terra Nova Gateway	Logged By:	Craig Taylor
Client:	Ekistics	Reviewed By:	Ian Osmond
Date:	July 28	Contractor:	Fowler's Excavating
		Equipment Used:	Metal Rod
GPS Coordinates: (UTM, Zone 22)	N5391653 E0280615	Test Pit Dimensions: (approximate)	Bog Probe

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID	Sample Depth (mbgs)	SVH (ppm)	Sample Type
0.0 – 0.5	BOG / PEAT	-	-	-	-
0. 5 – 1.5	Glaciofluvial – sand and gravel, compact.	-	-	-	-
	Bog probe terminated at 1.5 m.				

General Notes

1. Bog probe using a metal round bar and pushed in with a 2lb hammer.
2. mbgs (meters below ground surface)
3. Northing and easting coordinates were obtained using a hand-held Garmin GPS.
4. Groundwater was not encountered.

Test Pit Log

amec foster wheeler

Project No.:	TF1692301	Test Pit No.	TP02
Location:	Terra Nova Gateway	Logged By:	Craig Taylor
Client:	Ekistics	Reviewed By:	Ian Osmond
Date:	July 28	Contractor:	Fowler's Excavating
		Equipment Used:	Yanmar Mini Excavator
GPS Coordinates: (UTM, Zone 22)	N5391769 E0280745	Test Pit Dimensions: (approximate)	3 m long x 1 m wide x 2.4 m deep

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID	Sample Depth (mbgs)	SVH (ppm)	Sample Type
0.0 – 0.1	GRASS	-	-	-	-
0.1 – 0.4	Class "A" – grey, well graded sand and gravel, compact, dry to moist.	-	-	-	-
0.4 – 0.9	FILL – grey, 4" minus rock fill, compact moist.				
0.9 – 2.4	FILL – grey, structural blast rock fill (12" minus), compact, large boulders.				
	Test Pit terminated at 2.4 m.				

General Notes

1. Test pit excavated using a rubber track mounted mini excavator.
2. mbgs (meters below ground surface)
3. Northing and easting coordinates were obtained using a hand-held Garmin GPS.
4. Groundwater was not encountered.

Test Pit Log

amec foster wheeler

Project No.:	TF1692301	Test Pit No.	TP03
Location:	Terra Nova Gateway	Logged By:	Craig Taylor
Client:	Ekistics	Reviewed By:	Ian Osmond
Date:	July 28	Contractor:	Fowler's Excavating
		Equipment Used:	Yanmar Mini Excavator
GPS Coordinates: (UTM, Zone 22)	N5391787 E0280789	Test Pit Dimensions: (approximate)	3 m long x 1 m wide x 2.5 m deep

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID	Sample Depth (mbgs)		Sample Type
0.0 – 0.1	GRASS	-	-	-	-
0.1 – 0.7	FILL – brown, sand, loose, moist, brown.	-	-	-	-
0.7 – 2.0	FILL – grey, structural blast rock fill (12" minus), compact, moist, large boulders.	-	-	-	-
2.0 – 2.5	Glaciofluvial – brown, sand with some gravel, compact, moist.	TP03	2.0	-	Grab
	Test Pit terminated at 2.5 m due to excessive sloughing.				

General Notes

1. Test pit excavated using a rubber track mounted mini excavator.
2. mbgs (meters below ground surface)
3. Northing and easting coordinates were obtained using a hand-held Garmin GPS.
4. Groundwater was not encountered.

Test Pit Log

amec foster wheeler

Project No.:	TF1692301	Test Pit No.	TP04
Location:	Terra Nova Gateway	Logged By:	Craig Taylor
Client:	Ekistics	Reviewed By:	Ian Osmond
Date:	July 28	Contractor:	Fowler's Excavating
		Equipment Used:	Yanmar Mini Excavator
GPS Coordinates: (UTM, Zone 21)	N5363768 E706884	Test Pit Dimensions: (approximate)	3 m long x 1 m wide x 2.8 m deep

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID	Sample Depth (mbgs)	SVH (ppm)	Sample Type
0.0 – 0.1	GRASS	-	-	-	-
0.1 – 2.8	Glaciofluvial – light brown, sand with some gravel, some cobbles and small boulders, compact, moist.	-	-	-	-
	Test Pit terminated at 2.8 m.				

General Notes

1. Test pit excavated using a rubber track mounted mini excavator
2. mbgs (meters below ground surface)
3. Northing and easting coordinates were obtained using a hand-held Garmin GPS.
4. Groundwater @ 2.8 m.

Test Pit Log

amec foster wheeler

Project No.:	TF1692301	Test Pit No.	TP05
Location:	Terra Nova Gateway	Logged By:	Craig Taylor
Client:	Ekistics	Reviewed By:	Ian Osmond
Date:	July 28	Contractor:	Fowler's Excavating
		Equipment Used:	Yanmar Mini Excavator
GPS Coordinates: (UTM, Zone 21)	N5363726 E0706865	Test Pit Dimensions: (approximate)	3 m long x 1 m wide x 2.8 m deep

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID	Sample Depth (mbgs)	SVH (ppm)	Sample Type
0.0 – 0.1	GRASS	-	-	-	-
0.1 – 2.8	Glaciofluvial – light brown, sand with some gravel, some cobbles and small boulders, compact, moist.	-	-	-	-
	Test Pit terminated at 2.8 m.				

General Notes

1. Test pit excavated using a rubber track mounted mini excavator
2. mbgs (meters below ground surface)
3. Northing and easting coordinates were obtained using a hand-held Garmin GPS.
4. Groundwater @ 2.5 m.

Test Pit Log

amec foster wheeler

Project No.:	TF1692301	Test Pit No.	TP06
Location:	Terra Nova Gateway	Logged By:	Craig Taylor
Client:	Ekistics	Reviewed By:	Ian Osmond
Date:	July 28	Contractor:	Fowler's Excavating
		Equipment Used:	Yanmar Mini Excavator
GPS Coordinates: (UTM, Zone 21)	N5363669 E0706819	Test Pit Dimensions: (approximate)	3 m long x 1 m wide x 2.8 m deep

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID	Sample Depth (mbgs)	SVH (ppm)	Sample Type
0.0 – 0.1	GRASS	-	-	-	-
0.1 – 1.8	FILL – brown, sand and gravel, trace silt, some cobbles and small boulders, loose to compact, dry to moist.	-	-	-	-
1.8 – 2.8	FILL – Grey/brown, sand and gravel, trace fines, compact and moist.	-	-	-	-
	Test Pit terminated at 2.8 m.				

General Notes

1. Test pit excavated using a rubber track mounted mini excavator
2. mbgs (meters below ground surface)
3. Northing and easting coordinates were obtained using a hand-held Garmin GPS.
4. Groundwater was not encountered.

Test Pit Log

amec foster wheeler

Project No.:	TF1692301	Test Pit No.	TP07
Location:	Terra Nova Gateway	Logged By:	Craig Taylor
Client:	Ekistics	Reviewed By:	Ian Osmond
Date:	July 28	Contractor:	Fowler's Excavating
		Equipment Used:	Yanmar Mini Excavator
GPS Coordinates: (UTM, Zone 21)	N5363853 E0706993	Test Pit Dimensions: (approximate)	3 m long x 1 m wide x 2.5 m deep

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID	Sample Depth (mbgs)	SVH (ppm)	Sample Type
0.0 – 0.1	GRASS	-	-	-	-
0.1 – 1.8	FILL – brown, sand and gravel, trace silt, some cobbles and small boulders, loose to compact, dry to moist.	TP07	1.8	-	Grab
1.8 – 2.5	FILL – Grey/brown, sand and gravel, trace fines, compact and moist.	-	-	-	-
	Test Pit terminated at 2.5 m.				

General Notes

1. Test pit excavated using a rubber track mounted mini excavator
2. mbgs (meters below ground surface)
3. Northing and easting coordinates were obtained using a hand-held Garmin GPS.
4. Groundwater was not encountered.

Test Pit Log

amec foster wheeler

Project No.:	TF1692301	Test Pit No.	TP08
Location:	Terra Nova Gateway	Logged By:	Craig Taylor
Client:	Ekistics	Reviewed By:	Ian Osmond
Date:	July 28	Contractor:	Fowler's Excavating
		Equipment Used:	Metal Rod
GPS Coordinates: (UTM, Zone 21)	N5363557 E0706830	Test Pit Dimensions: (approximate)	Bog Probe

Soil and Groundwater Conditions

Depth (m) From - To	Description	Sample ID	Sample Depth (mbgs)	SVH (ppm)	Sample Type
0.0 – 0.2	MOSS / PEAT	-	-	-	-
	Bog probe terminated at 0.2 m.				

General Notes

1. Bog probe using a metal round bar and pushed in with a 2lb hammer.
2. mbgs (meters below ground surface)
3. Northing and easting coordinates were obtained using a hand-held Garmin GPS.
4. Groundwater was not encountered.

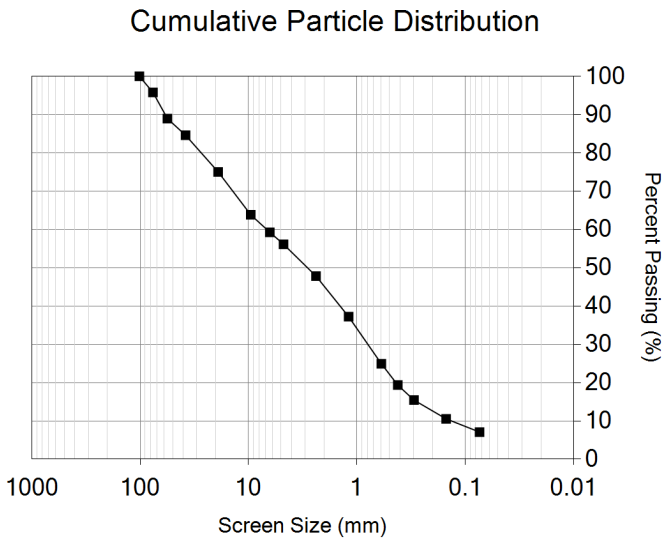
APPENDIX B: LAB TEST RESULTS

Sieve Analysis

Report Date: August 12, 2016 **Amend Date:** August 12, 2016

Client		**Project**	
Name:	Ekistics Planning & Design	**Name:**	(TF1692301) Terra Nova Gateways
Address:	1 Starr Lane Dartmouth, NS B2Y 4V7	**Address:**	
Attention:	.	**Phase:**	**Task:**
PO Number:		**Manager:**	Tim Park
Sample Date:	7/27/2016 by C. Taylor	**Lab/Ref. #:**	7087
Source:	Terra Nova gateway	**Description:**	Till - TP-04 @ 0.7BGS

Type of Specification: No project specification was provided.



Sieve Analysis:

200 Wash Procedure: A

	Sieve Size	Passing	Specification Min	Specification Max
Coarse Portion:	100mm	100%		
	75mm	96%		
	56mm	89%		
	37.5mm	85%		
	19.0mm	75%		
	9.5mm	64%		
Fine Portion:	6.3mm	59%		
	4.75mm	56%		
	2.36mm	48%		
	1.18mm	37%		
	600µm	25%		
	425µm	19%		
	300µm	15%		
	150µm	11%		
	75µm	7.1%		

Particle Size (bold indicates value was interpolated)							
Over 3" / 76mm	Gravel		Sand			Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
4.0%	21.0%	19.0%	**12.0%**	**25.0%**	11.9%	7.1%	

Remarks:

Distribution: Dawn O'Keefe

Reviewed By: Dawn O'Keefe

Dawn O'Keefe

Amec Foster Wheeler Environment & Infrastructure - 36 Pippy Place - St. John's, NL - A1B 3X4 Canada

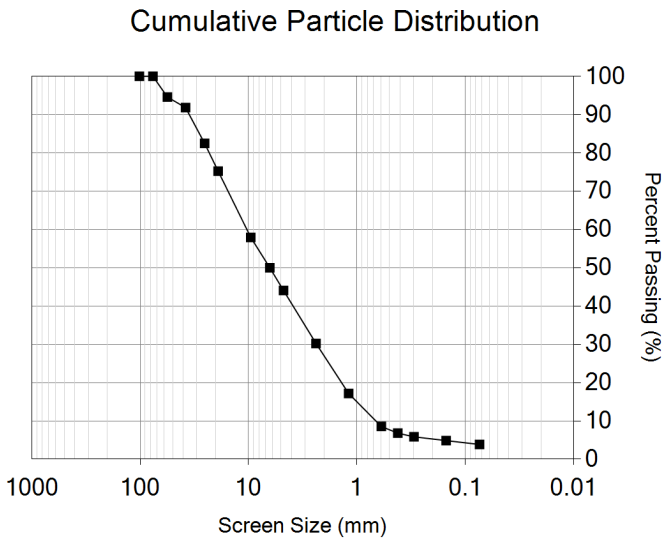
phone: 709-722-5062

Sieve Analysis

Report Date: August 12, 2016 **Amend Date:** August 12, 2016

Client		**Project**	
Name:	Ekistics Planning & Design	**Name:**	(TF1692301) Terra Nova Gateways
Address:	1 Starr Lane Dartmouth, NS B2Y 4V7	**Address:**	
Attention:	.	**Phase:**	**Task:**
PO Number:		**Manager:**	Tim Park
Sample Date:	7/27/2016 by C. Taylor	**Lab/Ref. #:**	7088
Source:	Terra Nova gateway	**Description:**	Till - TP-07 @1.8 BGS

Type of Specification: No project specification was provided.



Sieve Analysis:

200 Wash Procedure: A

	Sieve Size	Passing	Specification Min	Specification Max
Coarse Portion:	100mm	100%		
	75mm	100%		
	56mm	95%		
	37.5mm	92%		
	25mm	82%		
	19.0mm	75%		
	9.5mm	58%		
Fine Portion:	**Sieve Size**	**Passing**	**Min**	**Max**
	6.3mm	50%		
	4.75mm	44%		
	2.36mm	30%		
	1.18mm	17%		
	600µm	9%		
	425µm	7%		
	300µm	6%		
	150µm	5%		
	75µm	3.8%		

Particle Size (bold indicates value was interpolated)							
Over 3" / 76mm	Gravel		Sand			Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0%	25.0%	31.0%	**18.0%**	**19.0%**	3.2%	3.8%	

Remarks:

Distribution: Dawn O'Keefe

Reviewed By: Dawn O'Keefe

Dawn O'Keefe

Amec Foster Wheeler Environment & Infrastructure - 36 Pippy Place - St. John's, NL - A1B 3X4 Canada

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APPENDIX C: REPORT LIMITATIONS

Amec Foster Wheeler Environment & Infrastructure
a Division of Amec Foster Wheeler Americas Limited

DISCLAIMER

The conclusions and recommendations given in this report are based on information determined at the test locations. The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond test locations may differ from those encountered at the test locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Geotechnical Consultant be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered at the test locations.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Amec Foster Wheeler should be retained to review the detail foundation design, prior to construction, in order to confirm that Amec Foster Wheeler's recommendations have been correctly incorporated in the design.

Any comments made in this report on potential construction problems and possible methods are intended only for guidance of the designer. The number of test locations may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of superficial till and organic layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. Amec Foster Wheeler Environment & Infrastructure, a division of Amec Foster Wheeler Americas Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

SECTION INDEX

1.0 SUMMARY OF WORK

.1 The project involves various site, demolition, landscaping and construction works at the north and south entrances of Terra Nova National Park, Newfoundland and Labrador.

.2 Work also includes supply and installation of site and building signage, and visitor information boards.

1.1 WORK RESTRICTIONS

.1 Phasing:

.1 Phase1: The trails to Lookoff structures shall be used as construction access and shall be constructed first before commencing Work at other Work locations; Work at trails also includes installation of adjacent landscape boulders and construction of crusher-dust surfaced landings.

.2 Tree clearing must be completed before May (before songbird nesting).

.3 NOTE: Composting toilets have a long lead time of at least 6 weeks.

.4 Remaining Work: submit Work Phasing Plan to Departmental Representative for review and approval prior to commencing Work on site. Coordinate and integrate with Construction Schedule.

.1 Set out staging areas in consultation with Departmental Representative for both north and south entrances. Staging area locations shall be reviewed and approved by Departmental Representative prior to commencing Work at site.

.2 At South Entrance, existing pull-off site can be used for a staging area during construction.

.2 Access and Egress:

.1 Design, construct, and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with Occupational Health and Safety and National Building Code of Canada, 2010, requirements.

.2 Winter Access at North entrance: no transport trucks may park on site during the winter season; the site is to be completely secured.

.3 Water Supply:

.1 If water is required at the South entrance, a Provincial permit is required for extraction of water from Salmon River, and is subject to Provincial authority and discretion.

.2 Square Pond: part Provincial, part Parks Canada; it is permissible to extract water.

.4 Hoarding:

.1 Temporary site fencing: pavilions, parking lots, turn-off sites to be secured at both north and south entrances by modular construction metal fencing.

.1 Erect temporary site enclosure using purpose-made, prefabricated interlocking metal fence panels 2.1 m high.

.2 Provide lockable truck entrance gates as required and at least one pedestrian door as directed. Equip gates with locks and keys.

.5 Preservation of Property:

.1 If directed by the Departmental Representative, a start-up meeting will be held on site involving the Contractor and sub-contractors. The meeting shall be to ensure key construction personnel are aware of the environmental concerns, laws, rules and regulations in Terra Nova National Park.

.2 All park regulations, relevant federal and provincial acts, regulations, guidelines and codes of good practice will apply to all work and activities associated with this project.

.3 The Work shall be performed in a manner that will not have a significant environmental impact on Terra Nova National Park and its natural resources, including but not limited to flora, fauna or natural objects, or pose a danger to public health and public safety.

.4 Equipment and machinery selection for the preservation of biospheres at National Parks: equipment and machinery shall be minimally invasive in size, vibration potential, and weight. When feasible for the task, use light duty construction equipment, such as mini-excavator, skid steers, portable hand-held equipment, single axle truck cranes (≤ 19,000 GVW), and similar light weight equipment options.

.5 Do not use equipment or vehicles that impose loads in excess of the load capacity of asphalt roads and parking areas. If load capacity of existing roads and parking lots is not available or is otherwise uncertain, assume that they have been designed as low-volume roads and parking lots and not for heavy use and heavy loads.

.6 Areas adjacent to designated work areas may be sensitive ecosystems that can be easily damaged and harmed; in order to limit risk of damaging adjacent Park property and sensitive ecosystems, restrict work, workers and equipment, including staging and storage areas, to designated work areas.

.1 Do not permit equipment to stray from work locations, and only extend work to adjacent areas as minimally necessary to complete the Work, and only as permitted in writing by Departmental Representative; submit workplans and work layout drawings to Departmental Representative for review and approval.

.6 The Terra Nova National Park of Newfoundland and Labrador is of national significance. Damage to the site is not permitted, and all damage shall be repaired and restored to original or better condition at the direction and sole approval of the Departmental Representative. Reparations, if required, shall be at the sole expense of the Contractor.

.7 Smoking Restrictions: smoking or use of electronic cigarettes not permitted.

.8 Hot Work:

.1 During and for 1-hour after any activity with potential to produce ignition sources or excess heat, ensure the attendance of trained fire watch personnel to monitor, investigate and respond to conditions.

.2 Submit hot works policy and procedure manual to Departmental Representative.

.3 Take precautions to prevent fires. Provide and maintain temporary fire protection equipment of a type appropriate to the hazard anticipated in accordance with authorities having jurisdiction, governing codes, regulations, and ordinances. Every worker who may be required to use fire extinguishing equipment shall be trained in its use.

1.2 MEASUREMENT FOR PAYMENT

.1 Payment for the Work of this Contract, all Divisions, shall be on a lump sum basis as tendered, which shall be full compensation for all supervision, labour, materials and equipment necessary to complete the Work, including all subsidiary and incidental items thereto for which separate payment is not elsewhere provided.

1.3 PAYMENT PROCEDURES FOR TESTING

.1 Related Requirements Specified Elsewhere:

.1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Departmental Representative are specified under various technical specification sections (a.k.a., Sections).

.2 Appointment and Payment:

.1 Departmental Representative will appoint and pay for services of testing laboratory, except follows:

.1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.

.2 Inspection and testing performed exclusively for Contractor's convenience.

.3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.

.4 Mill tests and certificates of compliance.

.5 Tests specified to be carried out by Contractor under the supervision of Departmental Representative.

.2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

.3 Contractor’s Responsibilities

.1 Provide labour, equipment, and facilities to:

.1 Provide access to Work for inspection and testing.

.2 Facilitate inspections and tests.

.3 Make good Work disturbed by inspection and test.

.4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

.2 Notify Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

1.4 PROJECT MEETINGS

.1 Preconstruction Meeting:

.1 Within two weeks after award of Contract, hold a ½-day meeting to discuss construction strategies and procedure.

.2 Departmental Representative, Contractor, major Trade Contractors, suppliers listed in bid form, field inspectors and supervisors shall be in attendance.

.3 Coordinate time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work: in accordance with CONSTRUCTION SCHEDULE.

.3 Schedule of submission of shop drawings, samples, colour chips.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with CONSTRUCTION FACILITIES.

.5 Delivery schedule of specified equipment.

.6 Site safety and security in accordance with TEMPORARY BARRIERS AND ENCLOSURES.

.7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.8 Departmental Representative-provided products and salvaged items as indicated on drawings.

.9 As-built drawings.

.10 Maintenance manuals in accordance with CLOSEOUT SUBMITTALS.

.11 Take-over procedures, acceptance, warranties in accordance with Closeout Submittals.

.12 Monthly progress claims, administrative procedures, holdbacks.

.13 Appointment of inspection and testing agencies or firms.

.14 Insurances, transcript of policies.

.2 Progress Meetings:

.1 Progress meetings shall be held every 2 weeks.

.1 To the extent feasible, schedule mock-up reviews and site construction reviews to coincide with progress meeting days.

.2 Prepare as many mock-ups for a single review visit as practical.

.3 Coordinate mock-up reviews to the extent possible with reviews of pre-foundation pour, and other elements of construction requiring review before being covered or other construction proceeding. Refer to individual sections for review requirements.

.2 Contractor, major Trade Contractors involved in the project, and Departmental Representative shall be in attendance.

.3 Notify parties minimum 5 days prior to meetings.

.4 Contractor shall record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 working days after meeting.

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems that impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for effect on construction schedule and on completion date.

.12 Other business.

1.5 CONSTRUCTION SCHEDULE

.1 Definitions:

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Preferably, derive Bar Chart using commercially available computerized project management software.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring, and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

.2 Requirements:

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and period.

.3 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Substantial Performance and Final Completion as defined times of completion are required.

.3 Submittals:

.1 Provide submittals in accordance with SUBMITTAL PROCEDURES.

.2 Submit to Departmental Representative within 15 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring, and reporting of project progress.

.4 Project Schedule:

.1 Develop detailed Project Schedule derived from the Contract Documents.

.2 Ensure detailed Project Schedule includes Phases and milestones that reflect the work breakdown structure (WBS) for each Phase, along with the logical progression of the Work by trade jurisdiction.

.3 Submit WBS for review and approval to Departmental Representative within 15 days of Award of Contract.

.5 Project Schedule Reporting:

.1 Update Project Schedule every two weeks reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays, and impact with possible mitigation.

.6 Project Meetings:

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.2 Weather related delays with their remedial measures will be discussed and negotiated.

1.6 SUBMITTAL PROCEDURES

.1 Administrative:

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract. Submittals not stamped, signed, dated, and identified as to specific project will be returned without being examined and considered rejected.

.4 Notify Departmental Representative in writing at time of submission, identifying deviations from requirements of Contract stating reasons for deviations.

.5 Verify field measurements and affected adjacent Work are coordinated.

.6 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

.7 Contractor's responsibility for deviations in submission from requirements of Contract is not relieved by Departmental Representative review.

.2 Shop Drawings and Product Data:

.1 The term ‘shop drawings’ means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data that are to be provided by Contractor to illustrate details of a portion of Work.

.2 As may be required in specification Sections, submit shop drawings bearing stamp and signature of qualified professional engineer registered and licensed in Province of Newfoundland and Labrador, Canada.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 7 working days for Departmental Representative's review of each submission.

.5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Specification sections and indication of partial or complete submittal for stated section

.5 Other pertinent data.

.8 Submissions include:

.1 Date and revision dates.

.2 Project title and number.

.3 Name and address of:

.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract.

.5 Details of appropriate portions of Work as applicable:

.1 Fabrication.

.2 Layout, showing dimensions, including identified field dimensions, and clearances.

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Single line and schematic diagrams.

.9 Relationship to adjacent work.

.9 After Departmental Representative's review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested, except where hand drawn copies are produced or colours have to be chosen or confirmed, in specification Sections and as Departmental Representative may reasonably request.

.11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system, or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.14 Submit electronic copies of manufacturer’s instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards, and safety precautions.

.15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.16 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.17 Delete information not applicable to project.

.18 Supplement standard information to provide details applicable to project.

.19 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.20 The review of shop drawings is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

.3 Samples/brochures for colour or texture:

.1 Submit for review samples in duplicate or as required in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract.

.4 Where colour, pattern, or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples that Departmental Representative may require, consistent with Contract.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

.4 Certificates and Transcripts:

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

.2 Submit transcription of insurance immediately after award of Contract.

1.7 EMERGENCY CONTACT INFORMATION

.1 In the event of an emergency, call #911.

.2 North Entrance:

.1 **Emergency related requirements: Call the National Park's dispatch service at 1-877-852-3100** (this number will get you through to a dispatch service that provides contact with police, fire, ambulance - just about anything you need).

.2 For direct contact with various emergency services, use these numbers:

.1 RCMP Local Detachment (Glovertown): (709) 533-2828, 1-800-709-7267.

.2 Ambulance: Delaneys Ambulance Service (Glovertown): (709) 533-2111.

.3 Fire: Glovertown fire department: (709) 533-1111 or (709) 533-7878 (Cell).

.4 Hospital: James Paton Memorial Hospital (Gander): (709) 651-2500.

.5 Local medical clinic, Glovertown: (709) 533-2372/2374.

.3 Environmental issues such as fuel spills, problem wildlife, etc. call the Terra Nova NP Resource Conservation Staff at (709) 533-6090 or (709) 533-2801.

.4 If any questions re the park operations (highway snow clearing, site specific info, etc.) call Tyson Simmonds (Tech. Services Officer) at (709) 533-3136.

.3 South Entrance:

.1 **Emergency related requirements: Call the National Park's dispatch service at 1-877-852-3100** (this number will get you through to a dispatch service that provides contact with police, fire, ambulance - just about anything you need).

.2 For direct contact with various emergency services, use these numbers:

.1 RCMP Local Detachment (Clarenville): (709) 466-3211, 1-800-709-7267. (Glovertown detachment could also be called if required).

.2 Ambulance: Fewer’s Ambulance Service (Clarenville): (709) 466 9911.

.3 Fire: Port Blandford fire department: (709) 543-2600 or (709) 427-7999 (Cell).

.4 Hospital: Dr. G.B. Cross Memorial Hospital (Clarenville): (709) 466-3411.

.3 Environmental issues such as fuel spills, problem wildlife, etc. call the Terra Nova NP Resource Conservation Staff at (709) 533-6090 or (709) 533-2801.

1.8 HEALTH AND SAFETY

.1 References:

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS):

.1 Material Safety Data Sheets (MSDS).

.2 Province of Newfoundland and Labrador:

.1 Occupational Health and Safety Act and regulations, Workers Compensation Act and regulations, Workplace Hazardous Materials Information System Regulations.

.2 Health and Safety Plan:

.1 Prior to commencement of Work, develop written Health and Safety Plan specific to the Work. Implement, maintain, and enforce Plan for entire duration of Work and until final demobilization from site.

.2 Health and Safety Plan shall include the following components:

.1 List of health risks and safety hazards identified by hazard assessment.

.2 Control measures used to mitigate risks and hazards identified.

.3 On-site Contingency and Emergency Response Plan as specified below.

.4 On-site Communication Plan as specified below.

.3 On-site Contingency and Emergency Response Plan shall include:

.1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.

.2 Evacuation Plan: prior to entering the Work Site confirm escape routes, marshalling areas, and location of fire fighting equipment.

.3 Emergency Contacts: name and telephone number of officials from:

.1 Departmental Representative.

.2 Pertinent Federal and Provincial Departments and Authorities having jurisdiction.

.3 Local emergency resource organizations.

.4 Harmonize Plan with Park's Emergency Response and Evacuation Plan. Departmental Representative will provide pertinent data including name of PCA and Park Management contacts.

.4 On-site Communication Plan:

.1 Procedures for sharing of work related safety information to Subcontractors, including emergency and evacuation measures.

.2 List of critical work activities to be communicated with Park Manager that have a risk of endangering health and safety of Park users.

.5 Address all activities of the Work including those of subcontractors and suppliers.

.6 Review Health and Safety Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever a new subcontractor or supplier arrives at Work Site.

.7 Departmental Representative will respond in writing where deficiencies or concerns are noted and may request re-submission of the Plan with correction of deficiencies or concerns.

.8 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and authority having jurisdiction, weekly.

.9 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.

.10 Submit copies of incident and accident reports.

.11 Submit WHMIS MSDS - Material Safety Data Sheets.

.3 Filing of Notice:

.1 File Notification of Construction Project with Provincial authorities prior to beginning of Work.

.4 Meetings:

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

.5 Regulatory Requirements:

.1 Do Work in accordance with REGULATORY REQUIREMENTS.

.6 Responsibility:

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

.7 Province of Newfoundland and Labrador Compliance Requirements:

.1 Comply with Occupational Health and Safety Act and regulations, Workers Compensation Act and regulations, Workplace Hazardous Materials Information System Regulations.

.8 Unforeseen Hazards:

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

.9 Health and Safety Coordinator:

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:

.1 Have site-related working experience specific to activities.

.2 Have working knowledge of occupational safety and health regulations.

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully trained are not permitted to enter site to perform Work.

.4 Be responsible for implementing, enforcing daily, and monitoring site-specific Contractor's Health and Safety Plan.

.5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

.10 Posting of Documents:

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

.11 Correction of Non-Compliance:

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

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

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

.12 Powder Actuated Devices:

.1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

.13 Work Stoppage:

.1 Give precedence to the health and safety of the public, anyone visiting or working at worksite, and wildlife, and protection of the environment over cost and schedule considerations for Work.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Environmental Requirements: refer to specification Section 01 35 43.

1.10 REGULATORY REQUIREMENTS

.1 Parks Canada:

.1 Work shall comply with or exceed the requirements of the following:

.1 Canada National Parks Act (S.C. 2000, c. 32), current edition to August 15, 2016.

.2 National Parks Building Regulations (C.R.C., c. 1114).

.2 References and Codes:

.1 Work shall comply with or exceed the requirements of the National Building Code of Canada, 2010, and Amendments up to bid closing date, NL Department of Transportation and Works Specifications Book (2011) and Amendments, NL Department of Transportation and Works Traffic Manual (2014) and Amendments, and other codes of federal, provincial or local application provided that in case of conflict or discrepancy the more stringent requirements apply. Conflicts or discrepancies shall be resolved at the sole and final discretion of the Departmental Representative.

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes, and referenced documents.

.3 Regions and Municipalities:

.1 The work shall comply with or exceed the requirements of by-laws and ordinances of the jurisdiction of the project and the direction of authorities having jurisdiction as determined by the Departmental Representative.

1.11 QUALITY CONTROL

.1 Definitions:

.1 Corrective Action: Steps that are taken to remove the causes of an existing non-conformity or undesirable situation. The corrective action process is designed to prevent the recurrence of non-conformities or undesirable situations. It tries to make sure that existing non-conformities and situations do not happen again. It tries to prevent recurrence by eliminating causes.

.2 Hold Point: A mandatory verification point beyond which a Work Process cannot proceed without authorization by Departmental Representative. Hold Points may be nominated by Departmental Representative. The issuance of a Non-Conformance or Corrective Action report by Departmental Representative automatically creates a Hold Point for the Work Processes affected.

.3 Non-Conformance: When one or more characteristics of an installation fail to meet specified requirements, it is referred to as Non-conformance. When an installation deviates from specified requirements, it fails to conform. Non-conformance must be identified and rectified.

.2 Inspection:

.1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections, or approvals by Departmental Representative instructions, or law of Place of Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections, or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

.3 Independent Inspection Agencies:

.1 Independent Inspection/Testing Agencies will be selected by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative, Pay costs for retesting and re-inspection.

.4 Access to Work:

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Cooperate to provide reasonable facilities for such access.

.5 Procedures:

.1 Notify appropriate agency in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

.6 Rejected Work:

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If, in opinion of Departmental Representative, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

.7 Reports:

.1 Submit electronic copies of inspection and test reports to Departmental Representative.

.2 Provide copies to subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested.

.8 Tests and Mix Designs:

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

.9 Mock-Ups:

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.

.2 Construct in locations acceptable to Departmental Representative or as specified in specific Section.

.3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension because of such default will be allowed.

.5 If requested, Departmental Representative will assist in preparing schedule, fixing dates for preparation.

.6 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.

.7 Mock-ups may remain as part of Work.

.8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

.10 Mill Tests:

.1 Submit mill test certificates as requested or required of specification Sections.

.11 Equipment and Systems:

.1 Submit adjustment and balancing reports for mechanical, electrical, and building equipment systems.

1.12 TEMPORARY UTILITIES

.1 References:

.1 National Building Code of Canada 2010

.1 Part 8 Safety Measures and Construction and Demolition Sites.

.2 National Fire Code of Canada 2010

.1 Part 5 Hazardous Processes and Operations.

.3 Canadian Standards Association (CSA International)

.1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

.2 Installation and Removal:

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

.3 Water Supply:

.1 Provide continuous supply of potable water for construction use.

.2 Pay for utility charges at prevailing rates.

.3 Arrange for connection with appropriate utility company and pay costs for installation, maintenance, and removal.

.4 Temporary Heating and Ventilation:

.1 Provide and pay for temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

.5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.

.5 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

.7 Permanent heating system of building, not to be used unless authorized in writing by the Departmental Representative. Be responsible for damage to heating system if use is permitted.

.8 On completion of Work for which permanent heating system is used, replace filters and replace bearing. Thoroughly clean permanent equipment used during construction.

.9 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Departmental Representative.

.10 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

.5 Temporary Power and Light:

.1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools and equipment as required.

.2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.

.3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Departmental Representative.

.4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

.5 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

.6 Temporary Communication Facilities:

.1 Provide and pay for temporary telephone, fax, and data hook up lines and equipment as required.

.7 Fire Protection:

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.

1.13 CONSTRUCTION FACILITIES

.1 Scaffolding:

.1 Scaffolding: to CAN/CSA S269.2-M87 (R2003) - Access Scaffolding for Construction Purposes.

.2 Provide and maintain scaffolding, ramps, ladders, platforms, and temporary stairs.

.2 Hoisting:

.1 Provide, operate, and maintain hoists required for moving of materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.

.2 Hoists to be operated by qualified operator.

.3 Site Storage/Loading:

.1 Confine work and operations of employees by Contract Documents. Do not encumber premises with products.

.2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

.4 Construction Parking:

.1 Parking will be permitted on site.

.2 Provide and maintain adequate access to project site.

.5 Security:

.1 The Contractor is responsible for the security and safety of the site and building for the duration of the Contract.

.2 Provide fencing and additional security as deemed necessary.

.6 Offices:

.1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.

.2 Provide marked and fully stocked first-aid case in a readily available location.

.3 Subcontractors to provide their own offices as necessary. Direct location of these offices.

.4 The area of Work is available at Contractor’s option for project administrative use.

.7 Equipment, Tool and Materials Storage:

.1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment, and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

.8 Sanitary Facilities:

.1 Provide temporary sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

.3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Departmental Representative.

.9 Protection and Maintenance of Traffic:

.1 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.

.2 Protect travelling public from damage to person and property.

.3 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

.4 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

.5 Dust control: adequate to ensure safe operation at all times.

.6 Provide snow removal during period of Work.

.10 Clean-up:

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material not in construction facilities.

1.14 TEMPORARY BARRIERS AND ENCLOSURES

.1 Installation and Removal:

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

.2 Weather Enclosures:

.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.3 Design enclosures to withstand wind pressure and snow loading.

.3 Dust Tight Screens:

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

.2 Maintain and relocate protection until such work is complete.

.4 Access to Site:

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

.5 Fire Routes and Exits:

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

.6 Protection of Off-Site and Public Property:

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

.7 Protection of Building Finishes:

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

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

1.15 COMMON PRODUCT REQUIREMENTS

.1 References:

.1 Within text of each specifications section, reference may be made to reference standards.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested or to receive test data.

.4 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.2 Quality:

.1 Products, materials, equipment, and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source, and quality of products provided.

.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.3 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

.3 Availability:

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be reviewed for possible authorization in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

.4 Storage, Handling and Protection:

.1 Handle and store products in manner to prevent damage, adulteration, deterioration, and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over nameplates.

.5 Transportation:

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

.6 Manufacturer’s Instructions:

.1 Unless otherwise indicated in the specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions.

.7 Quality of Work:

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in his or her required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

.8 Coordination:

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves, and accessories.

.9 Concealment:

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls, and ceilings, except where indicated otherwise.

.2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

.10 Remedial Work:

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

.11 Location of Fixtures:

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

.12 Fasteners:

.1 Fasteners used for exterior applications or at the exterior shell of buildings shall be SAE No. 304 stainless steel.

.2 Provide metal fastenings and accessories in same texture, colour, and finish as adjacent materials, unless indicated otherwise.

.3 Prevent electrolytic action between dissimilar metals and materials.

.4 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.5 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.6 Keep exposed fastenings to a minimum, space evenly and install neatly.

.7 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

.13 Fasteners – Equipment:

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use SAE No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal, and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

.14 Protection of Work in Progress:

.1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

.15 Existing Utilities:

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work.

.2 Protect, relocate, or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

1.16 PRODUCT OPTIONS AND SUBSTITUTIONS

.1 Definitions:

.1 Acceptable Materials: The term Acceptable Materials is used to specify products by trade name, manufacturer, catalogue number, model number, or similar reference, and is used within the Project Manual as follows:

.1 Acceptable Materials listings are based on Departmental Representative's determination that materials meet specified requirements and opinion of applicability to the project requirements.

.2 Acceptable Materials listings are deemed to establish the minimum standard of acceptance that Departmental Representative will consider appropriate for the Work.

.3 Any product listed in the Acceptable Materials listing may be used to establish the Bid Price, unless an Addendum is issued adding additional Acceptable Materials.

.2 Basis-of-Design: The term Basis-of-Design is used to specify a specific material name, manufacturer, catalogue number, model number, or similar reference and is used as follows:

.1 Basis-of-Design Materials are used to establish Departmental Representative's minimum criteria for a product based on performance, material properties, appearance, and configuration.

.2 Use the Basis-of-Design Material to establish the Bid Price, unless an Addendum is issued adding additional Acceptable Materials.

.3 Non-proprietary specification means a specification that includes descriptive, reference standard, or performance requirements, or any combination thereof, but does not include proprietary names of products or manufacturers.

.4 Substitution means a proposal from a Contractor to provide a product, material, or item of equipment not specified in the Contract documents but functionally equivalent and readily exchangeable to a specified item, for consideration by Departmental Representative.

.2 Submittals:

.1 Submit complete data substantiating compliance of a product with requirements of Contract Documents. Include the following:

.1 Product identification, including manufacturer's name and address.

.2 Manufacturer's literature providing product description, applicable reference standards, and performance and test data.

.3 Samples, as applicable.

.4 Name and address of projects on which product has been used and date of each installation.

.5 For substitutions and requests for changes to accepted products, include in addition to the above, the following:

.1 Written verification that the substitute products can be obtained, meet the performance required for the project, and meet requirements of the National Building Code of Canada, 2010.

.2 Itemized comparison of substitution with named product(s). List significant variations.

.3 Designation of availability of maintenance services and sources of replacement materials.

.3 Product Options:

.1 For products specified by non-proprietary specification:

.1 Select any product, assembly, or material that meets or exceeds the specified standards for products specified only by referenced standards and performance criteria.

.2 Acceptable Materials: Select any named product, assembly, or material contained in the listing of Acceptable Materials, unless an addendum is issued indicating acceptance of additional Acceptable Materials.

.3 Basis-of-Design: Use the named product contained in the Basis-of-Design Material listing, unless an addendum is issued indicating acceptance of additional Acceptable Materials.

.4 Substitutions:

.1 Contractor will assemble requests for substitutions requested by subcontractors and submit to Departmental Representative for review.

.2 Departmental Representative will review proposed substitute products for acceptability only when submitted by Contractor; Departmental Representative will not review requests submitted independently by subcontractors.

.3 No substitutions will be permitted without Departmental Representative's written acceptance; Contractor will be required to remove products and replace with specified materials or provide a credit to the value of the contract at Departmental Representative's discretion where substitutions are found in the Work that have not been formally accepted by Departmental Representative.

.4 Departmental Representative is not obliged to accept any Proposed Substitution offered by Contractor, and reserves the right to dismiss any item with no further explanation.

.5 Substitute Products: Where substitute products are permitted, unnamed products may be accepted by Departmental Representative, subject to the following:

.1 Substitute products shall be the same type as, be capable of performing the same functions as, and meet or exceed the standards of quality and performance of the named product(s). Substitutions shall not require revisions to Contract Documents nor to work of Other Contractors.

.6 Substitute Manufacturers: Where substitute manufacturers are permitted, unnamed manufacturers may be accepted by Departmental Representative, subject to the following:

.1 Substitute manufacturers shall have capabilities comparable to those of the named manufacturer(s). Substitutions shall not require revisions to Contract Documents nor to work of Other Contractors.

.7 In making a proposal for substitution, the Contractor represents:

.1 That they have personally investigated the proposal and (unless the proposal explicitly states otherwise) determined that it performs in a similar way or is superior to the product or method specified.

.2 That the same guaranty will be furnished as for the originally specified product or construction method.

.3 That they will coordinate installation of the accepted substitute into the Work, making such changes in the Work as may be required to accommodate the change.

.4 That they will bear costs and waives claims for additional compensation for costs and time that subsequently become apparent arising out of the substitution.

1.17 EXAMINATION AND PREPARATION

.1 Existing Services:

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

.2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

.2 Location of Equipment and Fixtures:

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

.3 Records:

.1 Record locations of maintained, re-routed and abandoned service lines.

.4 Submittals:

.1 Submit name and address of Surveyor to Departmental Representative.

.2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

.5 Subsurface Conditions:

.1 Promptly notify Departmental Representative in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

1.18 EXECUTION

.1 Submittals:

.1 Submit written request in advance of cutting or alteration that affects:

.1 Structural integrity of elements of project.

.2 Integrity of weather-exposed or moisture-resistant elements.

.3 Efficiency, maintenance, or safety of operational elements.

.4 Visual qualities of sight-exposed elements.

.5 Work of Departmental Representative or separate contractor.

.6 Tenants of occupied portions of building.

.2 Include in request:

.1 Identification of project.

.2 Location and description of affected Work.

.3 Statement on necessity for cutting or alteration.

.4 Description of proposed Work, and products to be used.

.5 Alternatives to cutting and patching.

.6 Effect on Work of Departmental Representative or separate contractor or tenants.

.7 Written permission of affected separate contractor.

.8 Date and time the Work will be executed.

.2 Materials:

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Submittal Procedures.

.3 Preparation:

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas that are to be exposed by uncovering work; maintain excavations free of water.

.4 Execution:

.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Remove samples of installed Work for testing.

.6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.7 Execute Work by methods to avoid damage to other Work, and that will provide proper surfaces to receive patching and finishing.

.8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.10 Restore work with new products in accordance with requirements of Contract Documents.

.11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material, full thickness of the construction element.

.13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

.14 Conceal pipes, ducts and wiring in floor, wall, and ceiling construction of finished areas except where indicated otherwise.

1.19 CLEANING

.1 Project Cleanliness:

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Departmental Representative or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling. Refer to WASTE MANAGEMENT AND DISPOSAL.
- .7 Dispose of waste materials and debris off site.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

.2 Final Cleaning:

- .1 Clean work prior to final review by Departmental Representative.
- .2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5 Remove waste products and debris including that caused by Departmental Representative or other Contractors.
- .6 Remove waste materials from site in accordance with WASTE MANAGEMENT AND DISPOSAL.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 Remove stains, spots, marks, and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and horizontal hard surfaces.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.

.10 Inspect finishes, fitments, and equipment and ensure specified workmanship and operation.

.11 Broom clean and wash exterior walks, steps, and surfaces; rake clean other surfaces of grounds.

.12 Remove dirt and other disfiguration from exterior surfaces.

.13 Sweep and wash clean paved areas.

.14 Clean drainage systems.

.15 Remove debris and surplus materials from accessible concealed spaces.

1.20 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Management Goals:

.1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss Waste Management Plan and Goals.

.2 Waste Management Goal is to divert 75% construction and demolition materials considered recyclable from landfill sites, and reduce jobsite waste in compliance with Canadian Construction Association CCA 81 - 2001: A Best Practices Guide to Solid Waste Reduction.

.3 Accomplish maximum control of solid construction and demolition waste.

.4 Preserve environment and prevent pollution and environment damage.

.2 Definitions:

.1 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.2 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.3 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.4 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Returning reusable items including pallets or unused products to vendors.

.5 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.6 Separate Condition: refers to waste sorted into individual types.

.7 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

.3 Materials Source Separation Program (MSSP):

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated materials in areas that minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.

.1 Transport to approved and authorized recycling facility.

.2 Ship materials to site operating under Certificate of Approval.

.3 Materials must be immediately separated into required categories for reuse or recycling.

.4 Storage, Handling and Protection:

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.

.7 Protect surface drainage, mechanical and electrical from damage and blockage.

.8 Separate and store materials produced during dismantling of structures in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off-site processing facility for separation.

.5 Disposal of Waste:

.1 All demolition and construction waste shall be disposed of in a legal manner off-site, and outside of Park boundaries and property.

.2 Do not bury rubbish or waste materials.

.3 Burning rubbish and construction waste materials is not permitted on site.

.4 Do not dispose of waste, volatile materials, mineral spirits, oil, and paint thinner into waterways, storm, or sanitary sewers.

.5 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Reused or recycled waste destination.

.6 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

1.21 CLOSEOUT PROCEDURES

.1 Inspection and Declaration:

.1 Contractor's Inspection: Contractor and Subcontractors: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract.

.1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.

.2 Request Departmental Representative's Field Review.

.3 Departmental Representative's Field Review: Departmental Representative and Contractor will perform review of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.

.2 Completion: submit written certificate that following have been performed:

.1 Work has been completed and inspected for compliance with Contract.

.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, adjusted and balanced and are fully operational.

.4 Certificates required by Boiler Inspection Branch, Fire Commissioner, and Utility companies have been submitted.

.5 Operation of systems have been demonstrated to Departmental Representative's personnel.

.6 Work is complete and ready for final inspection.

.3 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative, Departmental Representative, and Contractor. If Work is deemed incomplete by Departmental Representative complete outstanding items and request re-inspection.

.4 Declaration of Certificate of Substantial Performance: when Departmental Representative consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance.

.5 Commencement of Lien and Warranty Periods: date of Departmental Representative's acceptance of submitted declaration of Substantial Performance shall be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.6 Final Payment: when Departmental Representative consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

.7 Payment of Holdback: after issuance of certificate of Substantial Performance, submit an application for payment of holdback amount.

.2 Cleaning:

.1 In accordance with CLEANING.

.2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with WASTE MANAGEMENT AND DISPOSAL.

1.22 CLOSEOUT SUBMITTALS

.1 Submittals in accordance with SUBMITTAL PROCEDURES:

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.2 Copy will be returned after final inspection, with Departmental Representative's comments.

.3 Revise content of documents as required prior to final submittal.

.4 Two weeks prior to Substantial Performance, submit to the Departmental Representative, two final copies and one digital version of Operating and Maintenance manuals in English.

.5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.6 Furnish evidence, if requested, for type, source and quality of products provided.

.7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.8 Pay costs of transportation.

.9 Submit `redline` marked up construction drawings to the Departmental Representative within 30 days of Substantial Performance and prior to Final Completion.

.2 Operations and Maintenance Manual Format:

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, process flow, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in dwg format on CD.

.3 Contents – Each Volume:

.1 Table of Contents: provide title of project;

.1 Date of submission; names.

.2 Addresses, and telephone numbers of Departmental Representative and Contractor with name of responsible parties.

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

.4 As-Built Drawings and Samples:

.1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

.5 Recording Actual Site Conditions:

.1 Record information on set of drawings, and in copy of Project Manual, provided by Departmental Representative.

.2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, and field test records, required by individual specifications sections.

.6 Materials and Finishes:

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional Requirements: as specified in individual specifications sections.

.7 Maintenance Materials:

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site, location as directed; place and store.

.4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Operating and Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

.8 Special Tools:

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to site, location as directed; place and store.

.4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Operating and Maintenance Manual.

.9 Storage, Handling and Protection:

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.10 Warranties and Bonds:

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.

.3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.

.6 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

.7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.8 Conduct joint 4-month and 9-month warranty inspection, measured from time of acceptance, by Departmental Representative.

.9 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.

.2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, pumps, motors, transformers.

.3 Provide list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at 4-month and 9-month post-construction warranty inspections.

.5 Procedure and status of tagging of equipment covered by extended warranties.

.6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.10 Respond in a timely manner to oral or written notification of required construction warranty repair work.

.11 Written verification will follow oral instructions. Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

.11 Pre-Warranty Conference:

.1 Meet with Departmental Representative to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Departmental Representative.

.2 Departmental Representative will establish communication procedures for:

.1 Notification of construction warranty defects.

.2 Determine priorities for type of defect.

.3 Determine reasonable time for response.

.3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

.12 Equipment Warranty Tags:

.1 Tag, at time of installation, each warranted equipment item. Provide durable, oil and water-resistant tag approved by Departmental Representative.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate following information on tag:

.1 Type of product/material.

.2 Model number.

.3 Serial number.

.4 Contract number.

.5 Warranty period.

.6 Inspector's signature.

.7 Contractor.

END OF SECTION

1.1 REFERENCES

.1 Parks Canada Agency

.1 Basis Impact Analysis (BIA), attached following this Section.

.2 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832/R-92-005-92, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices, Chapter 3 - Sediment and Erosion Control.

.3 Federal and Provincial Legislation (current editions)

.1 Parks Canada Act.

.2 Environment Canada Regulations.

.3 NL Department of Environmental & Conservation Regulations.

1.2 DEFINITIONS

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

.3 Before commencing construction activities or delivery of materials to site, submit the following plans for review and approval by Departmental Representative:

.1 Erosion and Sediment Control Plan as specified below, item 1.6 of this specification section.

.2 Historical, archaeological, cultural resources, biological resources, and wetlands plan as specified below, item 1.10 of this specification section.

.3 Environmental Protection Plan as specified below, item 1.11 of this specification section.

1.4 FIRES

.1 Fires, and burning of rubbish on site, are not permitted.

1.5 DISPOSAL OF WASTES

.1 Disposal of wastes, to Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Do not bury rubbish and waste materials on site or anywhere on Terra Nova National Park property. Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.6 DRAINAGE

.1 Develop and submit Erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations, EPA 832/R-92-005, Chapter 3.

.2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.

.3 Provide temporary drainage and pumping required to keep excavations and site free from water.

.4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.

.5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.7 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and shrubs, to 32 01 90.33 – Tree and Shrub Protection.

.2 Protect trees and plants on site unless otherwise indicated on Drawings.

.3 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.

.4 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.5 Minimize stripping of topsoil and vegetation.

.6 Restrict tree removal to footprint of new construction, or as additionally designated and approved by Departmental Representative.

1.8 WORK ADJACENT TO WATERWAYS

.1 Construction equipment to be operated on land only.

.2 Do not use waterway beds for borrow material.

.3 Waterways to be kept free of excavated fill, waste material and debris.

.4 Design and construct temporary crossings to minimize erosion to waterways.

.5 Do not skid logs or construction materials across waterways.

.6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

.7 Blasting is prohibited except with the express, written permission of Departmental Representative.

1.9 POLLUTION CONTROL

.1 Prior to the commencement of construction activities, prepare an Environmental Protection Plan that addresses procedures to follow in the event of a pollution incident, and ensure all staff are aware of these procedures. Provide copy of plan to the Departmental Representative.

.2 Immediately report any environmental emergency, such as a spill of a contaminant for example; refer to Section 01 11 10, article 1.6 Emergency Contact Information.

.3 Remove temporary erosion and pollution control measures prior to project completion unless directed otherwise.

.4 Control emissions from equipment to requirements of authority having jurisdiction and directions of Departmental Representative.

.5 Provide temporary enclosures to protect environment from effects of construction-generated deleterious airborne materials.

.6 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

.7 Keep paved surfaces clean. Control dust by application of calcium chloride, magnesium chloride or water.

1.10 HISTORICAL AND ARCHAEOLOGICAL CONTROL

.1 Provide historical, archaeological, cultural resources, biological resources, and wetlands plan that identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.

.2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

1.11 ENVIRONMENTAL PROTECTION PLAN

.1 Prior to the commencement of Work, develop a written Environmental Protection Plan specific to the Work. Implement, maintain, and enforce the plan for the entire duration of work until final demobilization from site.

.2 Environmental Protection Plan shall include the following components:

.1 Scope of Work for Environmental Consideration.

.2 Potential Environmental Impacts.

.3 Environmental Emergency Response Contacts as specified below.

.4 Environmental Emergency Response Plan as specified below.

.3 Environmental Emergency Response Contacts shall include:

.1 Contact information for:

.1 Environmental Spills.

.2 Medical/Emergency Services.

.3 Project Contacts.

.2 Name and telephone number of officials from:

.1 Departmental Representative.

.2 Pertinent Federal and Provincial Departments and Authorities having jurisdiction.

.3 Local emergency resource organizations.

.4 Environmental Emergency Response Plan shall include:

.1 Procedures for Preventing Environmental Emergencies.

.2 Procedures for Reporting and Restoration in case of emergency.

.3 Details of Spill Response Kits.

.5 Detail the Environmental Protection Measures required when dealing with:

.1 Site Preparation.

.2 Cultural and Natural Resources.

.3 Instream Work & Work Adjacent to Waterways.

.4 Site Clearing.

.5 Erosion Control.

.6 Wildlife Interaction.

.7 Fires.

.8 Garbage.

.9 Invasive Plants.

.10 Site Cleanup and Restoration.

.6 Address all activities of the Work including those of subcontractors and suppliers.

.7 Review the Environmental Protection Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever a new subcontractor or supplier arrives at Work Site.

.8 Departmental Representative will respond in writing, where deficiencies or concerns are noted and may request re-submission of the Plan with correction of deficiencies or concerns.

1.12 PERMITS AND APPROVALS

.1 Refer to Section 01 11 10 – General Requirements: Work Restrictions.

.2 Obtain copies of any permits or approvals issued by agencies having jurisdiction. Review and comply with the conditions contained in the permit or approval.

.3 Where permits or approvals are required and not obtained at time of bidding, be responsible for obtaining permits or approvals.

.1 List all activities that require approval as identified by the Environmental Protection Act and regulations of Newfoundland and Labrador, and Parks Canada.

.4 Inform employees and subcontractors of the terms and conditions of any permit or approval.

.5 Provincial Permit required for taking water from Salmon River.

1.13 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed non-compliance with federal, provincial or regional environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor shall, after receipt of such notice, inform Departmental Representative of proposed corrective action, and take such action for approval by Departmental Representative.

.3 Departmental Representative shall issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

1.14 PARKS CANADA BASIC IMPACT ASSESSMENT (BIA)

.1 The BIA completed for this project is attached, following this Section.

.1 Comply with the recommended Mitigation Measures, found on pp. 11 - 17 of the BIA analysis document, which are part of Contract as if repeated here in full.

.2 Notify Departmental Reprehensive of any anticipated deviations from the recommended Mitigation Measures for review and approval. Compliance with the Mitigation Measures is mandatory unless a written exception is provided by the Departmental Reprehensive in response to Contractor’s submitted alternate plan.

END OF SECTION

Basic Impact Analysis (BIA)

Park Entrance Recapitalization

Terra Nova National Park of Canada
Newfoundland and Labrador

September 2016

Parks Canada Parcs Canada

Parks Canada Basic Impact Analysis

1. PROJECT TITLE & LOCATION

Terra Nova Park Entrance Recapitalization, Terra Nova National Park of Canada, Newfoundland and Labrador

2. PROPONENT INFORMATION

Darren Fitzgerald, P. Eng., Highway Engineering Services – East,
Parks Canada - Gros Morne National Park,
P.O. Box 130, 3 DOT Drive,
Rocky Harbour, NL, A0K 4N0

darren.fitzgerald@pc.gc.ca
Telephone: (709) 458-3469
Cell: (709) 458-8672
Facsimile: (709) 458-3318

3. PROPOSED PROJECT DATES

Planned commencement: 2016-09-19
Planned completion: 2017-03-31

4. INTERNAL PROJECT FILE

TN-2016-21

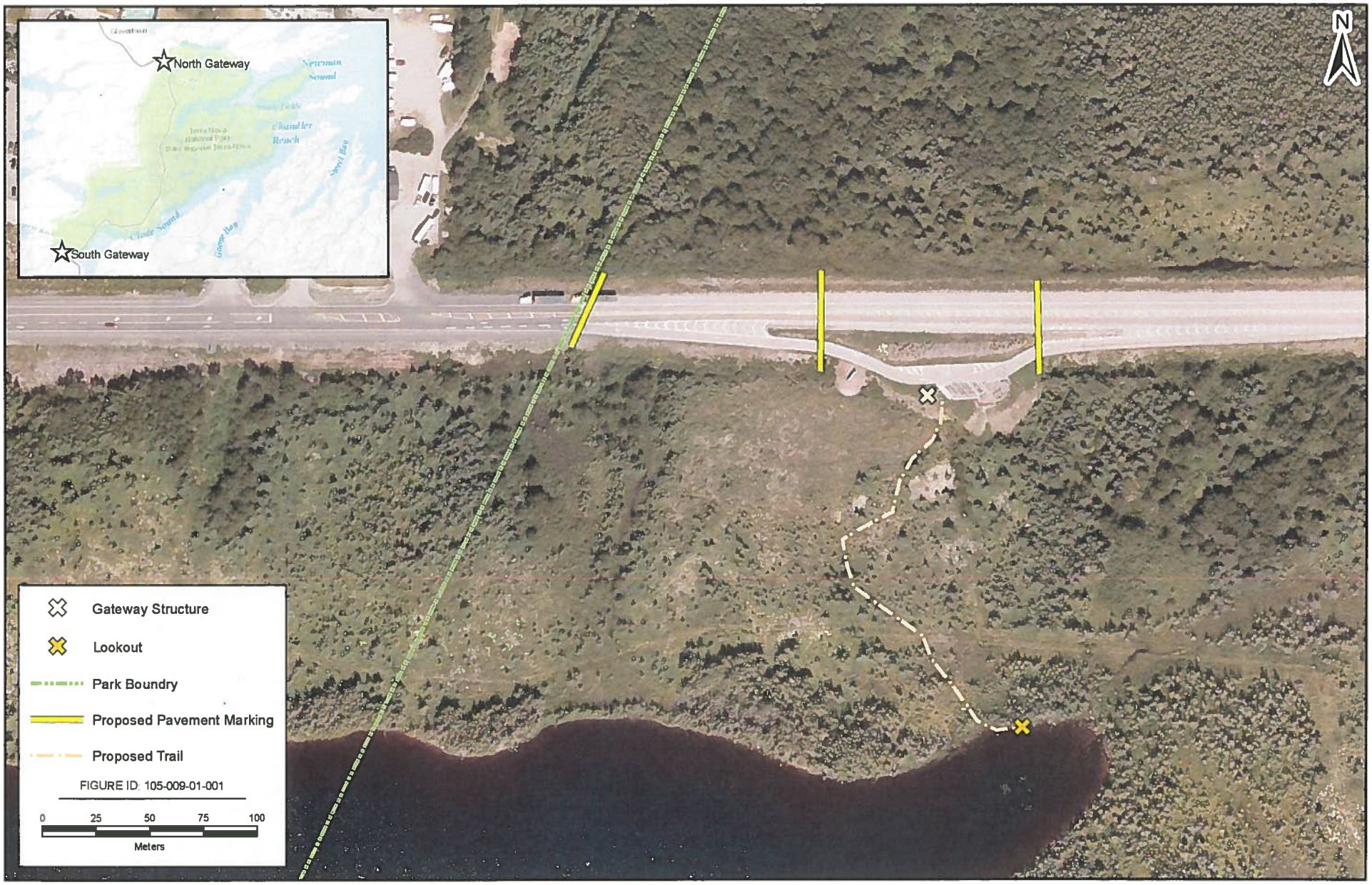
5. PROJECT DESCRIPTION

The Park Entrance Recapitalization Project is proposed in order to achieve a more appealing welcome to visitors coming into Terra Nova National Park (TNNP) from both the north and south entrances along Highway 1 (Trans-Canada Highway, TCH). TNNP was officially recognized in 1957, when it became Newfoundland and Labrador's first national park. Today, tourists continue to be attracted to the park due to its abundance of wildlife, exceptional scenery, renowned salmon fishing pools, award winning golf courses and array of recreational activities.

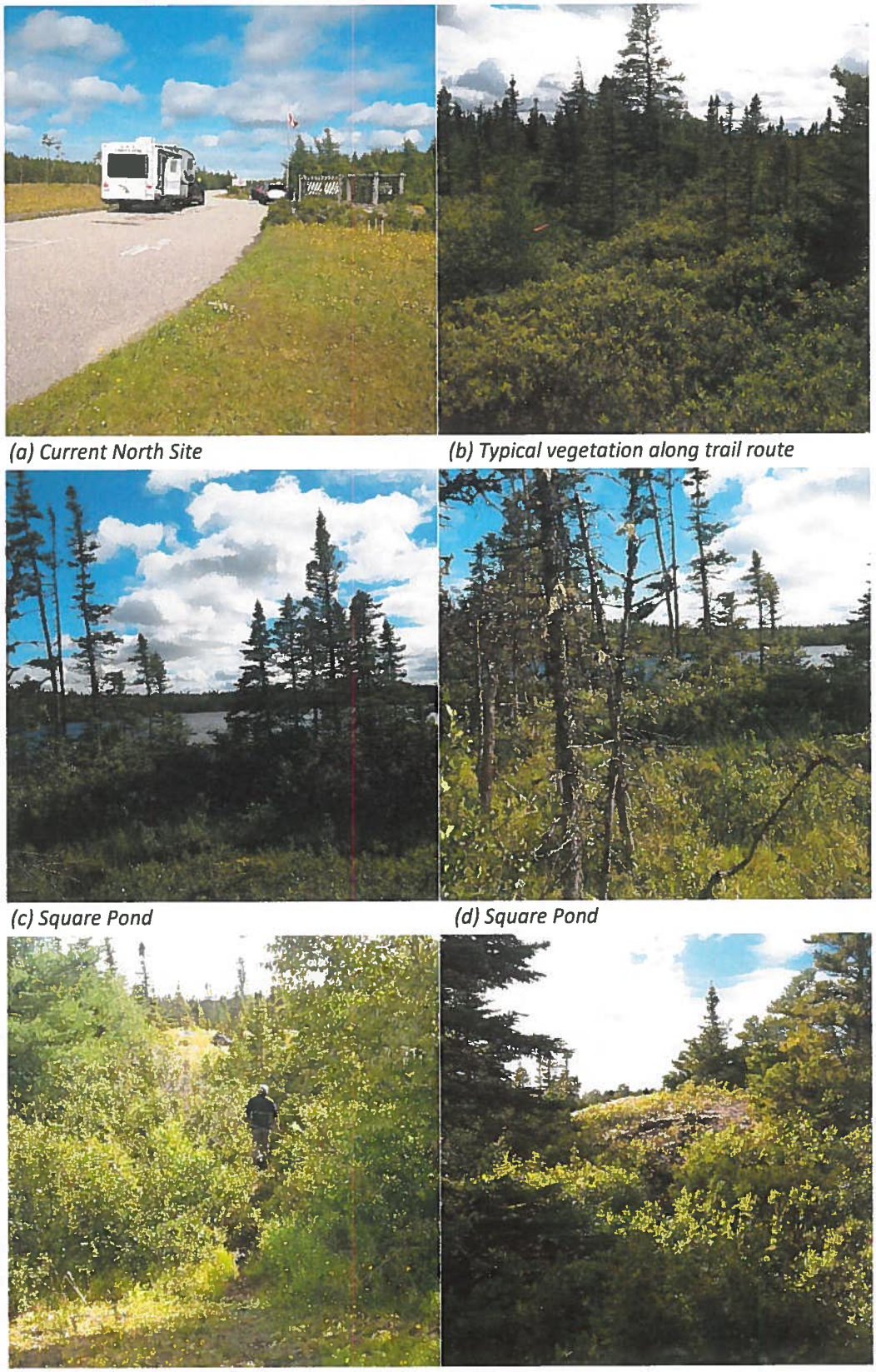
As per the TNNP Management Plan (2009), park stakeholders and visitors alike have communicated that there are problems with the lack of information and orientation in the park, such as poor/ineffective signage along the TCH, poor directional signage once in the park, poor location of information for new visitors and lack of demarcation of park limits. The park entrance project will allow visitors a more formal gateway to the park, emphasizing various natural aspects of the park.

These new park entrances will include pavilions and composting washrooms. They will incorporate more natural elements with different activities, and the use of artificial structures will be reduced. Improved pathways and trails will be incorporated into the plans using low maintenance approaches versus boardwalks. These trails will be based on present trails, easiest grades and driest routes and will be wheelchair accessible.

The north entrance site will be at the same location of the existing rest stop along the TCH, at approximate UTM coordinates 22U, E 280766, N 5391777, about 250m east of the Splash 'n Putt (Figure 1). This project area will include the area between the rest stop and Square Pond. Project components will include painted pavement markings to signify the entrance to the park, new and relocated signage, modifications to the existing parking area, and a new gateway structure which will be a visual cue for oncoming traffic.. The new gateway structure will also incorporate interpretive panels, include washrooms and will function as a trailhead (Attachment 1). Some areas of the existing asphalt and concrete curbs will be removed and disposed of. The existing sign will be removed and stored for reinstallation. All excavated footings, foundations, pavements, etc. will be backfilled with clean fill and reinstated with topsoil and local sod. About 50 spruce and birch trees are expected to be removed from the area. Any trees and shrubs that will be required for replanting will be locally supplied.



Public Works and Government Services Canada	Terra Nova National Park - North Gateway Proposal	FIGURE NO **Figure 1**	PREPARED BY SEM
	Overview Map	COORDINATE SYSTEM **UTM Zone 22**	DATE **20/07/2016**



(a) Current North Site *(b) Typical vegetation along trail route*

(c) Square Pond *(d) Square Pond*

(e) Trail route toward Square Pond *(f) Rock outcrop*

Figure 2 North Site Photographs.

A trail is also proposed to provide visitors with a mini experience of the park and an introduction to its varied landscape. The trail will be one way (in and out) to a viewing platform at Square Pond. A rock outcrop is present near the parking area which will attract visitors and provide a view of the area (Figure 2f).

The south entrance site will be just to the south of the current rest stop, about 1km southwest of the Twin Rivers Golf Course along the TCH (Figure 3), approximate UTM coordinates 22U, E 706807, N 5363705. This project area will extend east of the highway and then south almost to Salmon River (locally referred to as Salmon Brook). A section of the south site contains perceived inert material that has been left over from a previous dumping ground. Parks Canada has investigated this particular site and has concluded that there is no human health or ecological risk.

The south entrance part of the project will include removal and remediation of the current gateway site. All disturbed areas will be reinstated with topsoil and fine-graded to ensure drainage away from the highway. The area will be hydro seeded with the mix to be determined. The existing wooden kiosk will be removed and disposed of. The existing asphalt paving and concrete curbs will be removed and reused by Parks Canada. A gravel shoulder will be reinstated along the edge of the highway. The existing well crocks and surrounding wood curbs will remain and be protected. The existing picnic tables will be removed and returned to Parks Canada. The flag and flag pole, along with light standard, are to be removed and relocated to the new gateway site. The existing trees are to remain and be protected by protection fence which will remain in place for the duration of the project (Attachment 1).

The south entrance site will be moved slightly south along the TCH which will make the entrance to be more visible to the travelling public and allow proximity to Salmon River. As at the north site, painted pavement markings and signage will be installed to signify entry to the park. The gateway structure will also be a visual cue for passing traffic and include interpretive panels, washrooms and function as a trailhead. A look-off near a rock outcrop is planned at the river along the trail which will attract visitors, provide an experience of the river and the possibility of additional interpretive materials. This location also holds the option for a third structure and possible trail extension (Figure 4).

Shrubs, perennials, both coniferous and deciduous trees will be planted at both sites. Rock lined ditches will be installed to ensure drainage is slowed (Attachment 1).

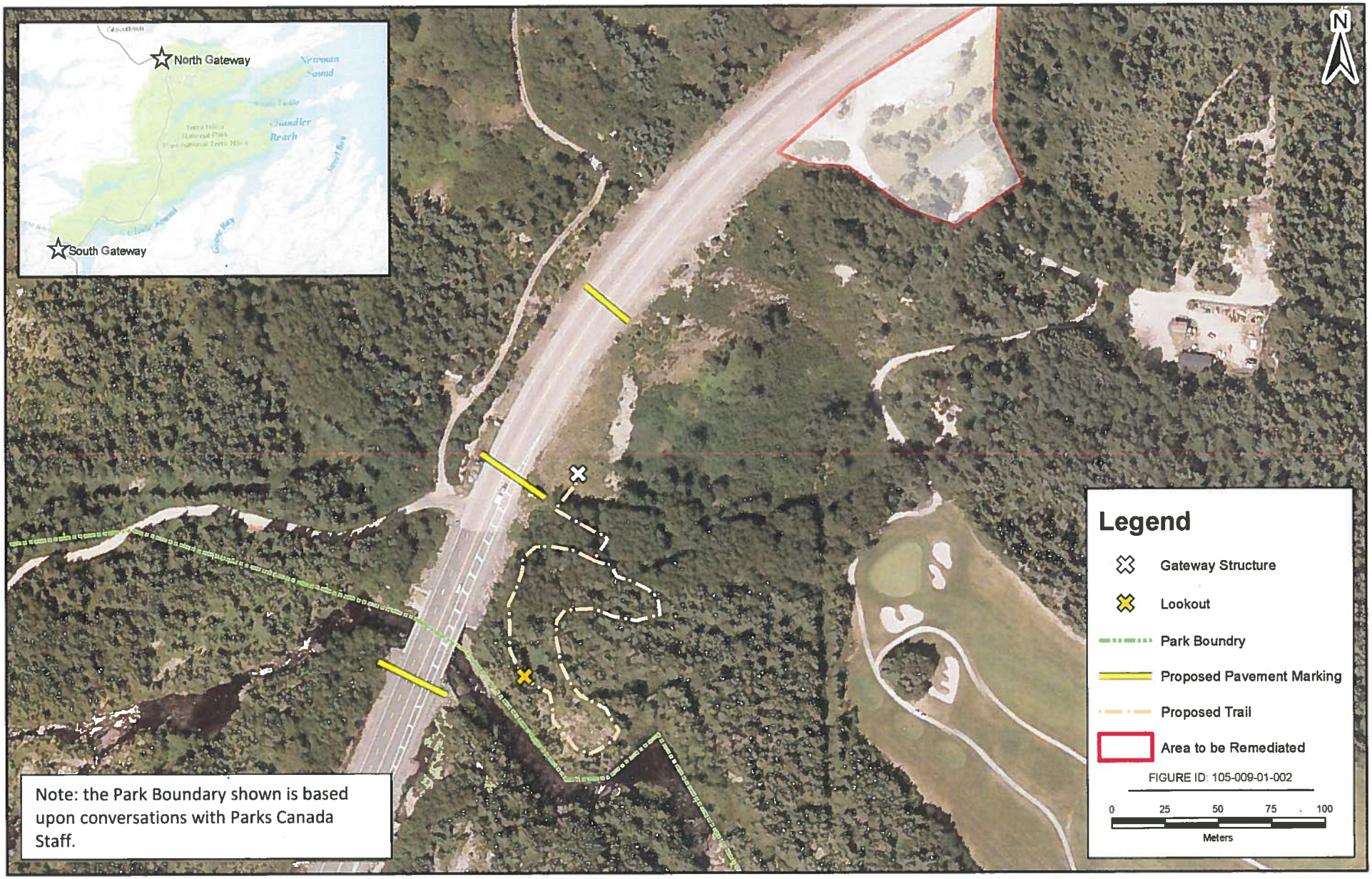
Construction of the park entrances and approaches will be completed with traditional construction techniques and equipment. Equipment expected to be utilized for this project includes standard light and heavy haul equipment, backhoes, excavators, dump trucks, etc.

The construction schedule is anticipated to commence in September 2016.

Regulatory Review, Permits and Approvals

Under Section 67 of the Canadian Environmental Assessment Act 2012, a federal authority such as Parks Canada cannot carry out a project on federal lands unless it first determines that the project will not cause significant adverse environmental effects. Therefore, Parks Canada are responsible for undertaking an environmental review of the proposed project. Parks Canada has decided that the environmental review process for the proposed project will require the completion of a Basic Impact Assessment (this document).

A scheduled salmon river is located in close proximity to the proposed look-off structure at the south entrance site (approximately 25 meters). Parks Canada manages such projects within their jurisdiction and have in-house expertise to ensure the protection of Salmon River and the surrounding environment. It is not typical procedure for Parks Canada to refer such projects to other federal or provincial agencies. There will be no in-water work in this river.



Public Works and Government Services Canada	Terra Nova National Park - South Gateway Proposal	FIGURE NO **Figure 3**	PREPARED BY SEM
	Overview Map	COORDINATE SYSTEM **UTM Zone 22**	DATE **20/07/2016**

(a) Existing South Site

(b) New South Site (facing north)

(c) New South Site (facing south)

(d) Typical Vegetation at South Site

(e) Proposed Lookout at Salmon River

(f) Trail Route for South Site (note the bottles/cans due to former dump site).

Figure 4 South Site Photographs.

6. VALUED COMPONENTS LIKELY TO BE AFFECTED

The geographic area of the valued components encompasses the general vicinity of the project construction sites illustrated in Figures 1 and 3.

Natural Resources

Atmospheric Environment

- Air Quality
- Noise and Vibration

Terrestrial Environment

Soils and Landforms

Terra Nova National Park (TNNP) is located within the Terra Nova Region of the Avalon Zone, one of four geological zones defined by Williams (1979). There are four main geological assemblages within the Terra Nova Area:

- Long Cove Group – consists primarily of deformed volcanic rocks;
- Connecting Point Group – consists primarily of layered marine sedimentary rocks;
- Musgravetown Group – consists primarily of terrestrial sedimentary and volcanic rocks; and
- Igneous inclusion (Sommerville, 1997).

TNNP is located in the Central Newfoundland Ecoregion of Newfoundland. This ecoregion is composed of a mixture of crystalline Paleozoic strata. Where stream erosion has cut deeply, the uplands are rugged and rocky, but elsewhere, they present a rolling terrain. Seven percent of TNNP is characterized as barren land, including rock barrens, kalmia barrens and transition barrens (Karim 2003). Four main types (orders) of soil are classified in the park such as Podzols, Regisols, Gleysols and Organics with Podzols being the dominant (Parks Canada 1984, 1977). The surface is dominated by hummocky to ridged, sandy morainal deposits with slopes that range from 5-30% and are associated with Humo-Ferric Podzols.

Water

According to the Terra Nova National Park Ecological Integrity Statement (2001), bald eagles, cod, capelin, sea-run trout and Atlantic salmon utilize the marine ecosystems of the park.

The park also contains 134 ponds, 86 brooks and rivers and extensive wetland habitat in the form of bogs, fens, marshes and swamps (Parks Canada 2009). The north site project will have a trail which will lead to an outlook at Square Pond, a pond approximately 0.3km^2 (Figure 2). The south site project trail will border Salmon River, a small scheduled salmon river that forms part of the border of the park (Figure 4).

Flora

Seventy-percent of the park is forested, with Black spruce (*Picea mariana*) being the dominant tree species, and smaller areas covered in Balsam fir (*Abies balsamea*) and hardwoods including white birch (*Betula papyrifera*), red maple (*Acer rubrum*) and trembling aspen (*Populus tremuloides*) (Parks Canada 2009). A few small planted stands of red pine (*Pinus resinosa*) can be found in the park but it is sensitive to environmental changes and regenerates slowly. Alders and other similar shrubs are also found as well as ground ferns, various mushrooms and snowberries. There are 523 species of vascular plants (Brouillet *et al.* 1998), 200 species of moss (Hedderson 1987) and 100 species of lichen (Yetman *et al.* 1999). Amongst the vascular plants, 427 are indigenous to the area, 89 introduced, 29 rare and seven hybrid species (Parks Canada 1984, 1977).

The Atlantic Population of the Boreal felt lichen (*Erioderma pedicullatum*), listed as endangered on Schedule 1 of SARA and Species of Special Concern by COSEWIC, and Blue felt lichen (*Degelia plumbea*) which are classified as Species of Special Concern by COSEWIC, are two species of lichen found in the park area.

The north site project area is dominated by spruce / coniferous forest and low growing scrub and bog. Alternatively, the south site project area is dominated by birch, poplar, pine and larch with understory shrubs. Some of the trail areas have red pine which are in danger of being lost from the island, however, these were planted during past rehabilitation projects. However, any red pine encountered as an obstacle during the trail development will be relocated/replanted whenever possible.

Fauna

Mammals:

The TNNP has a relatively limited number of animal species. Of the 21 species of terrestrial mammals found in the park only twelve are native to insular Newfoundland and Labrador (Parks Canada 2009). The Newfoundland marten (*Martes americanus atrata*), listed as a threatened species on the List of Wildlife Species at Risk set out under the *Species at Risk Act* (*SARA*) and extirpated from the park in the late 1970s, has been reintroduced. The habitat of deep coniferous woods is suitable for these species and can be found in both project locations.

Non-native mammals present in the park include moose (*Alces alces*), snowshoe hare (*Lepus americanus*) and red squirrel (*Tamiasciurus hudsonicus*). The little brown bat or little brown myotis (*Myotis lucifugus*) and Northern myotis (*Myotis septentrionalis*) are present in the park and protected under the federal *SARA* and has been classified as Endangered on an Emergency Listing.

Large mammals that are found within the park include black bear (*Ursus americanus*), moose and Newfoundland caribou (*Rangifer tarandus)*. The small mammals that may occur include Newfoundland marten, snowshoe hare, mink (*Neovison vison*), beaver (*Castor canadensis*), coyote (*Canis latrans*), fox (*Vulpes vulpes*), lynx (*Lynx canadensis*) and red squirrel.

Birds:

There are approximately 169 bird species found in the park and 63 species use the park as breeding grounds (Parks Canada 2009) and the park is also home to the Terra Nova Migratory Bird Sanctuary (TNMBS). As such, a vast variety of birds can be found near the marine shorelines and throughout the park. Nearly half of the birds on the list of species recorded at TNNP have been observed in or over the TNMBS. The main species groups are shorebirds, waterfowl and seabirds. A few hundred Canada Geese (*Branta Canadensis*), American Black Ducks (*Anas rubripes*), Common Goldeneye (*Bucephala clangula*) and Common mergansers (*Mergus merganser americanus*) use the sanctuary during fall migration, and shorebirds frequent the tidal flats during summer and early fall. While the overall numbers of migratory birds using the site are not large, the number of species is impressive. Around 30 species are recorded regularly within Newman Sound (Environment Canada 2014).

The Red crossbill (*Percna* subspecies, unique to insular Newfoundland) is found in the park area and is classified as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The Olive sided flycatcher (*Contopus cooperi*) which is classified as Threatened in SARA, and the rusty blackbird (*Euphagus carolinus*), Barrow's Goldeneye (*Bucephala islandica*), and the short eared owl (*Asio flammeus*) are also species at risk within the park (COSEWIC) and are classified as Special Concern SARA. The provincially vulnerable Gray-cheeked thrush (*Catharus minimus*) can also be found here. Other birds in the park area include osprey (*Pandion haliaetus*), eagle (*Haliaeetus leucocephalus)*, ruffed and spruce grouse (*Falcipennis canadensis*), great horned owl (*Bubo virginianus*), boreal owl (*Aegoluis funereus*), loon (*Gavia* genus), tern (*Sternidae* family), greater yellowleg (*Tringa melanoleuca*), spotted sandpiper (*Actitis macularius)*, white-winged crossbill (*Loxia leucoptera*), hawk owl, finches (*Fringillidea*), ducks (*Anatidae* family) and warblers (AMEC 2014).

Due to the proximity of the construction site to Hwy 1 on both the north and south sites, no impacts are anticipated as there shouldn't be any nesting sites within the construction area. If nesting sites are found during construction, the contractor will follow mitigations outlines in their environmental protection plan.

Fish:

There are seven freshwater species of fish found in TNNP, including Atlantic salmon, brook trout, Arctic char, American eel, rainbow smelt, three-spine stickleback and nine-spine stickleback (Parks Canada, 2009). Atlantic salmon and

brook trout include both resident and anadromous (spend part of life cycle in the ocean) populations. American eel are catadromous completing the reproductive process of their life cycle in the ocean. Of the seven species present, Atlantic salmon and brook trout are the two species that are harvested. The primary salmon run at Northwest River has shown considerable improvement over the past number of years and the health of fish populations is currently being assessed and research is determining the effects of recreational harvest on freshwater species. Unauthorized fishing activity occurs on a sporadic basis along the coastal areas outside of the park, with potential effects on trout and salmon populations. The south site location is directly next to Salmon River (locally referred to as Salmon Brook, which is a scheduled salmon river).

Cultural Resources

No impacts anticipated associated with this project area including landscapes and landscape features, buildings and engineering works, archaeological sites, and archaeological and historical objects, however during construction activities archaeological requirements will be followed in the event of an interaction/discovery.

Visitor Experience (VE)

The construction period is expected to take place late in the tourist season (Fall 2016); there may be some traffic delays during construction activities to visitors travelling along the TCH as both the north and south sites are the main entrances to the park. Currently, there is little interest at either location to draw tourists. The south site is approximately 1km southwest of the Twin Rivers Golf Course which may cause some additional traffic, but due to the lateness of the season, this additional traffic will be minimal.

Health and Socio-economic (related to Aboriginal and non-Aboriginal peoples)

The Salmon River that is located near the near the South Entrance Site is an active salmon fishing location. During a site visit to the existing trails and proposed river look-off location, anglers were observed in the close proximity to the project area. The proposed project may potentially obstruct the access to the river and/or deteriorate fishing conditions during project construction and operation. However, fall/early spring construction should not impact anglers or fishing conditions.

There are no other predicted aspects of the project that would result in direct or indirect impacts to Aboriginal and non-aboriginal peoples. As well there are no other known traditional uses of the lands and/or resources in the project area that would be impacted by the project.

7. EFFECTS ANALYSIS

The effects analysis includes all the valued components and what the effects of the project will have on them.

Natural Resources

Atmospheric Environment

Air Quality: During construction activity, air quality may be reduced due to air borne dust particles. Heavy equipment exhaust may also affect air quality during construction.

Noise and Vibration: Due to the location of the project being within the park, noise from heavy equipment may affect visitors in the area. In addition to visitors it may pose a problem for wildlife, birds, and fish species near the construction site.

Terrestrial Environment

Soils and Landforms

There are the potential impacts from soil compaction, erosion and contamination due to accidental spills. Soil compaction is a form of soil degradation that can lead to soil erosion and decreased flora productivity. Compaction is the compression of soil particles into a smaller volume which reduces the pore size available for air and water. This in turn leads to impaired water infiltration, root penetration and flora nutrient and water uptake. This will restrict root growth and penetration into the subsoils, leading to stunted and stressed plants. Compaction also leads to increased potential for surface water ponding, water runoff, surface soil waterlogging and erosion (Wolkowsky and Lowery, 2008).

Water

As the majority of work will be taking place along the TCH, little potential is expected. However, at the north site, construction of the lookout at Square Pond and trail creation through the bog area, and at the south site, construction of the lookout at Salmon River, all have the potential to release sediment. Other deleterious substances have the potential to be released through bank erosion, leaks, refueling, and spills.

Noise and vibrations caused by construction machinery and related activities are also issues which could affect the freshwater environment, specifically sensitive tissues in fish (i.e., swim bladder) and their behavior. As this work is expected to commence late September 2016, this is not expected to impact salmon migration. There will not be a disruption of fish migration and passage, changes in channel morphology, water quality or a permanent loss of fish habitat as a result of this project. The residual impact to fish and fish habitat will be negligible.

Flora

The footprint of the north entrance will be within the existing footprint so is expected to have little impact. The proposed north entrance trail will require some hand felling of trees but generally will follow an existing natural path. The approach off the TCH to the south entrance will directly affect the vegetation adjacent to the existing highway however, the new rest stop is going to go in a previously cleared location so will have minimal impact. The proposed south entrance trail will follow an existing informal trail with the hand felling of some trees to provide views along the trail to the river. The impact of the alteration of the terrestrial environment from both sites is considered minimal due to the low percentage of habitat being affected as it compares to the entire park. The habitat is also degraded in quality due to its proximity to the highway and therefore the effect on species that inhabit this ecosystem will be negligible.

Fauna

Short-term disturbances are predicted for mammals and birds that are in the vicinity of the construction sites during mobilization of equipment and the operation of equipment during construction. The temporary operation of equipment and increased human presence and noise may lead to a temporary displacement of wildlife.

The entire landscape within TNNP has been identified as Marten Critical Habitat. According to the Recovery Plan for the American Marten in Newfoundland (2010), critical habitat must be maintained above defined thresholds. These thresholds are described in the plan in terms of a minimum amount of total forest, mature and overmature forest, and a maximum amount of younger-aged forest. All projects undertaken within the park must be assessed in terms of its impact on critical habitat for marten. The minimal amount of vegetation that may be removed for this project does not significantly alter the amount of critical habitat for marten on the landscape (vegetation clearing will be minimal as entrances will be constructed on previously disturbed sites or exiting trails. Areas to be modified will be inspected for the presence of individual marten or dens prior to construction.

The Atlantic Population of the Boreal felt lichen (*Erioderma pedicullatum*) and the Blue felt lichen (*Degelia plumbea*), listed as a Species of Special Concern under SARA, are found within park boundaries. Any vegetation identified for removal will be inspected prior to construction.

The little brown bat or little brown myotis (*Myotis lucifugus*), Northern myotis (*Myotis septentrionalis*), Red crossbill *(Loxia curvirostra percna),* Olive sided flycatcher *(Contopus cooperi) and* Rusty blackbird *(Euphagus carolinus)* are present in the park and protected under the federal SARA. Individuals or roosting/nesting sites for these species will be determined during a site inspection before the project commences.

Should any member of these species be identified within the project footprint during project activities, work should be halted and Parks Canada staff notified immediately.

Visitor Experience (VE)

Traffic: The aesthetic and visual impacts of the presence of machinery during construction are expected to be minimal due to the size of equipment and duration of the project. The project will have a direct impact on traffic in the area due to reduced speeds and delays at the construction sites.

Health and Socio-economic

The proposed project schedule is not expected to impact access of anglers to the river and/or deteriorate fishing conditions during project construction and operation. As per consults with a local member of the Northwest River Conservation Group, the proposed project should have a positive impact with enhanced access to Salmon River via an improved trail and parking.

8. MITIGATION MEASURES

The mitigation measures listed are standard construction measures and are typically used in construction projects. It may be acceptable for deviations from some of these measures and the ones listed below are to be used as a guide. The overall implementation of mitigation and controls will be the responsibility of the contractor selected to complete the work.

Natural Resources

Atmospheric Environment

- All equipment (e.g., diesel generators, etc.) shall meet the requirements of applicable federal legislation/regulations.
- Best Management Practices shall be implemented to mitigate air quality effects where practical.
- Dust from operating activities will be controlled using water. In the event of excessive dust, water will be applied to travel and work surfaces.
- All vehicles and generators will have exhaust systems regularly inspected and mufflers will be operating properly to meet emission standards.
- Adherence to all permits and approvals.
- Idling of engines will be kept to a minimum, contingent on operating instructions and temperature considerations.

Terrestrial Environment

Soils and Landforms, Flora and Fauna

The south site location is the site of a former dump and as such, the area contains garbage, mostly cans and bottles. Parks Canada has conducted an investigation and have determined that the former dump does not pose any health or environmental risk. However, any exposed inert material will be removed and backfilled in with new clean material.

Prior to initiating construction, Parks staff will complete a survey of all terrestrial habitat to be disturbed during construction to look for residences (dens) of small mammals and nesting sites of birds/waterfowl for any 'species at risk' or 'species of concern', If any residences and/or nesting sites associated with species at risk or species of concern are encountered proper procedures will be followed by the contractor This could result in a delay in scheduling of the

construction. Due to the proximity of the construction site to the TCH, no impacts are anticipated as there shouldn't be any nesting sites within the construction area. If nesting sites are found during construction, the contractor will follow mitigations outlined in their environmental protection plan (EPP).

In the unlikely case that a species of special concern is spotted such as the Boreal felt lichen or Blue felt lichen, the contractor will stop work immediately and report the sighting to Parks Canada staff.

Components of the proposed project will be timed to lessen the potential impact on this VC. For example, the timing of any tree clearing will help to mitigate any potential impacts on maternal Newfoundland marten dens and breeding birds. The tree clearing will occur during the fall and winter 2016. Should the proposed tree clearing not be completed by April 1, 2017, Parks Canada staff will survey the remaining areas to be cleared for dens, nests or hibernaculums. If required, Parks Canada will provide immediate protection to these areas from cutting until the den, nest or hibernaculum is naturally abandoned.

The north entrance will be on the same footprint as the current entrance. The south entrance part of the project includes clearing, however, much of this is already cleared from previous disturbances. For the proposed trails on both the north and south entrances, the project will use existing paths when available. In addition, all timber will be hand felled in order to avoid any loss of trees outside the tree clearing limit.

The timely completion of work will minimize the duration of impacts to mammals and birds from noise and increased human presence.

- Vehicles will yield the right-of-way to wildlife.
- Protect trees and plant species of high ecological, heritage or cultural value; all clearing activities must be flagged and pre-approved by designated Parks Canada staff.
- No personal pets, domestic or wild, will be allowed on the site.
- All personnel should be aware of the potential for encounters with bears, caribou, moose, etc. and they will be instructed to immediately report any sightings. No attempt to harass or disturb wildlife will be made by any worker.
- Should a nest of birds listed in the Canadian Wildlife Service (CWS) Occasional Paper Birds Protected in Canada under *MBCA* be encountered during the proposed work program, the CWS and Parks Canada will be contacted.
- Where vegetation clearing is required, the work will be completed as much as possible after the period when migratory birds may be breeding in a particular habitat. The CWS has directed that in order to avoid direct bird mortality, all vegetation clearing activities should occur outside of the local breeding season for land birds.
- Nests, eggs and nest shelters of migratory birds must not be disturbed or destroyed. Where possible, clearing activities should occur outside the bird nesting season. If a nest is found, a 20 m radium will be implemented and left undisturbed until nesting is completed, and construction activities should be minimized in the immediate area until nesting is completed.
- If the nest of any raptor is encountered during construction and operation activities, work in the vicinity of the nest is to be curtailed until Parks Canada staff has been contacted and appropriate mitigation is applied. This includes a 200 m buffer zone around any active raptor next during most of the year, extending to an 800 m buffer zone during the breeding season (March 31 to July 31).
- If a Newfoundland marten is encountered, all work will stop and sightings will be reported immediately to Parks Canada staff.
- Machine operators will be briefed on proper food and garbage disposal and other wildlife issues before work begins.
- All solid waste will be handled according to and in compliance with applicable federal/provincial regulations and will be considered for reuse, resale or recycling at an approved facility.
- Work areas will be kept clear of waste and litter to reduce the potential for attracting wildlife and reducing potential interactions with wildlife. Any waste that may attract animals (i.e., food) will be stored in covered, wildlife-proof containers.
- Burning of waste is not permitted without appropriate permits.

- Ensure proper cleaning of machinery/vehicles to prevent potential spread of invasive species.
- Where trees and shrubs are to be removed, they will be cut flush with the ground wherever possible. All cut wood is the property of Parks Canada; consult with designated Parks Canada staff to determine appropriate cutting methods, use and disposal of cut wood and other plant material. These materials will be stacked clear of on-going activities for future rehabilitation. The *Parks Canada National Best Management Practices* (Parks Canada 2016) will be observed.
- There will be no cutting in areas designated as sensitive without notification and approval.
- Clearing activities will comply with the requirements of all applicable permits.
- Chain saws or other hand-held equipment will be used in clearing vegetation. The use of mechanical clearing methods, such as bulldozers, will not be permitted
- If operating chain saws directly over or adjacent to waterbodies is unavoidable, use measures such as tarps to trap and prevent debris from entering the waterbody as much as possible.
- If grubbing is required, the organic vegetation mat and/or the upper soil horizons will be restricted to the minimum area required. It will be spread, in a manner to cover inactive exposed areas or retained for use in rehabilitation efforts.
- If grubbing is required, the grubbed material will not be pushed into areas that are to be left undisturbed. Grubbing material will be buried with 60 cm of soil cover.
- Disturbance and/or clearing sensitive wildlife areas (e.g., riparian vegetation) will be avoided during site preparation, where possible, to minimize the physical footprint of the Project.
- Existing laydown and storage areas will be used, where feasible.
- All vehicle and equipment use, including use of all-terrain vehicles (ATVs), will be restricted to designated routes within and between work, laydown, maintenance and storage areas.
- Travel in areas outside designated work areas will not be permitted.
- Heavy equipment (e.g., dump trucks and front-end loaders) will only be used in work areas.
- If required, reclamation techniques will emphasize the revegetation of the sloped and cleared areas of the site with local plants, shrub and trees approved by Parks Canada.

Water

All construction work will follow standard environmental practices to ensure the aquatic environment is not harmed and biological processes are not interrupted. The construction plan will be dependent upon the selected contractor. The contractor will be responsible for ensuring proper procedures are followed while using heavy equipment near a water body, such as switching lubricants to vegetable oil, refuelling away from water and having a spill response plan in place and spill kits onsite.

- It is recommended that a full time environmental monitor be present during construction activities to ensure all mitigations are in place and working properly, and will work closely with the contractor and Parks Canada staff.
- When working within the proximity of Salmon River, the environmental monitor will observe the river to ensure there is no migrating salmon present. If migrating salmon is spotted all work will be stopped until the environmental monitor deems the river clear of salmon.
- Work will be conducted with the minimum amount of disturbance necessary. Work will be conducted in a manner that prevents potential sedimentation of watercourses and waterbodies in or adjacent to the work areas.
- All activities must conform to relevant Provincial Occupational Health and Safety Guidelines.
- Where grubbing is required, measures will be implemented to reduce and control runoff of sediment-laden water during grubbing, and the re-spreading and stockpiling of grubbed materials. Where grubbed materials are re-spread or stockpiled, as many stumps and roots as possible will be left on the ground surface to maintain soil cohesion, dissipate the energy of runoff and promote natural re-vegetation. Erosion control measures will be implemented in areas prone to soil loss.
- If grubbing is required, the length of time that inactive grubbed areas will be left exposed to the natural elements will be minimized to prevent unnecessary erosion. Mitigations such as the placement and maintenance of silt curtains or deployment of hay bales will be used to prevent erosion from exposed areas.

- Slash and any other material or debris related to construction or operations activities will not be permitted to enter any watercourse, and will be piled above spring flood levels and retained for final rehabilitation efforts.
- If required, overburden storage areas will be located at least 50 m from any waterbody on well-drained soil and will be stored in stable piles and sloped to prevent pooling.
- If any new laydown, maintenance or storage areas are required for construction and operations activities, they will only be established within the project footprint, and will follow the procedures for vegetation clearing, grubbing and debris disposal, and erosion prevention.
- Storage areas will be placed on level terrain and kept free of ponding or run-off.
- A buffer zone of undisturbed vegetation will be maintained between Project activities and all watercourses as much as possible.
- All areas of exposed erodible soil will be stabilized by back-blading, grading and/or compacting to meet engineered slope requirements.
- Primary means for controlling erosion is avoiding activity that contributes to erosion. The disturbance of new areas will be minimized and work shall not be undertaken on easily erodible materials, and during or immediately following heavy rainfalls without approved protection measures in place.
- Existing or new siltation control structures used in this work will be monitored by the contractor for excessive accumulation of sediment. The contractor will remove accumulated sediment from control structures to gain full effectiveness of the systems. Effluent from control structures will be released to flow overland for appropriate filtration prior to entering any waterbody.
- If an environmental inspection reveals that silt is entering any waterbody, further mitigative measures will be implemented, such as temporary drainage ditches, siltation control (settling) ponds, ditch blocks/check dams or sediment dam traps, to intercept run-off. The necessary or appropriate measures will be determined in the field.
- Surface water shall be directed away from work areas by ditching. Runoff from these areas shall have sediment removed by filtration or other suitable methods and shall be directed away from wetlands and watercourses.
- Minimize the number of saw cuts made to treated wood in the field. If unavoidable, cut treated wood away from waterbodies and over tarps to catch debris; cuttings, sawdust and other treated wood waste material must not enter waterbodies.

Construction of Look-off near Salmon River

Special mitigations are considered to ensure minimum impact to the Salmon River adjacent to the proposed look-off structure. This area is considered sensitive and special care must be practiced during the construction and planning period.

- When working within proximity of Salmon River, the environmental monitor will observe the river to ensure there is no migrating salmon present and to confirm there is no run off from the construction site of any type of deleterious substance, including sedimentation.
- Work will be conducted with the minimum amount of disturbance necessary. Work will be conducted in a manner that prevents potential sedimentation of the river adjacent to the work areas.
- The exposed soil must be minimized by limiting the area exposed at any one time and by limiting the time that any one area is exposed. All stockpiled soil must be covered and/or dyked to prevent erosion or runoff of sediment-laden water from leaving the site. All stockpiled soil must be stored above the floodplain. Wherever possible, exposed soil should be replanted or sodded to ensure soil stabilization.
- Every effort must be made to minimize the clearing of vegetation. Trees and brush must be cut above the soil horizon. Stumps and roots must be left in place to preserve soil stability. Regenerating brush must be left in place to provide viable root systems to hold the soil.
- Minimize the number of saw cuts made to treated wood in the field. If unavoidable, cut treated wood away from the river and over tarps to catch debris; cuttings, sawdust and other treated wood waste material must not enter the river.
- Work should be properly timed to avoid potential interference with recreational fishing.

- Access to Salmon River should be maintained for anglers.
- Consultation should be made with any local anglers association(s) or locals who utilize the area, in order to inform them of the project details and the construction period.
- Work should be scheduled to avoid periods of heavy precipitation. Erosion control structures (temporary matting, geotextile filter fabric) are to be used, as appropriate, to prevent erosion and release of sediment and/or sediment laden water during the construction phase.
- If concrete production must occur on site, all drainage and wash water must be properly contained and must not drain into the riparian environment.
- Machinery should be well muffled and noise levels should be minimized as much as possible.

Human Environment (Cultural Resources, VE Components, Health/Socio-Economic)

For the purposes of this section, cultural resources components, VE components and health/socio-economic components are considered under human environment.

The aesthetics associated with the project include tree clearing, facilities and services, public safety, cultural heritage and any socio-economics impacts.

- Tree clearing associated with the project is to be completed as per the approved design plan and contract specifications and will be hand felled.
- Access to public facilities and services will be impacted as minimally as possible.
- Public safety is of utmost importance during this project and is the intent of Parks Canada to minimize disturbance to the greatest extent possible to the users of the park during construction activities. As the majority of the project will be completed outside of tourist season, this impact is likely to be minimal. The contractor is responsible to take all necessary precautions to ensure there are no safety concerns related to visitors of the Park.
- Any historic resource discoveries will be reported to Parks Canada. Workers will not destroy or disturb any features indicative of a cultural or archaeological site. Such features should be avoided until a report has been made to the Parks Canada archaeologist and clearance to proceed has been received.
- The contractor is responsible to take all necessary precautions to ensure there are no safety concerns related to visitors of the Park.
- The contractor is responsible to ensure all parties (i.e., Park Staff, Sub-Contractors, etc.) receive a copy of the EPP or BIA prior to project start-up.
- All vehicles and equipment will yield to people, if present, and reduced speeds will be maintained on all roadways.
- The handling and storage of hazardous materials will follow all applicable federal legislation/regulations. All relevant current Material Safety Data Sheets (MSDS) will be readily available for the site.
- Access to Salmon River should be maintained for anglers.
- Consultation was made with a member of the Northwest River Conservation Group and resident of Port Blandford. Input provided was that the schedule of the project will not impact anglers and the project itself will have a positive impact due to improved trail access and parking.

General Construction Measures

The contractor will submit an environmental protection plan with their bid and will not start work until the plan has been accepted by Parks Canada. These mitigations are recommendations only and the contractor should be familiar with all applicable regulations and guidelines that may apply to the project. It is the sole responsibility of the contractor to comply with the applicable regulations and permit requirements.

It is recommended that an EPP be prepared in accordance with DFO's *Fisheries Act*. To ensure mitigation of potential adverse effects identified, the EPP shall:

- Be available to all staff during project activities;
- Include an Erosion and Sedimentation Management Plan that will detail appropriate work methods and best practices for working around water and proposed erosion control methods. Parks Canada's desired end result

is to allow no release into any water body of sediments in levels that are deleterious to fish, fish habitat, wildlife habitat or that would alter growing or hydraulic conditions;

- Contain spill response procedures including appropriate spill kit requirements and spill and emergency response contacts; and
- Include provisions to reduce human-wildlife interactions.

Additional Measures

- Machinery is to arrive on-site in a clean condition and should be free of soils and vegetation and maintained free of fluid leaks. For all contractors, Spill Response Kits (absorbent materials, etc.) must be on-site at all times. In the event of any spill of deleterious substances (e.g., petroleum hydrocarbons, hydraulic fluid), the contractor is responsible for containing and cleaning up the spill; the spill is to be reported and sent to Parks Canada. In the event of a reportable spill on-land or a spill, regardless of size, in the freshwater environment, applicable federal legislation/regulations will be followed.
- Machinery will be required to remain inside the trail boundaries, to ensure reduced impacts to all areas out the trail/project footprint.
- In reaching decisions on containment and clean-up procedures, the following criteria will be applied:
    - minimize danger to workers and public;
    - protect water supplies;
    - minimize pollution of watercourses;
    - minimize area affected by spill; and
    - minimize the degree of disturbance to the area and watercourses during clean-up.
- All work relating to the construction and operations activities for the Project will be conducted according to the conditions set out in the permits and/or approvals and authorizations.
- Only minor repairs and maintenance (e.g., lubrication) of 'non-mobile' equipment such as flatbeds, shovel, etc. will be performed on-site. All major repairs, where possible, are to be performed at an existing garage location outside of the project area.
- All fuel and other hazardous materials will be handled following applicable federal legislation/regulations.
- In addition to spill kits located at fuel storage tanks additional spill kits will be located at designated central storage location(s). Personnel who deal with fuelling, fuel transfer and pumps and generators will be trained in the use of the kits.
- All necessary precautions will be taken to prevent and reduce the spillage, misplacement or loss of fuels and other hazardous materials.
- A spill is defined as reportable, depending on the class and quantity of dangerous goods involved, which varies between applicable Regulations:
- In the event of a leak from a vehicle, pipeline or storage tank system, the operator of the vehicle, pipeline or storage tank system shall immediately notify Parks Canada staff and take those steps that are necessary to abate the discharge, clean the area affected
- Only workers who are qualified and trained in handling these materials as stated in the manufacturer's instructions and government laws and regulations will handle fuel and other hazardous materials.
- Operators will attend the entire refuelling operations.
- Despite measures taken to reduce the potential for spills or leaks, should any soils be contaminated by petroleum hydrocarbons, they will be assessed and managed in accordance with the applicable federal legislation/regulations
- Handling and fuelling procedures will comply with the applicable federal legislation/regulations and any additional requirements in order to limit potential contamination of soil or water, and will not occur within 100 m of any water body. Drums will be tightly sealed against corrosion and rust and surrounded by an impermeable barrier in a dry building with an impermeable floor or outside with appropriate spill containment (110%) and covers.
- Contracted fuel suppliers will, before transporting or positioning fuel or oil, have a copy of their fuel and hazardous material spills contingency plan. Transportation of hazardous and dangerous materials shall be

conducted in accordance with provincial, territorial and federal transportation regulations. Transportation documents shall be retained in a retrievable filing system and stored for the duration of the undertaking.

- Smoking will be prohibited within 10 m of a fuel storage area.
- Small quantities of hazardous material (drums, cans and other containers under 20 L volume) will be stored in a secure location protected from weather and freezing, as well as vehicle traffic.
- Hazardous waste will be moved to an appropriate hazardous waste storage area. These areas are constructed in compliance with all applicable federal and provincial legislation.
    - All hazardous waste will be handled according to the applicable federal legislation/regulations. Waste classified as "hazardous" or "special" that cannot be disposed of in regular landfill sites will be sent for disposal to a licensed hazardous waste management company.
    - Waste material will not be disposed of on-site or in a body of water.
    - Burning of waste is not permitted.
    - Where hazardous waste materials are to be stored outdoors, a designated area will be established, graded and fitted with an impermeable membrane covered with local soil and surrounded by an earth berm.
    - Waste oils, lubricants, and other used oil will be retained in an approved tank or closed container, and disposed of in accordance with the applicable federal legislation/regulations.
    - Any soil contaminated by small leaks of oil or grease from equipment will be disposed of according to the applicable federal legislation/regulations.
    - All hazardous wastes generated, by alternative treatments will be handled according to the procedures for handling fuel and hazardous materials.

9. OTHER Considerations

9 a) PUBLIC/STAKEHOLDER ENGAGEMENT

Indicate whether public/stakeholder engagement was undertaken in relation to potential adverse effects of the proposed project:

☐ No

☒ Yes (Member of the Conservation Group visited the south site with Park staff on August 8th. Member was very familiar with Salmon River, its fishing holes and traditional use. He says that the proposed project will not impact anglers. There should be a positive impact with enhanced access to Salmon River via an improved trail and parking).

9 b) ABORIGINAL CONSULTATION

Indicate whether Aboriginal consultation was undertaken in relation to potential adverse effects of the proposed project:

☒ No

☐ Yes (describe the process to involve relevant parties and how the results were taken into consideration).

9 c) **SURVEILLANCE**

Document whether surveillance (also referred to as compliance monitoring or site inspection) will be required to verify that required mitigation measures are implemented.

☐ Surveillance is not required

☒ Surveillance is required (provide details such as the proposed schedule and the focus of inspections)

Due to the fact that the project is located within a National Park it is recommended that inspections be conducted to ensure proper mitigations measures are being implemented properly.

9 d) **FOLLOW-UP MONITORING**

Follow-up monitoring is:

☒ not required

☐ required by legislation or policy (indicate basis of requirement – e.g., required by the *Species at Risk Act*; *Fisheries Act*, or the *Parks Canada Cultural Resource Management Policy)*

☐ required to evaluate effectiveness of mitigation measures and/or assess restoration success

9 e) Sara notification is:

☒ not required

☐ required under the *Species at Risk Act* (outline the nature of and response to any notification).

10. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

The temporal and spatial scope of the project are limited, and considering the work techniques, time of year and common mitigation measures involved there are no significant adverse environmental effects anticipated as a result of this project.

This project is not likely to cause significant residual effects and there are no predicted cumulative effects associated with the project.

11. EXPERTS CONSULTED

Include Parks Canada experts. Add as many entries as necessary for the project.

Department/Agency/Institution: Parks Canada Agency	Date of Request: 2016-06-05
Expert's Name & Contact Information: Rod Cox	Title: Resource Management Officer II
Expertise Requested: Review of the Basic Impact Analysis	

Department/Agency/Institution: Parks Canada Agency	Date of Request:
Expert's Name & Contact Information: Kirby Tulk	Title: Resource Conservation Manager
Expertise Requested: Review of the Basic Impact Analysis	
Response: Summarize, append correspondence as required and add to attachment list (Section 17).	

12. DECISION

Taking into account implementation of mitigation measures outlined in the analysis, the project is:

☒ not likely to cause significant adverse environmental effects.

☐ likely to cause significant adverse environmental effects.

NOTE: If the project is identified as likely to cause significant adverse effects, CEAA 2012 prohibits approval of the project unless the Governor in Council (Cabinet) determines that the effects are justified in the circumstances. A finding of significant effects therefore means the project CANNOT go ahead as proposed.

FOR SARA REQUIREMENTS:

☒ There are no residual adverse effects to species at risk and therefore the *SARA*-Compliant Authorization Decision Tool was not required

OR, the *SARA*-Compliant Authorization Decision Tool (Appendix 2) was used and determined:

☐ There is no contravention of *SARA* prohibitions

☐ Project activities contravene a *SARA* prohibition and CAN be authorized under SARA

☐ Project activities contravene a *SARA* prohibition and CANNOT be authorized

13. RECOMMENDATION AND APPROVAL

(Add additional blocks as required)

Prepared by: EIA author (name & position): Shawn Kean, Senior Environmental Assessor	Date: 2016-09-08
Recommended by: Karen Wolfrey– Project manager, FII	Date: Sept 8/16
Signature: Karen Wolfrey	
Recommended by: Kirby Tulk – Resource Conservation Manager	Date: 15/09/16
Signature:	
Approved by: William Brake – Superintendent, NL east field Unit	Date: Sep 16/16
Signature:	

14. ATTACHMENTS

Attachment 1: **Terra Nova National Park Entrance Rehabilitation Project, Drawings**

Attachment 2: **Parks Canada National Best Management Practices; Campground and Day Use Area Maintenance and Modification**

Attachment 3: **Parks Canada National Best Management Practices; Trails**

15. NATIONAL IMPACT ASSESSMENT TRACKING SYSTEM

☐ Project registered in tracking system

☒ Not yet registered *(CEAA 2012 requires PCA submit a report to Parliament annually. EIAs must be entered in the tracking system* ***by the end of April*** *to enable reporting.*

*****Ensure that all required mitigation measures and conditions (e.g., follow-up monitoring requirements) are included in project permits and authorizations*****

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Appendix 1 Environmental Impact Analysis Tools: Effects Identification Matrix

***Section A** focuses on direct effects of the project and **Section B** on indirect effects that are caused by changes to the environment.*

A. Direct Effects (during preparation/construction phases)

			Components potentially directly affected by the proposed project											
			Natural Resources					Cultural Resources		Visitor Experience				
			Air	Soil & landforms	Water (surface, ground, crossings, etc.)	Flora (specify, including SAR)	Fauna (specify, including SAR)	Landscapes	Archaeological	Visitor access & services	Recreational/Accom m opportunities	Viewscapes and soundscapes	Visitor Safety	Essence of place
	Phase	Examples of Associated Activities												
Project Components	Preparation / construction	Supply and storage of materials	☐	☒	☐	☐	☐	☐	☐	☒	☐	☒	☐	☐
		Burning	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Clearing	☐	☒	☒	☒	☒	☐	☐	☒	☐	☒	☒	☐
		Demolition	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Disposal of waste	☐	☒	☒	☐	☐	☐	☐	☒	☐	☐	☐	☐
		Blasting/ Drilling	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Dredging	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Drainage	☐	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐
		Excavation	☒	☒	☒	☒	☒	☐	☐	☒	☐	☐	☒	☐
		Grading	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Backfilling	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Use of machinery	☒	☒	☒	☒	☒	☐	☐	☒	☒	☐	☒	☐
		Transport of materials/ equipment	☒	☒	☒	☐	☐	☐	☐	☒	☐	☐	☒	☐
		Building of fire breaks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Use of Chemicals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Set up of temporary facilities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Other…	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

A. Direct effects continued (during operation/implementation/decommissioning phases)

			Components potentially affected by the proposed project											
			Natural Resources					Cultural Resources		Visitor Experience				
			Air	Soil & landforms	Water (surface, ground, crossings, etc.)	Flora (specify, including SAR)	Fauna (specify, including SAR)	Insert heritage values for your site	Insert heritage values for your site	Visitor access & services	Recreational & Accomm. opportunities	Viewscapes and soundscapes	Visitor Safety	Essence of place
	Phase	**Examples of Associated Activities**												
Project Components	Operation/Implementation/Decommissioning	Waste disposal	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Wastewater disposal	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Maintenance	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Use	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Use/Removal of temporary facilities	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Use of Chemicals	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Active fire stage	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Prescribed burn cleanup	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Planting	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Culling	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Vehicle Traffic	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
		Other…	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

B. Indirect Effects (all phases)							
You may wish to change the components listed under the headings to specify the natural or resources that are priority considerations for your PCA site or for the specific project being reviewed.		**Impacts as a result of changes to the environment**					
		With respect to non-Aboriginal peoples:	With respect to Aboriginal peoples:		With respect to visitor experience		
		Health and socio-economic conditions	Health & socio-economic conditions	Current use of lands and resources for traditional purposes	Access & services	Recreation & accommod'n opportunities	Safety
Phase	**Natural resource components affected by the project**						
Preparation /construction operation/implementation/decommissioning	Could impacts to air lead to adverse effects on...	☐	☐	☐	☐	☐	☐
	Could impacts to soils and landforms lead to adverse effects on...	☐	☐	☐	☐	☐	☐
	Could impacts to water (e.g., surface, ground water and water crossings) lead to adverse effects on...	☐	☐	☐	☐	☐	☐
	Could impacts to flora (including SAR) lead to adverse effects on...	☐	☐	☐	☐	☐	☐
	Could impacts to fauna (including SAR) lead to adverse effects on...	☐	☐	☐	☐	☐	☐
	Other...	☐	☐	☐	☐	☐	☐

Attachment #1

Terra Nova National Park Entrance Rehabilitation Project, Drawings

For

Park Entrance Construction Project

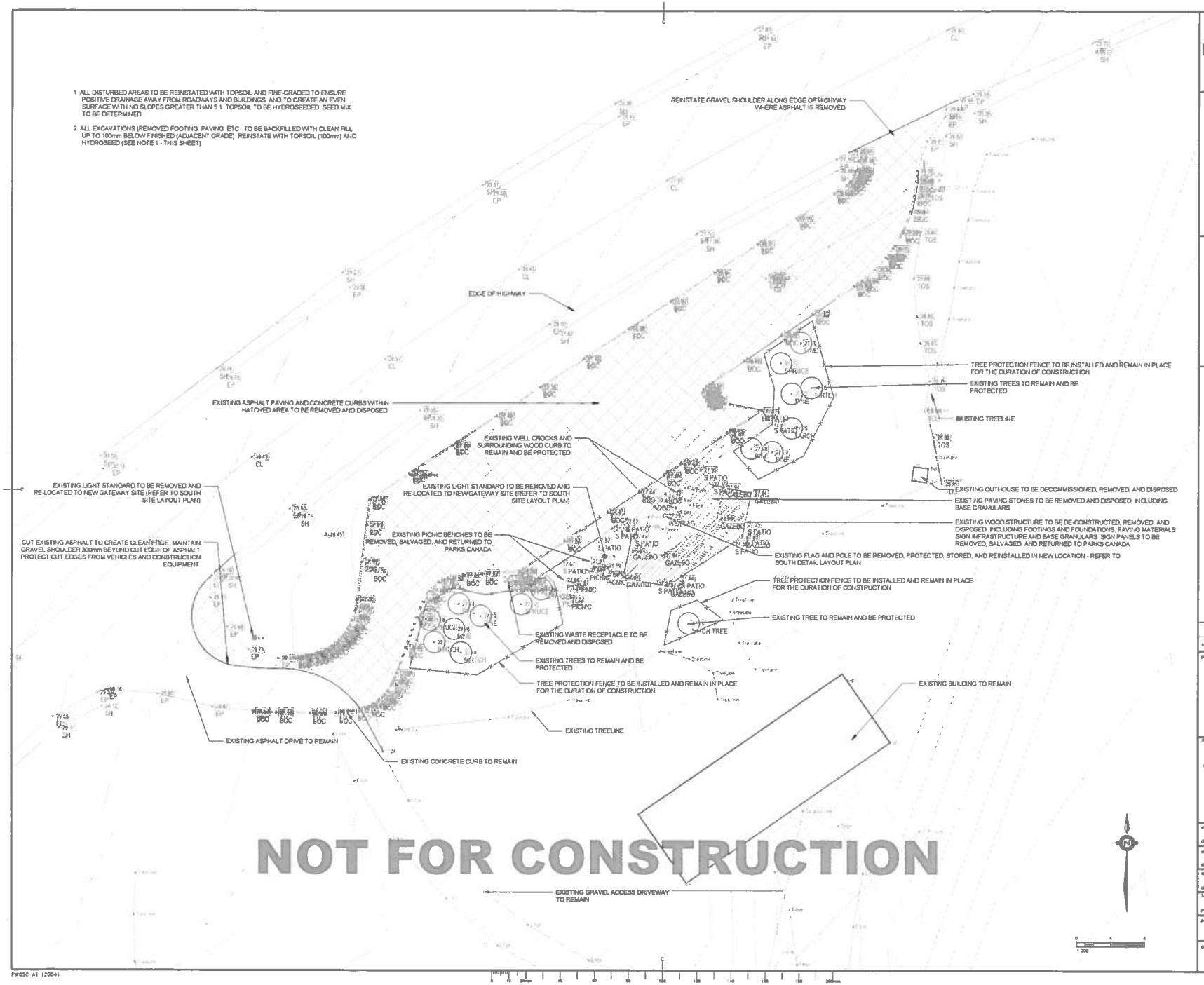
Basic Impact Analysis

Terra Nova National Park of Canada
Newfoundland and Labrador

August 2016

1 ALL DISTURBED AREAS TO BE REINSTATED WITH TOPSOIL AND FINE-GRADED TO ENSURE POSITIVE DRAINAGE AWAY FROM ROADWAYS AND BUILDINGS. AND TO CREATE AN EVEN SURFACE WITH NO SLOPES GREATER THAN 5:1 TOPSOIL TO BE HYDROSEEDED SEED MIX TO BE DETERMINED

2 ALL EXCAVATIONS (REMOVED FOOTING PAVING ETC TO BE BACKFILLED WITH CLEAN FILL UP TO 100mm BELOW FINISHED (ADJACENT GRADE) REINSTATE WITH TOPSOIL (100mm) AND HYDROSEED (SEE NOTE 1 - THIS SHEET)



Public Works and Government Services Canada / Travaux Publics et Services gouvernementaux Canada

ekistics plan+design

1	ISSUED FOR 66% REVIEW	JULY 10 2018
remarks		date

project / projet

TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin

SOUTH SITE - EXISTING CONDITIONS & REMOVALS

designed CC/JB/BR/SC/KP / conçu

date ----

drawn / dessiné

date

approved / approuvé

date

Tender / Soumission

PWGSC Project Manager / Administrateur de projets TPSGC

project number / no. du projet

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drawing no / no. du dessin

L-101

PWGSC A1 (2004)

E-DRM/SDD-E. ----

EDGE OF HIGHWAY

EXISTING BERM TO BE EXCAVATED FOR PROPOSED VEHICULAR ACCESS POINT. EXCAVATE TO 890MM BELOW PROPOSED FINISHED GRADE

EXISTING BERM TO BE RE-GRADED; REFER TO GRADING PLAN

EDGE OF PROPOSED PAVEMENT

ALL EXISTING BOULDERS IN BERM TO BE REMOVED AND STOCKPILED FOR RE-USE ON SITE

ALL EXISTING TREES WITHIN BERM TO BE REMOVED (50 SPRUCE AND BIRCH)

EDGE OF HIGHWAY

EXISTING BERM TO BE RE-GRADED; REFER TO GRADING PLAN

EXISTING BERM TO BE EXCAVATED FOR PROPOSED VEHICULAR ACCESS POINT. EXCAVATE TO 890MM BELOW PROPOSED FINISHED GRADE

EXISTING BERM TO BE RE-GRADED; REFER TO GRADING PLAN

EDGE OF PROPOSED PARKING AREA

EDGE OF EXISTING ASPHALT PAVEMENT

8454 | 8351 | 4779 | 14383 | 7209 | 2900 | 2775 | 3429 | 1857 | 7874 | 2575 | 24744 | 3578 | 12887 | 8670 | 4755 | 6290 | 2202 | 43236 | 8991 | 38711 | 3323 | 8938 | 10368 | 4248

EXISTING ASPHALT TO BE REMOVED AND DISPOSED, INCLUDING GRANULAR BASE.

REMOVE EXISTING ASPHALT AND CONCRETE CURB, INCLUDING GRANULAR BASE. PROVIDE CLEAN, STRAIGHT SAW CUT WHERE ASPHALT IS BEING REMOVED. PROTECT CUT EDGES FROM CONSTRUCTION EQUIPMENT AND VEHICLES.

REMOVE EXISTING CONCRETE CURB

REMOVE EXISTING ASPHALT AND CONCRETE CURB, INCLUDING GRANULAR BASE. PROVIDE CLEAN, STRAIGHT SAW CUT WHERE ASPHALT IS BEING REMOVED. PROTECT CUT EDGES FROM CONSTRUCTION EQUIPMENT AND VEHICLES.

REMOVE EXISTING SIGN, INCLUDING FOOTINGS, PROTECT, AND STORE FOR RE-INSTALLATION IN NEW LOCATION – REFER TO LAYOUT DRAWINGS. BACKFILL EXCAVATED HOLES AND REINSTATE SURFACE WITH TOPSOIL AND HYDROSEED.

EXISTING ASPHALT TO REMAIN. PROVIDE CLEAN, STRAIGHT SAW CUT WHERE ASPHALT IS BEING REMOVED. PROTECT CUT EDGES FROM CONSTRUCTION EQUIPMENT AND VEHICLES

EXISTING ASPHALT TO BE REMOVED AND DISPOSED, INCLUDING GRANULAR BASE.

EXISTING WASTE RECEPTACLE TO BE REMOVED AND DISPOSED

TREE LINE

EXISTING SHELTER TO BE REMOVED AND DISPOSED, INCLUDING ALL FOOTINGS, FOUNDATIONS, PAVED SURFACES, SIGNAGE INFRASTRUCTURE. ALL SIGN PANELS TO BE REMOVED, SALVAGED AND RETURNED TO PARKS CANADA.

EXISTING PAVING STONES AND GRANULAR BASE TO BE REMOVED AND DISPOSED.

EXISTING BENCHES TO BE REMOVED, SALVAGED, AND RETURNED TO PARKS CANADA

NOTE: ALL EXCAVATED FOOTINGS, FOUNDATIONS, PAVEMENT STRUCTURES, ETC. TO BE BACKFILLED WITH CLEAN FILL TO 100mm BELOW PROPOSED FINISHED GRADE AND REINSTATED WITH 100mm TOPSOIL AND HYDROSEED. SEED MIX TO BE DETERMINED.

NOT FOR CONSTRUCTION

1 : 200

PWGSC A1 (2004)

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project: TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing: NORTH SITE - EXISTING CONDITIONS & REMOVALS

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date ----

drawn ----

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PWGSC Project Manager Administrateur de projets TPSGC

project number ------

drawing no L-102

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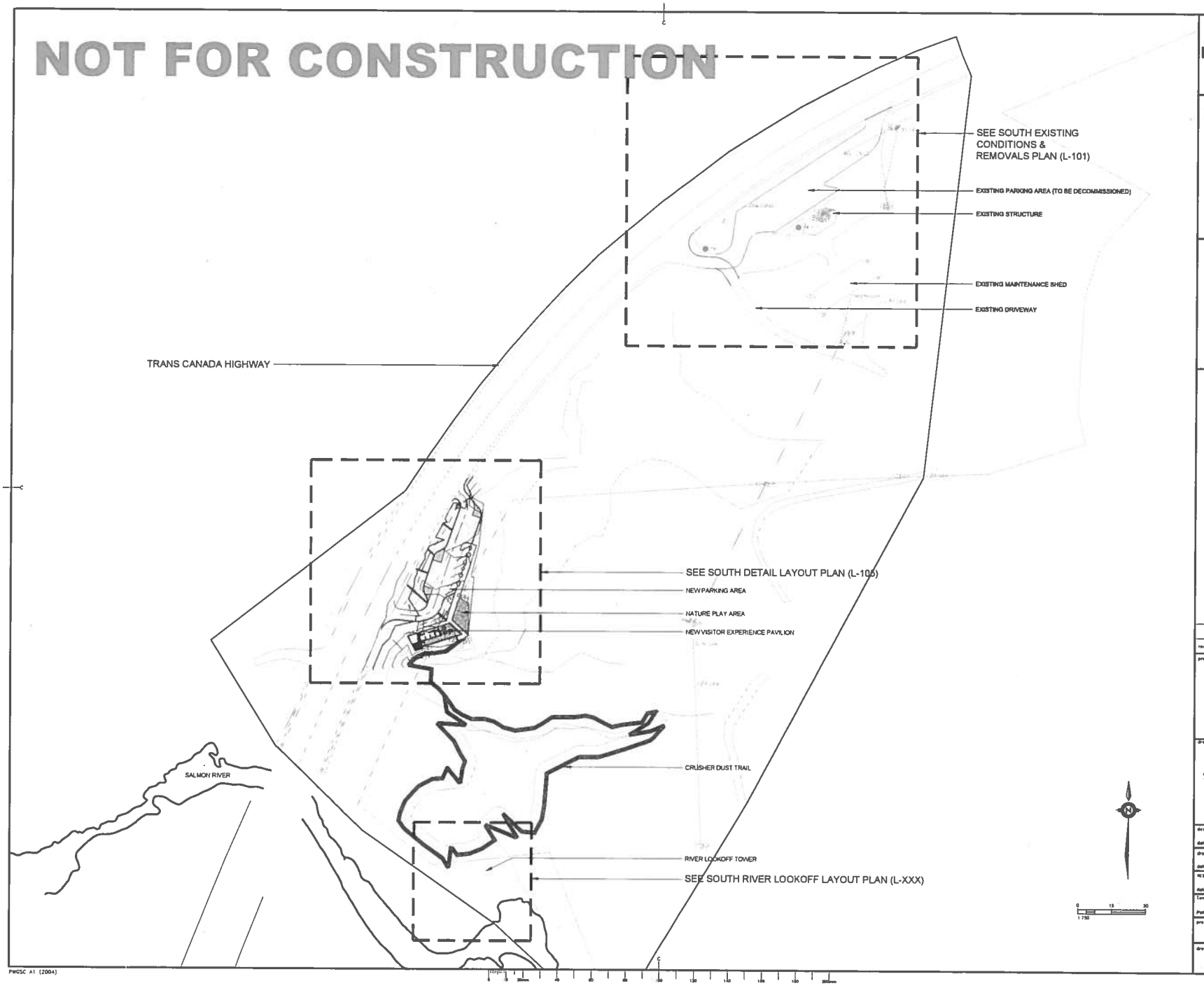
NOT FOR CONSTRUCTION



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revision		date
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project / projet

TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin

SOUTH SITE - LAYOUT PLAN

designed / conçu: CC/JB/BR/SC/KP

date

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date

approved / approuvé

date

Tender / Soumission

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project number / no. du projet

drawing no. / no. du dessin

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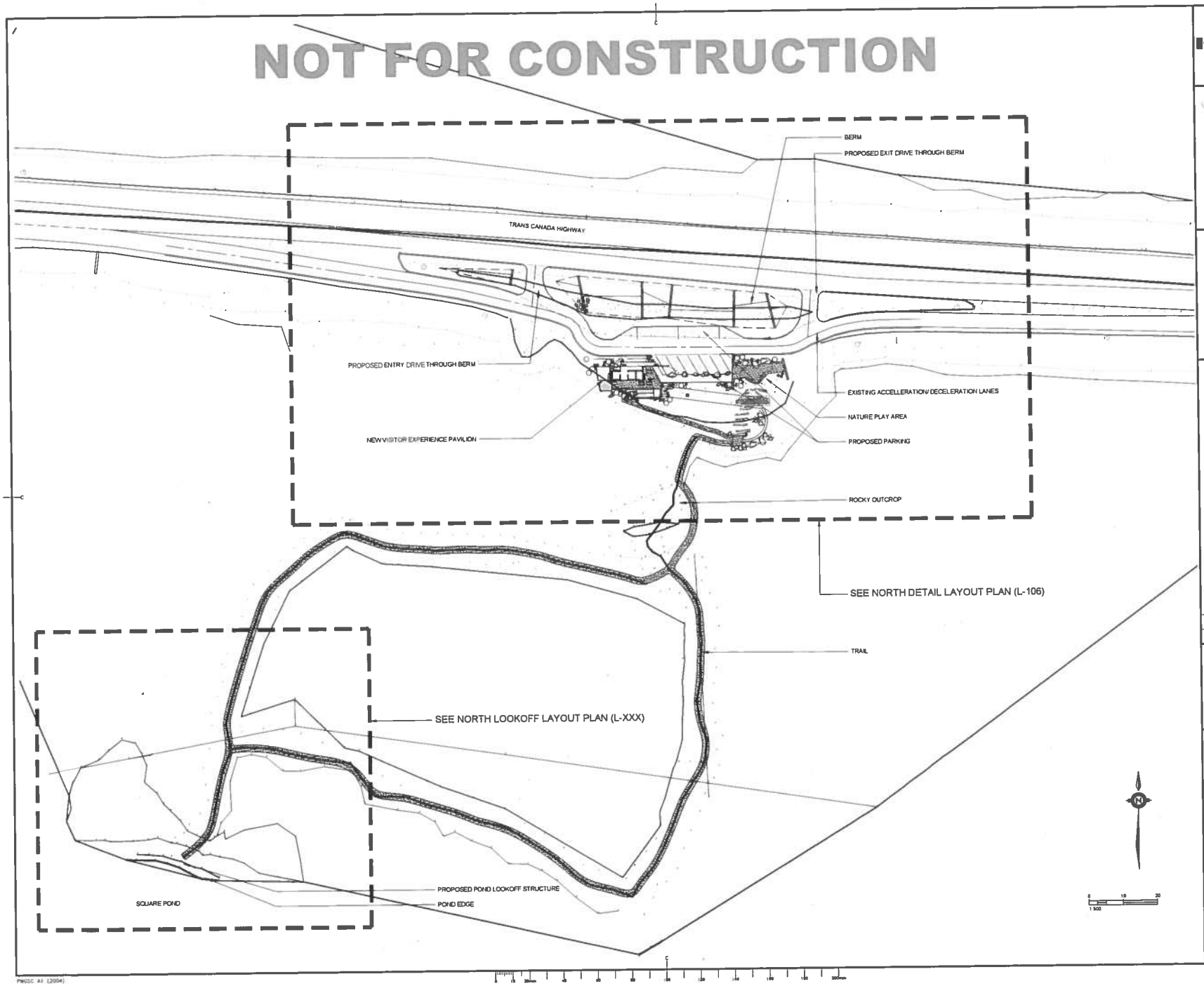

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drawing / dessin

NORTH SITE - LAYOUT PLAN

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project number / no. du projet: ----
drawing no / no du dessin: L-104

E-DRM/EDD-E: ----

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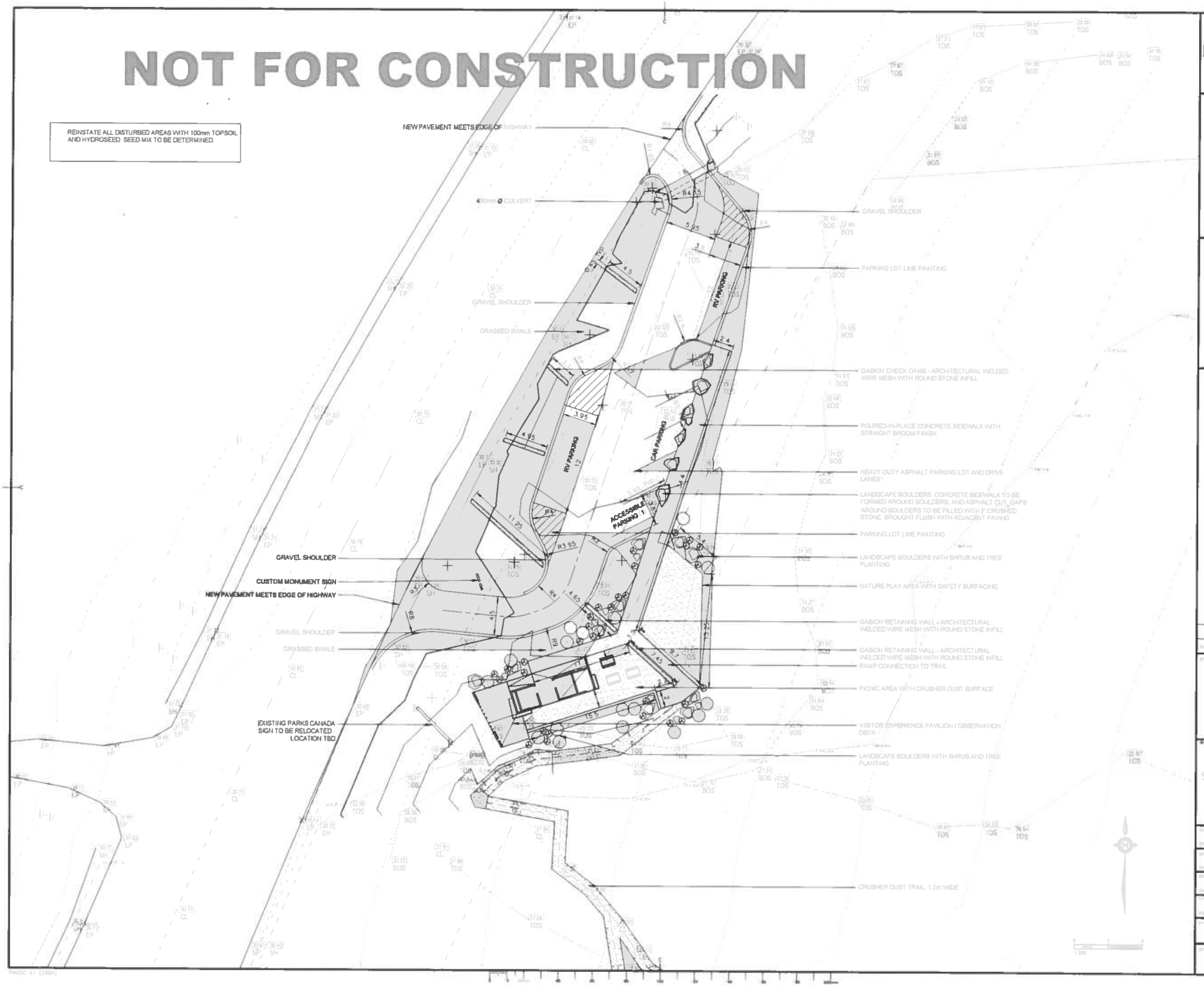
NOT FOR CONSTRUCTION

REINSTATE ALL DISTURBED AREAS WITH 100mm TOPSOIL AND HYDROSEED SEED MIX TO BE DETERMINED



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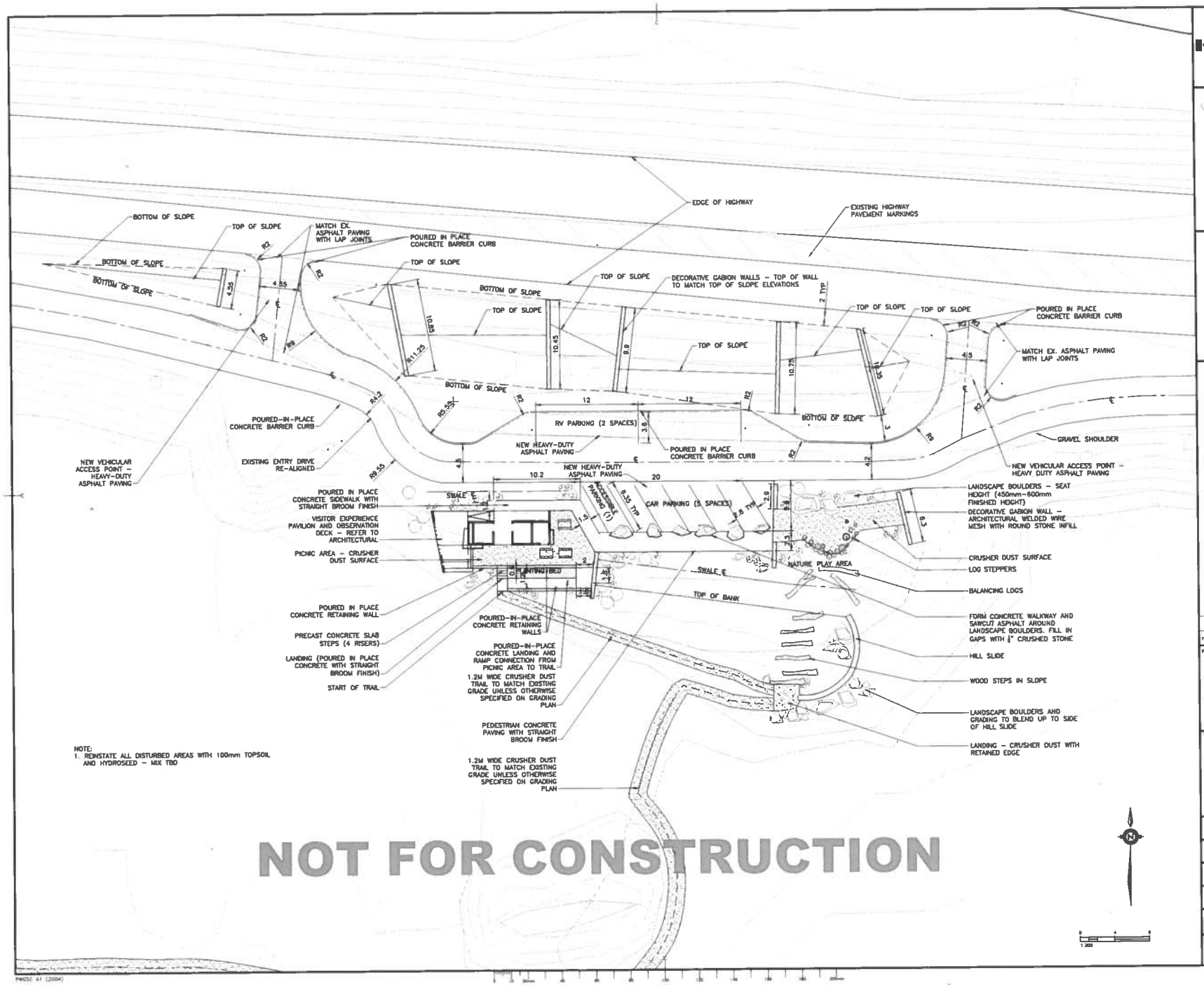
TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

SOUTH DETAIL LAYOUT PLAN

Designed CC/JB/BR/SC/KP

L-105



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revisions		date
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project / projet

TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin

NORTH DETAIL LAYOUT PLAN

designed / conçu: CC/JB/BR/SC/KP
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approved / approuvé:
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Tender / Soumission:
PWGSC Project Manager / Administrateur de projets TPSGC:
project number / no du projet: ----
drawing no / no du dessin: L-106

E-DPM/SDD-E: ----

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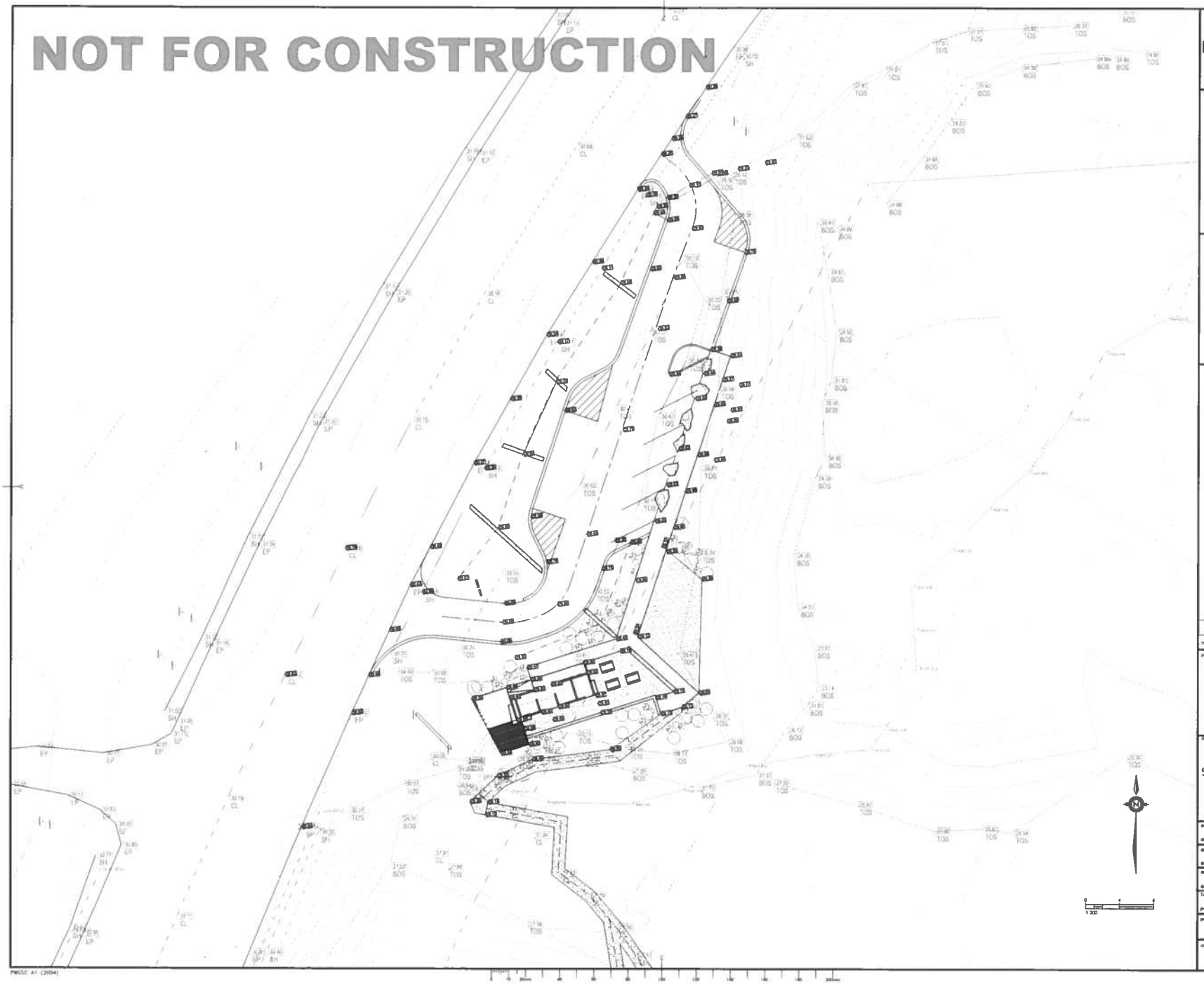

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1	ISSUED FOR 66% REVIEW	JULY 18 2016
revision		date

project / projet

TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin

SOUTH SITE - GRADING PLAN

designed / conçu: CC/JB/BR/SC/KP

date

drawn / dessiné

date

approved / approuvé

date

Tender / Soumission

PWGSC Project Manager / Administrateur de projets TPSGC

project number / no. du projet

drawing no. / no. de dessin: L-107

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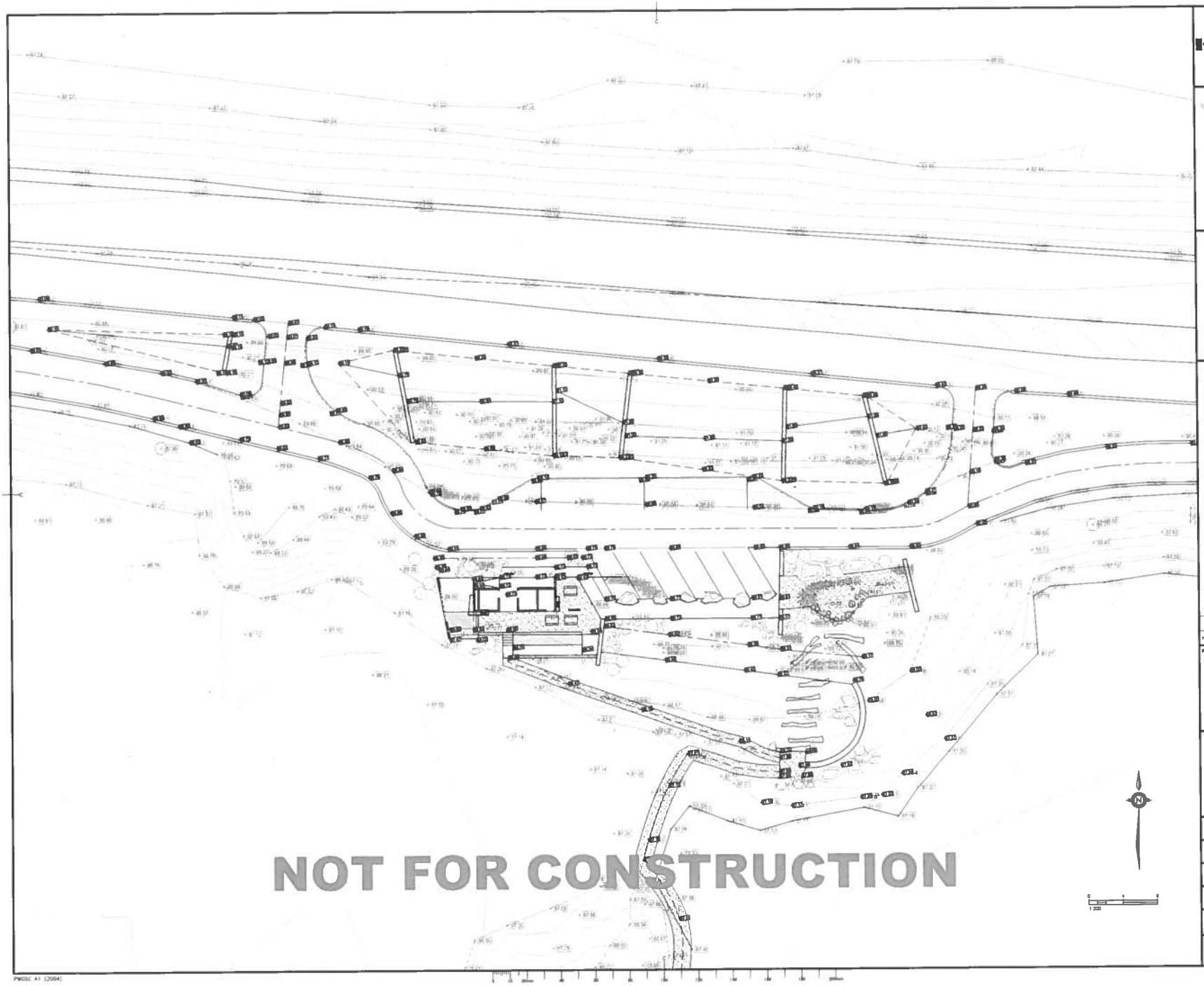

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revisions		date
1	ISSUED FOR 66% REVIEW	JULY 19 2016

project / projet

TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin

NORTH SITE GRADING PLAN

designed / conçu: CC/JB/BR/SC/KP

date: ----

drawn / dessiné: ----

date: ----

approved / approuvé

date

Tender / Soumission

PWGSC Project Manager / Administrateur de projets TPSGC

project number / no. du projet: ----

drawing no / no du dessin: L-108

PWGSC A1 (2004)

E-DPM/DDD-E. ----

CONSTRUCTION NOTES

1 ALL WORKS TO BE PERFORMED IN ACCORDANCE WITH PARKS CANADA REGULATIONS AND GUIDELINES LATEST EDITIONS

2 ALL WORKS TO BE IN ACCORDANCE WITH THE "STANDARD SPECIFICATION FOR MUNICIPAL SERVICES" PREPARED JOINTLY BY THE NOVA SCOTIA ROAD BUILDERS ASSOCIATION AND THE NOVA SCOTIA CONSULTING ENGINEERS ASSOCIATION LATEST EDITION

3 CONTRACTOR TO OBTAIN ALL NECESSARY PERMITS REQUIRED TO PERFORM WORKS COMPLY WITH ALL PERMIT REQUIREMENTS AND CONDITIONS

4 DO NOT SUBSTITUTE MATERIALS UNLESS PRIOR WRITTEN APPROVAL IS GIVEN BY THE ENGINEER

5 THE CONTRACTOR IS RESPONSIBLE FOR ALL CONSTRUCTION LAYOUT ACTIVITIES ALL ELEVATIONS ARE METRIC AND GEODETIC

6 CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF WETLANDS AND THE OCEAN FROM DAMAGE DUE TO SILTATION RUNOFF FROM THE CONSTRUCTION SITE ACCEPTABLE CONSTRUCTION PROCEDURE MAY BE OBTAINED FROM "EROSION AND SEDIMENTATION CONTROL HANDBOOK FOR CONSTRUCTION SITES", CURRENT EDITION BY THE NOVA SCOTIA DEPARTMENT OF ENVIRONMENT. THE CONTRACTOR SHALL MAKE NECESSARY REPAIRS TO SEDIMENTATION AND EROSION CONTROL DEVICES AS DIRECTED BY OWNER'S ON SITE REPRESENTATIVE

7 INVERTS OF EXISTING SERVICES TO BE VERIFIED IN FIELD PRIOR TO CONSTRUCTION DISCREPANCIES TO BE REPORTED IMMEDIATELY TO THE ENGINEER

8 ALL DUCTILE IRON PIPE AND FITTINGS TO BE POLY WRAPPED WITH ZINC ANODES (EN 24.48) VALVES TO CLOSE AS PER HRWC STANDARD DRAWING NO 1025 GATE VALVES TO BE USED FOR VALVES 300mmØ AND SMALLER

9 SANITARY MANHOLES TO BE PRECAST CONCRETE c/w WATERPROOFING MEMBRANE COVERS TO BE MP-P18 WITH ONE 19mmØ HOLE AND NO GASKETS/GASKETS COVER TO HAVE NEOPRENE GASKET BETWEEN COVER AND FRAME AIR TESTING TO TAKE PLACE THROUGH 19mmØ HOLE WITH COVER ON. ALL MANHOLES LOCATED OFF STREET TRAVELED WAY TO HAVE BOLT DOWN COVERS (MP-R13 OR APPROVED EQUIVALENT)

10 ALL STORM MANHOLES AND CATCHBASINS TO BE PRECAST WITH A LOC GASKETS FOR CATCHBASIN LEADS

11 ALL MANHOLE COVERS FOR WATER WORKS TO BE MP-R84 MARKED "HRWC" LOGO

12 INSULATION TO BE H40 ROAD OR TRAFFIC RATED, 50mm RIGID STYROFOAM

13 WHERE TRENCH ROCK IS ENCOUNTERED AT THE END OF A PIPE RUN ROCK IS TO BE OVERBLASTED BY 10m BEYOND END OF PIPE

14 STORM AND SANITARY LATERALS TO BE INSTALLED AT MINIMUM 2% GRADE TO STREET BOUNDARY OR STEEPER AS DIRECTED BY ENGINEER. USE 150mmØ WHITE PVC DR28 FOR SANITARY LATERALS AND 100mmØ GREEN PVC DR35 FOR STORM LATERALS. WHERE TRENCH ROCK IS ENCOUNTERED AT THE END OF A LATERAL ROCK IS TO BE OVERBLASTED 8m BEYOND END OF PIPE

15 ALL POWER POLE INSTALLATION AND RELOCATION TO BE COORDINATED AND BLASTED BY CONTRACTOR

16 ALL TRAFFIC SIGN BASES AND POLES TO BE INSTALLED TO SPECIFICATIONS

17 CONTRACTOR IS RESPONSIBLE FOR ALL GEOTECHNICAL WORKS (INCLUDING INSPECTION) WORKS TO BE CERTIFIED BY PROJECT GEOTECHNICAL ENGINEER

18 INLET AND OUTLET HEADWALLS TO BE CONSTRUCTED AS PER HW SPECIFICATIONS DWG 8 HWCD 1629 & 1623

19 WHERE LATERALS CONNECT TO MANHOLES, PROPER BENCHING TO BE CONSTRUCTED TO DIRECT FLOW INTO OUTLET PIPE

20 CONTRACTOR TO CONTACT CONSULTANT AND PARKS CANADA INSPECTOR FOR SITE REVIEW AT THE FOLLOWING STAGES
1 GRUBBING COMPLETED
2 SUBGRADE COMPLETED
3 TYPE 2 GRAVEL COMPLETED
4 TYPE 1 GRAVEL COMPLETED
APPROVAL FROM PROJECT ENGINEER AT EACH STAGE TO BE RECEIVED IN WRITING PRIOR TO START OF WORK ON NEXT STAGE

21 THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TRAFFIC CONTROL AND SAFETY MEASURES DURING WORK

22 LOT GRADING TO BE PERFORMED SUCH THAT RUNOFF IS DIRECTED INTO SWALES AND DISCHARGED AT CURB OR REAR LOT BOUNDARY

23 ALL DISTURBED AREAS BEYOND THE STREET LINE, NOT STABALIZED BY GRAVEL TO BE HYDROSEEDED CONTRACTOR TO RE-HYDROSEED AREAS WHICH DO NOT SHOW SIGNS OF ACTIVE GROWTH IN THE FIRST GROWING SEASON. ALL EXISTING SURFICIAL TOPSOIL, DELETERIOUS FILL MATERIALS AND WEAKENED AND/OR DISTURBED SOIL WITHIN THE LIMITS OF CONTRACT SHALL BE REMOVED AND DISPOSED OF OFF SITE

24 THE CONTRACTOR SHALL ADVISE THE ENGINEER AT LEAST TWO DAYS IN ADVANCE OF ANY SERVICE INSTALLATION. NO PIPE WORKS SHALL BE BURIED UNTIL APPROVAL IS GIVEN BY THE ENGINEER

25 ALL WATERMAIN BENDS TEES AND FITTINGS SHALL INCLUDE MECHANICAL JOINT RESTRAINT DEVICES AND TRUST BLOCKS UNLESS OTHERWISE NOTED

26 CONTRACTOR TO VERIFY ALL EXISTING GRADES AND REPORT ANY DISCREPANCIES TO THE ENGINEER

27 ALL EXISTING SURFICIAL TOPSOIL, DELETERIOUS FILL MATERIALS AND WEAKENED AND/OR DISTURBED SOIL WITHIN THE LIMITS OF CONTRACT SHALL BE REMOVED AND DISPOSED OF OFF SITE.

EROSION AND SEDIMENT CONTROL GENERAL NOTES

1 CONSTRUCTION ACTIVITY TO BE CARRIED OUT BASED ON THE PRINCIPLE THAT PREVENTION OF SEDIMENT LADEN RUN-OFF IS THE FOCUS RATHER THAN RELYING ON TREATMENT AT OUTFALL. THIS IS TO BE ACCOMPLISHED BY MINIMIZING EXPOSED SOIL. ONCE EXCAVATION HAS BEGUN IN A PARTICULAR AREA, THE WORK IS TO BE COMPLETED IN THAT AREA, INCLUDING FINAL GRADING AND STABILIZATION. ON THIS PROJECT IT WILL BE UNACCEPTABLE TO CONSTRUCT THE ENTIRE PROJECT AND THEN DO ALL STABILIZATION WORK. SOIL STABILIZATION WORK ON THIS PROJECT WILL BE AN ONGOING PROCESS HEAVILY INFLUENCED BY WEATHER FORECASTS

2 ALL WORKS TO BE PERFORMED IN ACCORDANCE WITH THE REQUIREMENTS OF PARKS CANADA AND THE NEWFOUNDLAND DEPARTMENT OF ENVIRONMENT

3 CONTRACTOR IS RESPONSIBLE FOR THE PROTECTION OF NATURAL WATERCOURSES FROM DAMAGE DUE TO SILTATION RUN OFF FROM THE CONSTRUCTION SITE. ACCEPTABLE CONSTRUCTION PROCEDURES MAY BE OBTAINED FROM THE "EROSION AND SEDIMENTATION CONTROL HANDBOOK FOR CONSTRUCTION SITES", CURRENT EDITION BY THE NOVA SCOTIA DEPARTMENT OF ENVIRONMENT

4 TRIBUTARY STORMWATER FROM SITE TO BE DIRECTED TO SEDIMENTATION CONTROL DEVICES AT ALL TIMES DURING CONSTRUCTION

5 CONTRACTOR TO MONITOR ENVIRONMENT CANADA'S 5 DAY FORECAST ON A DAILY BASIS. WHEN RAIN IS FORECAST CONTRACTOR TO ENSURE THAT ALL EXPOSED AREAS ARE STABILIZED PRIOR TO RAINFALL EVENT. ENVIRONMENT CANADA'S WEATHER LINE 426-9030

6 CONTRACTOR TO INSPECT SEDIMENT CONTROL STRUCTURES AND MAKE NECESSARY REPAIRS ON A WEEKLY BASIS AND BEFORE AND AFTER EACH RAINFALL EXCEEDING 10mm. CONTRACTOR TO KEEP A LOG DOCUMENTING INSPECTIONS, REMEDIATION ACTION AND WEEKLY REPORT OF EXPOSED AREAS

7 CONTRACTOR TO OBTAIN ALL NECESSARY PERMITS TO PERFORM WORKS, AND COMPLY WITH ALL PERMIT REQUIREMENTS AND CONDITIONS INCLUDING THE PROVISION OF SECURITY

8 CONTRACTOR TO HAVE ADDITIONAL SILT FENCE, BALED HAY AND LOOSE HAY AND/OR MULCH ON SITE FOR MAINTENANCE AND INSTALLATION OF ADDITIONAL MEASURES AS REQUIRED

9 COVER EXPOSED SURFACES WITH HAY MULCH OR WOOD CHIPS AS REQUIRED TO PREVENT SEDIMENT RUN-OFF. MAINTAIN COVERAGE THROUGHOUT CONSTRUCTION PERIOD

10 MEASURES TO REMAIN IN PLACE THROUGH LOT AND BUILDING CONSTRUCTION PERIOD

11 CONTRACTOR TO INSTALL AND MAINTAIN DIVERSION DITCHES AROUND AND THROUGH THE SITE AS NECESSARY TO KEEP CLEAN WATER CLEAN

12 ALL LOT DRAINAGE EASEMENTS TO BE HYDROSEEDED AND MULCHED AT COMPLETION OF GRADING ACTIVITY

13 ALL EXPOSED AREAS NOT FINISHED WITH ASPHALT CONCRETE, GRAVEL, OR SOD TO BE HYDROSEEDED

14 WHERE SILT FENCE IS SHOWN AND GROUND IS TOO ROCKY TO INSTALL REGULAR SILT FENCE, CONTRACTOR MAY SUBSTITUTE WITH WOODCHIP BERM AS SHOWN IN DETAIL

15 MAINTAIN CLEAN GRAVEL ACCESS ROAD TO SITE. PERIODICALLY APPLYING ADDITIONAL GRAVEL TO COVER MUD SURFACES. CONTRACTOR RESPONSIBLE TO CLEAN ADJACENT STREETS ON AN ON-GOING BASIS

16 RESTRICT VEHICLE ACCESS TO SITE AT CONSTRUCTION ENTRANCES

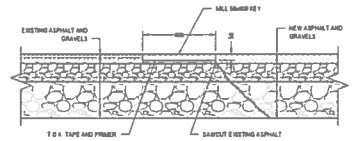
17 STOCKPILING OF MATERIAL ON-SITE MUST BE STABILIZED USING APPROPRIATE MEASURES INCLUDING SILT FENCE, HAY AND TRAPS

18 SITE ACTIVITY IS SUBJECT TO REQUIREMENTS OF PARKS CANADA

19 ALL SEDIMENT CONTROL MEASURES TO BE FUNCTIONAL AT ALL TIMES DURING CONSTRUCTION

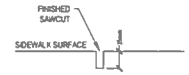
20 CONTRACTOR TO LEAVE SEDIMENTATION CONTROL MEASURES IN SERVICE UNTIL CONSULTANT OR PARKS CANADA REQUESTS THAT THEY BE TAKEN OUT OF SERVICE

21 THE SEDIMENTATION AND EROSION CONTROL MEASURES OUTLINED ON THIS PLAN ARE RECOMMENDATIONS ONLY. DEPENDING ON SITE CONDITIONS DURING CONSTRUCTION ADDITIONAL MEASURES WOULD BE REQUIRED. CONTRACTOR SHOULD RETAIN A QUALIFIED EROSION & SEDIMENTATION CONTROL SPECIALIST TO PROVIDE DIRECTION AS CONSTRUCTION PROGRESSES

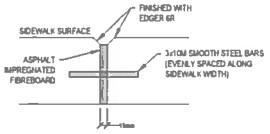


NOTE
SAWCUT EXISTING ASPHALT TO MAKE VERTICAL CLEAN JOINT. MILL 50x600 KEY PLACE AND COMPACT NEW GRAVELS. APPLY TOK TAPE AND PRIMER TO KEY AND PLACE/COMPACT NEW ASPHALT. SHALL HAVE SMOOTH TRANSITION WITH EXISTING ASPHALT TO ENGINEER'S FULL SATISFACTION

ASPHALT JOINT
SCALE 1:20



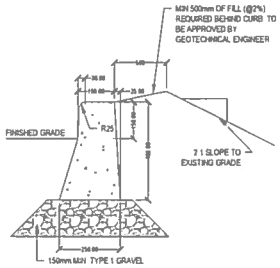
CONTROL JOINT



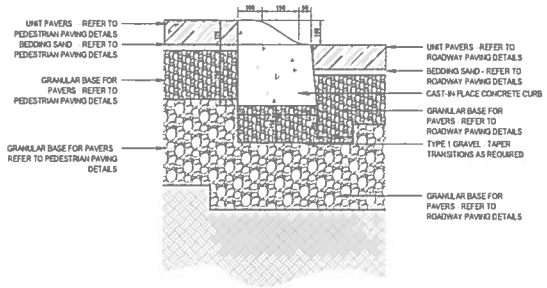
EXPANSION JOINT

NOTES
1 EXPANSION JOINTS TO BE SPACED EVERY 50m
2 CONTROL JOINTS TO BE SPACCED EVERY 1.5m
3 GRAVEL BASE TO EXTEND 150mm BEYOND EDGE OF SIDEWALK CONCRETE
4 CONTROL JOINTS TO BE SAW CUT
5 EXPANSION JOINT BARS ARE TO BE GREASED ON ONE SIDE OF THE JOINT
6 DURING CONSECUTIVE POURS, THE END OF EACH POUR IS TO OCCUR AT AN EXPANSION JOINT

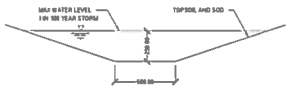
CONCRETE SIDEWALK JOINTS
SCALE 1:50



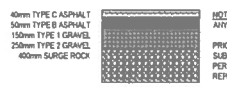
CONCRETE CURB
SCALE 1:10



ROLLED CURB
SCALE 1:10



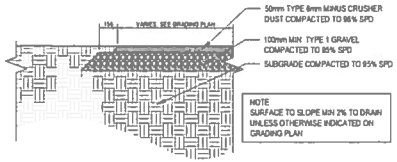
SWALE CROSS SECTION
SCALE 1:20



NOTES PAVEMENT STRUCTURE TO BE VERIFIED WITH GEOTECHNICAL REPORT. SHOULD ANY DISCREPANCIES OCCUR, THE GEOTECHNICAL REPORT SHALL BE TAKEN AS CORRECT

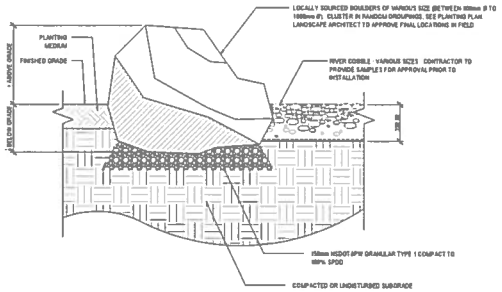
PRIOR TO PLACEMENT OF THE PAVEMENT AND SUB-BASE GRAVELS, THE ENTIRE SUBGRADE SHOULD BE PROOF-ROLLED UNDER THE SUPERVISION OF THE GEOTECHNICAL PERSONNEL. ANY AREAS SHOWING EXCESSIVE DEFLECTION SHOULD BE EXCAVATED AND REPLACED WITH COMPACTED GRANULAR MATERIAL.

ASPHALT PAVEMENT
SCALE 1:30

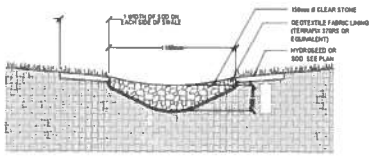


NOTE
SURFACE TO SLOPE MIN 2% TO DRAIN UNLESS OTHERWISE INDICATED ON GRADING PLAN

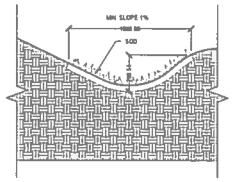
CRUSHER DUST PAVING
SCALE 1:20



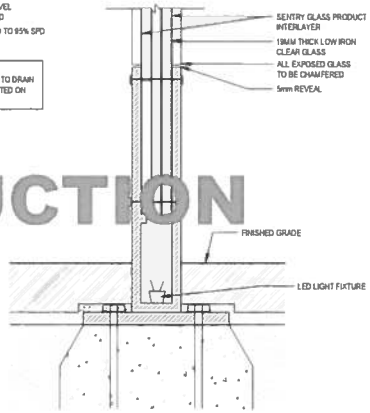
BOULDER SECTION
SCALE 1:20



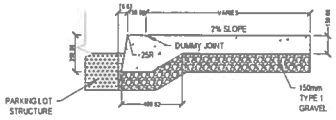
ROCK SWALE SECTION
SCALE 1:20



SOD SWALE SECTION
SCALE 1:20



SIGN BASE
SCALE 1:5



STANDARD SIDEWALK SECTION
SCALE 1:20

Public Works and Government Services Canada / Travaux Publics et Services gouvernementaux Canada

ekistics plan+design

revisions		date
1	ISSUED FOR 66% REVIEW	JULY 10 2018

project / projet: TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin: SITE NOTES AND DETAILS

designed / conçu: EC/AB/BR/SC/KP
date: ---
drawn / dessiné: ---
date: ---
approved / approuvé:
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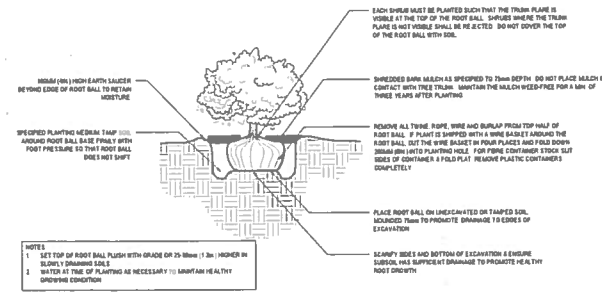
Tender / Soumission:
PWGSC Project Manager / Administrateur de projet TPSGC:
project number / no. du projet: ----
drawing no / no du dessin: L-500

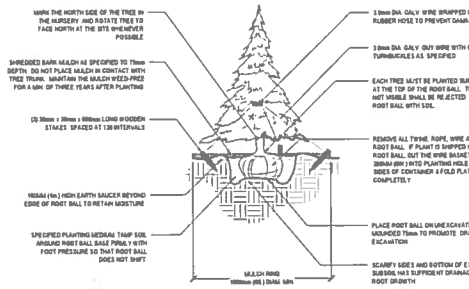
PWGSC A1 (2004)

E-DPM/GDD-E. ----



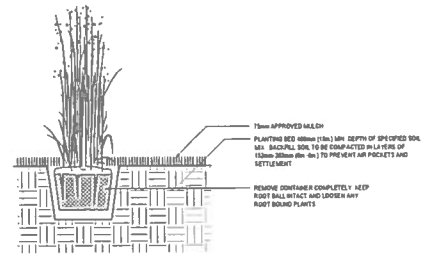
NOTES
1. SET TOP OF ROOT BALL FLUSH WITH GRADE OR 25-50mm (1-2in.) HIGHER IN SLOWLY DRAINING SOILS
2. WATER AT TIME OF PLANTING AS NECESSARY TO MAINTAIN HEALTHY GROWING CONDITION

SHRUB PLANTING DETAIL
SCALE 1:20



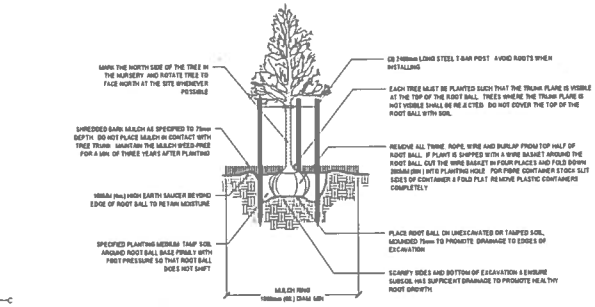
NOTES
1. DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED. DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN
2. STAKE TREES ONLY UPON THE APPROVAL OF THE LANDSCAPE ARCHITECT
3. WATER AT TIME OF PLANTING AS NECESSARY TO MAINTAIN HEALTHY GROWING CONDITIONS
4. SET TOP OF ROOT BALL FLUSH WITH GRADE OR 25-50mm (1-2in.) HIGHER IN SLOWLY DRAINING SOILS

CONIFEROUS TREE PLANTING
SCALE 1:20



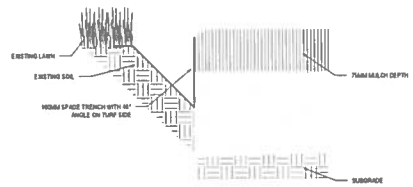
NOTES
1. ALL PERENNIALS AND GRASSES TO BE PLANTED AT EQUAL, TRIANGULAR SPACING UNLESS OTHERWISE INDICATED ON PLAN. REFER TO PLANTING PALETTE FOR PLANT SPACING

PERENNIAL PLANTING
SCALE 1:20

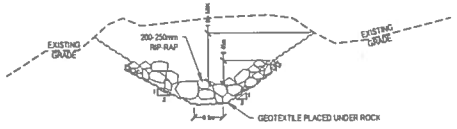


NOTES
1. DO NOT HEAVILY PRUNE THE TREE AT PLANTING. PRUNE ONLY CROSSOVER LIMBS, CO-DOMINANT LEADERS, AND BROKEN OR DEAD BRANCHES. SOME INTERIOR TWIGS AND LATERAL BRANCHES MAY BE PRUNED. DO NOT REMOVE THE TERMINAL BUDS OF BRANCHES THAT EXTEND TO THE EDGE OF THE CROWN
2. STAKE TREES ONLY UPON THE APPROVAL OF THE LANDSCAPE ARCHITECT
3. WRAP TREE TRUNKS ONLY UPON THE APPROVAL OF THE LANDSCAPE ARCHITECT
4. SET TOP OF ROOT BALL FLUSH WITH GRADE OR 25-50mm (1-2in.) HIGHER IN SLOWLY DRAINING SOILS
5. WATER AT TIME OF PLANTING AS NECESSARY TO MAINTAIN HEALTHY GROWING CONDITION

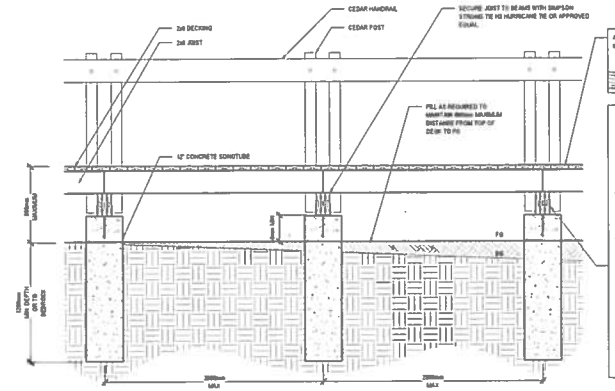
DECIDUOUS TREE PLANTING
SCALE 1:20



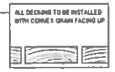
PLANTING BED - SPADE EDGE
SCALE 1:20



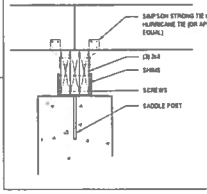
TYPICAL ROCKLINED DITCH
SCALE 1:40



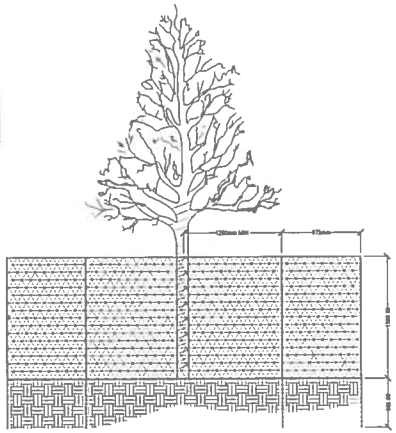
TIMBER DECKING
SCALE 1:20



1) DRILL INTO CONCRETE. EPOXY BOLT INTO PLACE. MOUNT SIMPSON POST SADDLE (BCP18 SHOWN OR APPROVED EQUAL)
2) ASSEMBLE (3) 2x8 INTO BEAM. PLACE BEAM IN SADDLE, SHIM AS NECESSARY TO FIT
3) SCREW BEAM INTO SADDLE PER MANUFACTURER'S RECOMMENDATIONS



NOTES
1) SET TOP OF CONCRETE SONOTUBE MINIMUM 50mm ABOVE FINISH GRADE
2) TOP OF DECK NOT TO EXCEED 600mm ABOVE FINISH GRADE
3) FASTEN ALL DECKING WITH 4" OUTDOOR RATED DECK SCREWS OR APPROVED EQUAL
4) CONCRETE SONOTUBE SUNK TO MINIMUM 1200mm BELOW FINISH GRADE, OR TO BEDROCK
5) IN ORDER TO MAINTAIN 750mm MINIMUM DISTANCE BETWEEN TOP OF DECK AND FG CONTRACTOR TO FILL WITH ADDITIONAL TOPSOIL AS NECESSARY. DIMENSIONS VARY WITH TOPOGRAPHY
6) ATTACH ALL JOISTS AND STRINGERS TO BEAM WITH SIMPSON STRONG TIE ANGLE BRACKETS, OR APPROVED EQUAL
7) ALL DECKING TO BE INSTALLED WITH CONVEX GRAIN FACING UP



NOTES
- ALL WORK FOR TREE PROTECTION TO BE CARRIED OUT IN ACCORDANCE WITH APPROVED HORTICULTURAL PRACTICES
- TREE PROTECTION FENCING TO BE INSTALLED BEYOND THE DRIPLINE OF THE TREE, OR A MINIMUM DISTANCE OF 1000mm
- SEE L 105 FOR AREAS WHERE EXISTING TREES ARE TO BE PROTECTED
- 2400mm LENGTH T-BARS SPACED 1000mm O.C. AND WIRED TO THE INSIDE OF A STANDARD SNOW FENCE (ORANGE 1.2M HIGH PLASTIC FENCE) AT THREE LOCATIONS WITH 8M WIRE
- ATTACHMENT OF FENCE TO EXISTING TREES IS NOT PERMITTED
- FENCING TO BE INSTALLED PRIOR TO START OF CONSTRUCTION AND MAINTAINED IN PLACE UNTIL ALL CONSTRUCTION IS COMPLETE
- FRAMED HOARDING IS TEMPORARY FENCING FOR THE DURATION OF CONSTRUCTION ACTIVITY PLACED AROUND EXISTING TREES TO BE PRESERVED. FRAME HOARDING IS DEFINED AS PLASTIC SAFETY FENCING SUPPORTED BY IRON "T" STAKES AT 1000mm O.C. AND SUPPORTED WITH A WOODEN FRAME OF 25mm X 75mm SLATS ACROSS THE TOP
- ABSOLUTELY NO STORAGE OR MATERIALS OR PARKING WITHIN FENCING BOUNDARY

TREE PROTECTION
SCALE 1:30

Public Works and Government Services Canada / Travaux Publics et Services gouvernementaux Canada

ekistics plan+design

rev	revisions	date
1	ISSUED FOR 66% REVIEW	JULY 13 2018

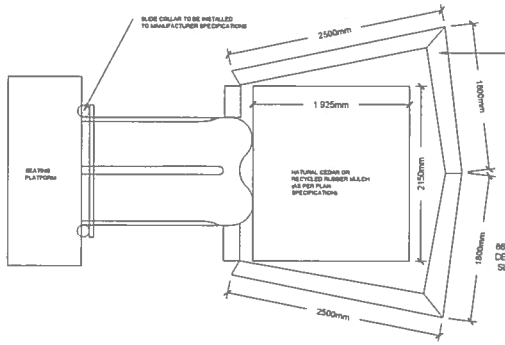
project / projet: TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin: SITE DETAILS I

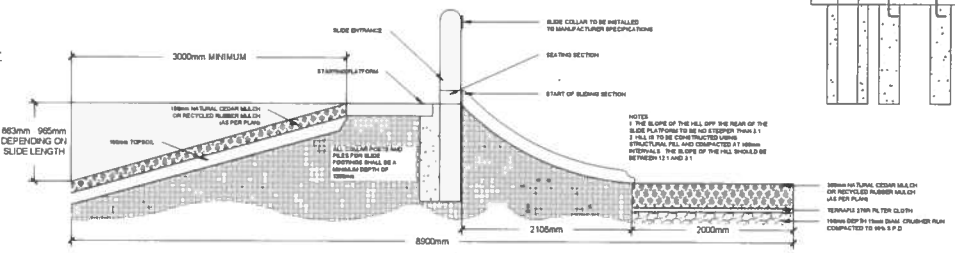
designed / conçu: CC/JB/BR/SC/KP
date: ---
drawn / dessiné: ---
date: ---
approved / approuvé:
date:
Tender / Soumission
PWGSC Project Manager / Administrateur de projet TPSGC
project number / no. du projet: ---
drawing no / no. du dessin: L-501

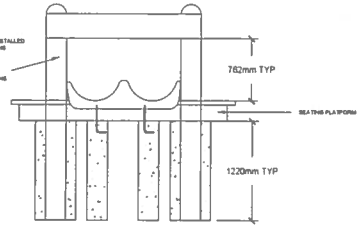
PWGSC A1 (2004)

E-DPM/CDD-E. ----

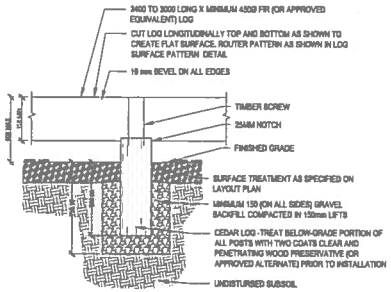


HILL SLIDE
SCALE 1:30



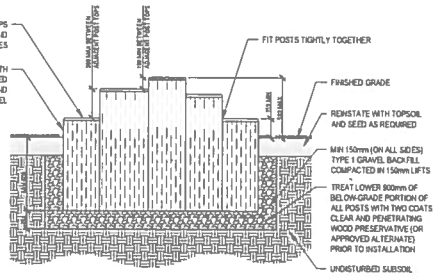


NOTES
1. SPECIFIED DEPTHS OF TOPSOIL ARE DEPTHS AFTER SETTLEMENT SPECIFIED DEPTH OF CRUSHER DUST AND GRANULAR BASES IS COMPACTED DEPTH
2. ALL TIMBER, LUMBER AND LOGS TO BE FREE FROM WARPS, CHECKS AND CRACKS
3. LOG INSTALLATION TO BE TO THE SATISFACTION OF THE LANDSCAPE ARCHITECT
4. MULTIPLE HORIZONTAL LOGS MAY BE INSTALLED END-TO-END IN A ZIG-ZAG PATTERN. ANGLE CUT ENDS TO CREATE MITRE JOINT. ENSURE 6mm GAP AT JOINT



HORIZONTAL LOG ABOVE GRADE
SCALE 1:20

NOTES
1. ALL POSTS TO BE INSTALLED VERTICAL WITH TOPS CUT HORIZONTAL. VARY HEIGHTS AS INDICATED ON LAYOUT PLAN
2. NUMBER OF POSTS VARIES. REFER TO LAYOUT PLAN AND LOG STEPPER SCHEDULE
3. ALL FASTENERS TO BE HOT-DIPPED GALVANIZED



LOG STEPPER
SCALE 1:20

NOT FOR CONSTRUCTION

Public Works and Government Services Canada / Travaux Publics et Services gouvernementaux Canada

ekistics plan+design

revisions		date
1	ISSUED FOR 66% REVIEW	JULY 16 2016

project / projet
TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin
SITE DETAILS 2

designed / conçu: CC/JB/BR/SC/KP
date: ----
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approved / approuvé:
date:
Tender / Soumission:
PWGSC Project Manager / Administrateur de projets TPSGC:
project number / no du projet: ----
drawing no / no du dessin: L-502

PWGSC A1 (2004)

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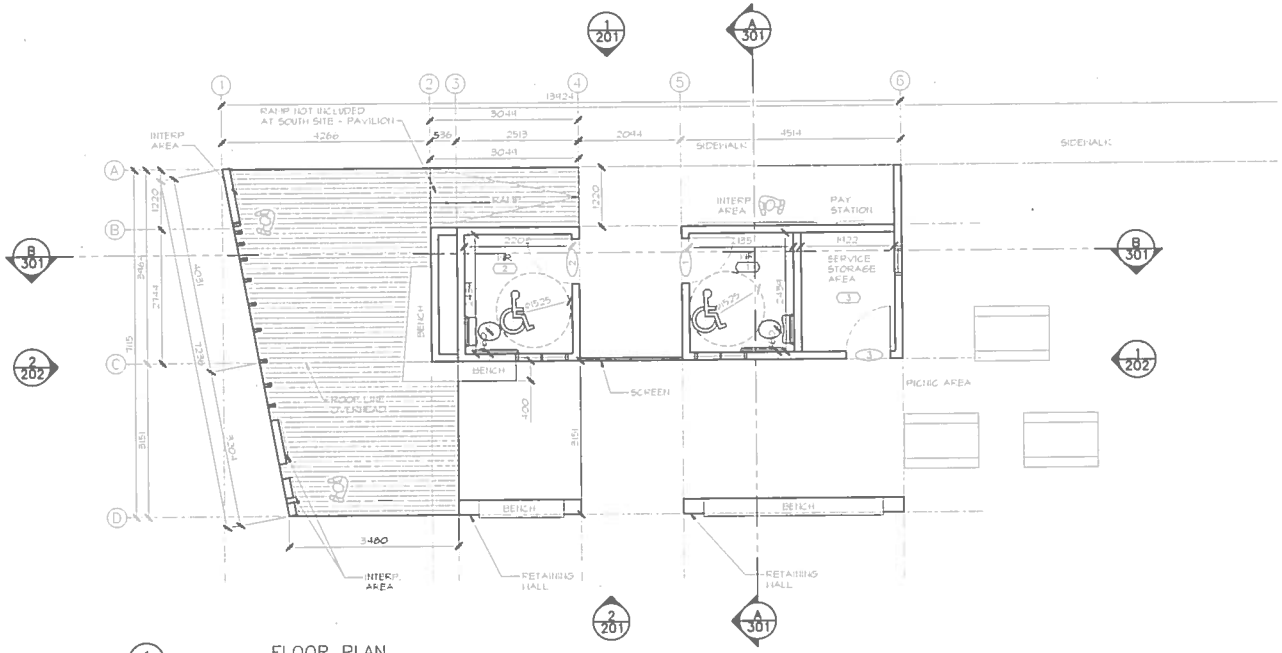

1/101 FLOOR PLAN

SCALE : 1:50

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revisions		date
1	ISSUED FOR REVIEW/66%	17/15 2016

project / projet

TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin

NORTH - SOUTH SITE PAVILION FLOOR PLAN

designed / conçu: CC/JB/BR/SC/AP

date: ----

drawn / dessiné: ----

date: ----

approved / approuvé

date

Terrain: South south

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project number / no du projet: ----

drawing no / no. du dessin: A-101

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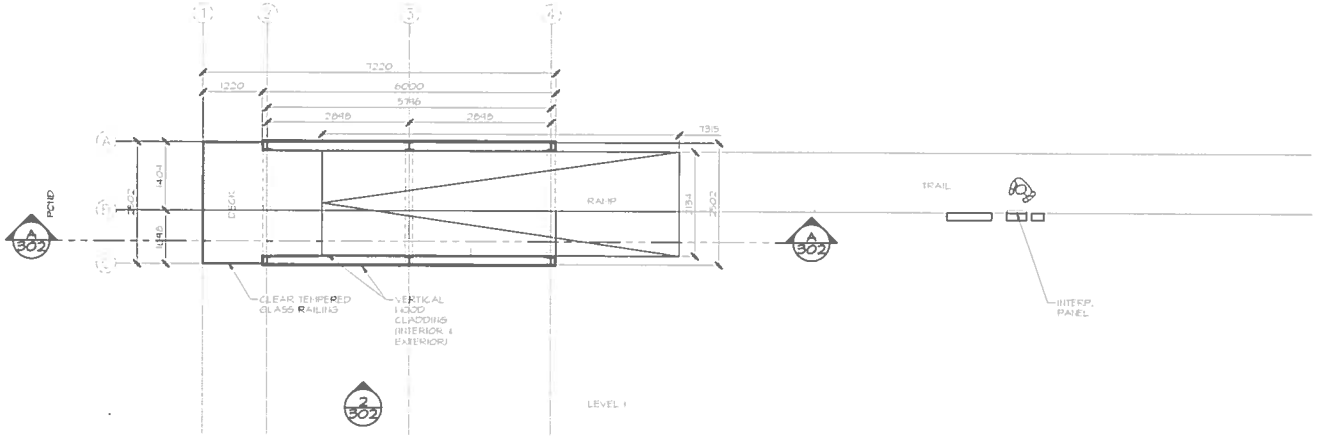

1 102 FLOOR PLAN

SCALE : 1:50

0m 1m 2m 3m 4m 5m

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revision		date
1	ISSUED FOR 66% REVIEW	OCT 19 2016

project

TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing

NORTH SITE - POND LOOKOFF

designed CC/JB/BR/SC/KP

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date

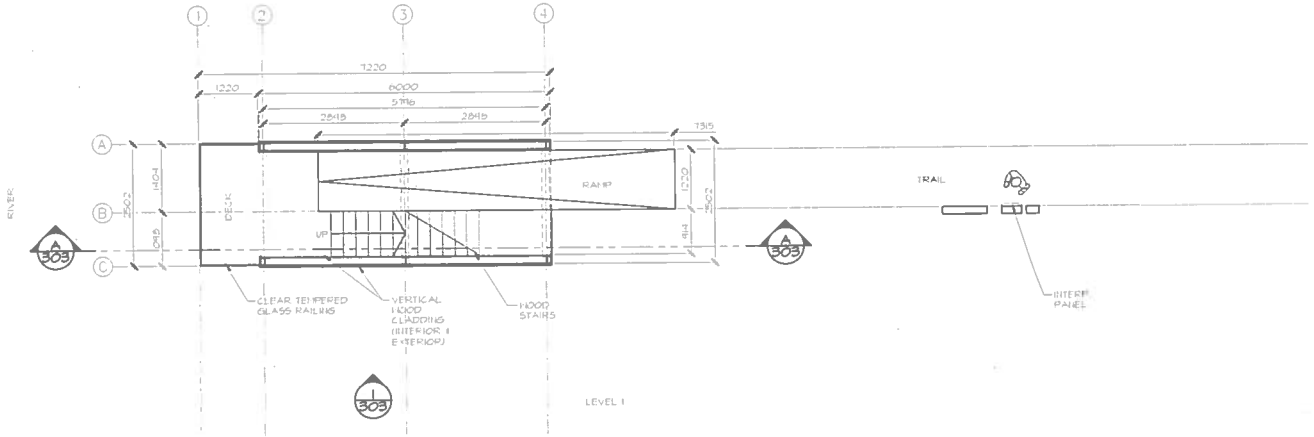
tender

PWGSC Project Manager

project number

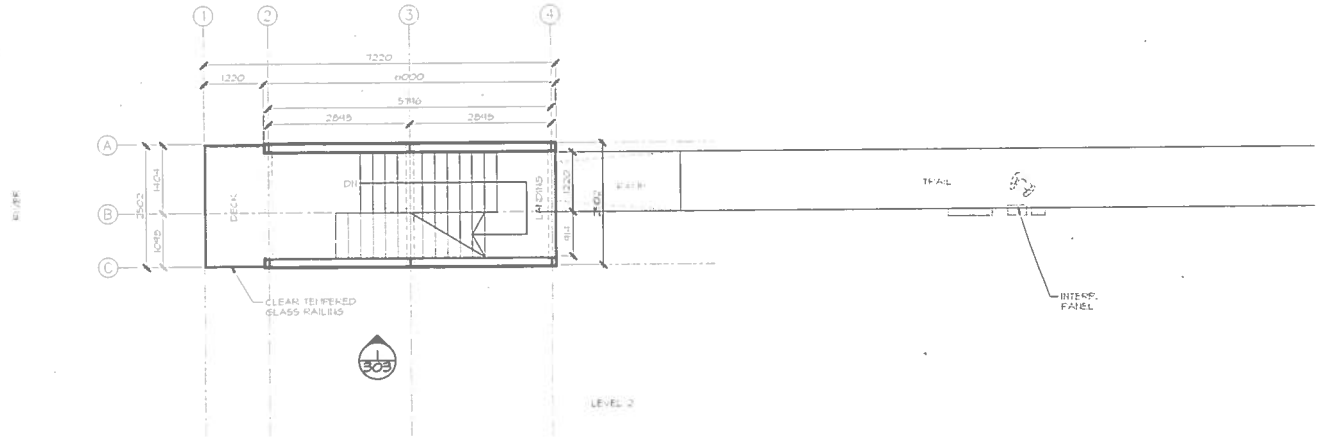
drawing no

A-102



FLOOR PLAN – LV1

SCALE : 1:50



FLOOR PLAN – LV2

SCALE : 1:50

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revisions		date
1	ISSUED FOR 66% REVIEW	JUL 11 2016

project / projet

TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin

SOUTH SITE RIVER LOOKOFF FLOOR PLAN

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drawn / dessiné: ----
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approved / approuvé:
date:

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drawing no / no. du dessin: A-103

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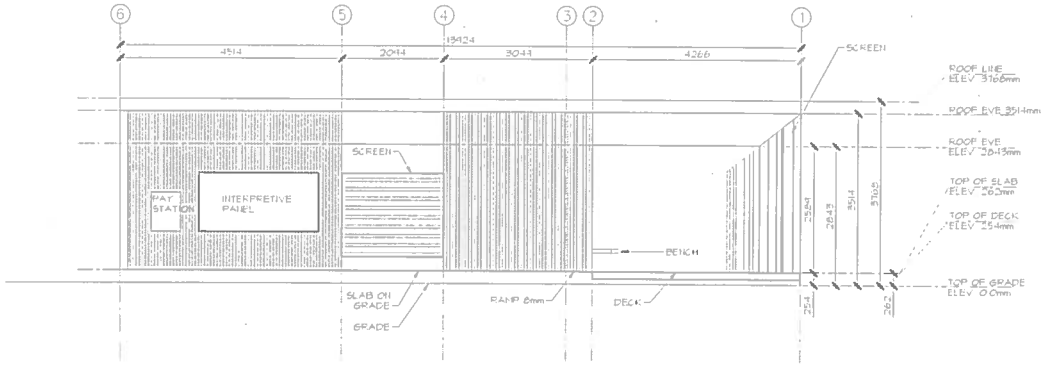
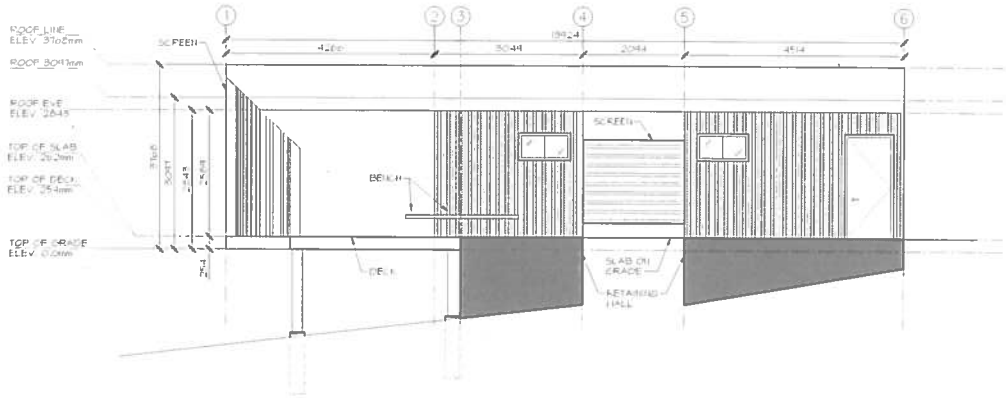


1/201 ELEVATION – NORTH

SCALE : 1:50



2/201 ELEVATION – SOUTH

SCALE : 1:50

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revisions		date

project / projet

TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin

NORTH- SOUTH SITE PAVILION ELEVATIONS NORTH & SOUTH

Designed CC/JB/BR/SC/AH

date – – – –

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date – – – –

REVIEWED / VÉRIFIÉ

date

Tender / Soumission

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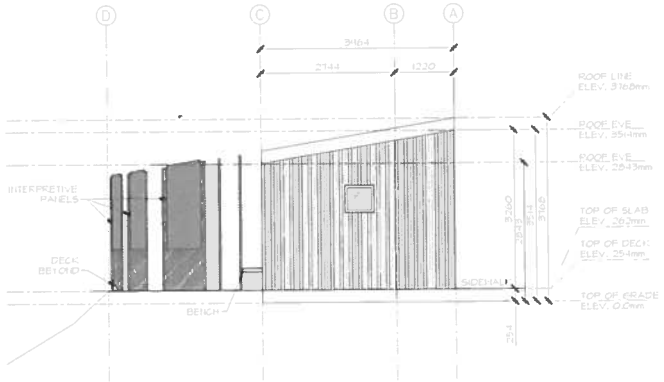
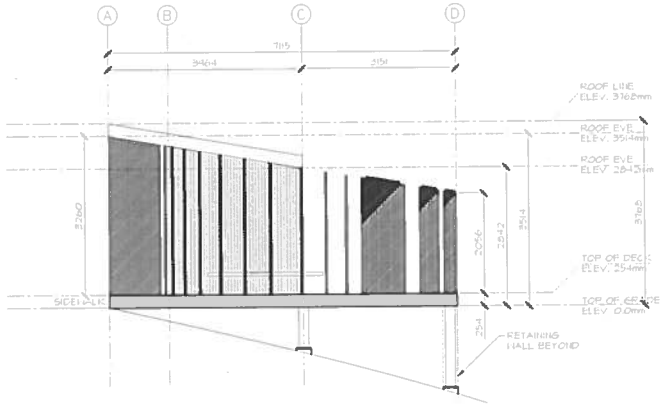


1/202 ELEVATION – EAST

SCALE : 1:50



2/202 ELEVATION – WEST

SCALE : 1:50

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revisions		date
1	ISSUED FOR REVIEW/66%	07/15 2016

project / projet

TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin

NORTH - SOUTH SITE PAVILION ELEVATIONS EAST & WEST

designed / conçu: CC/JB/BR/SC/KP

date: ----

drawn / dessiné: ----

date: ----

approved / approuvé

date

tender / soumission

PWGSC Project Manager / Administrateur de projets TPSGC

project number / no. du projet: ----

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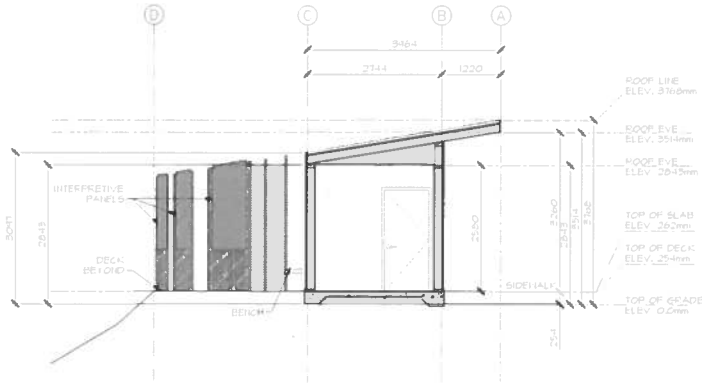

1/301 SECTION A

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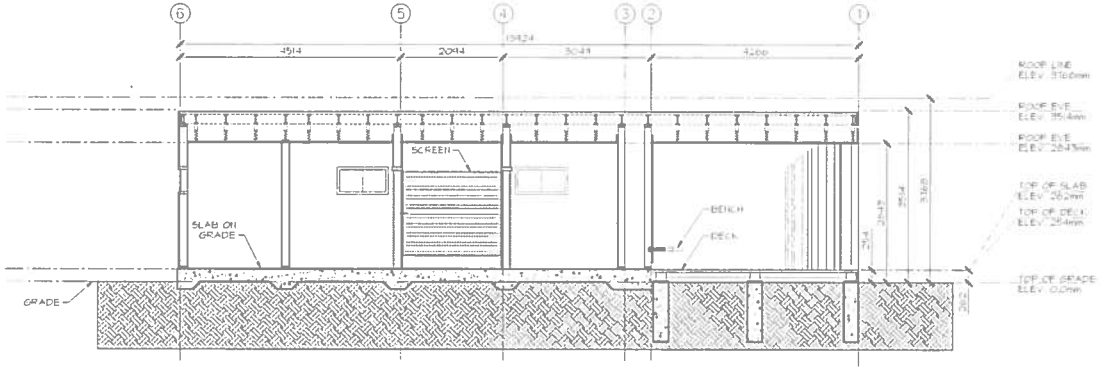

2/301 SECTION B

SCALE : 1:50

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revisions		date

project / projet

TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing / dessin

NORTH - SOUTH SITE PAVILION SECTIONS

Designed CC/JB/BR/SC/KP consultant

date ----

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chkd ----

approved approval

date

Tender Southspan

PWGSC Project Manager Administrateur de projets TPSGC

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PWGSC A1 (2004)

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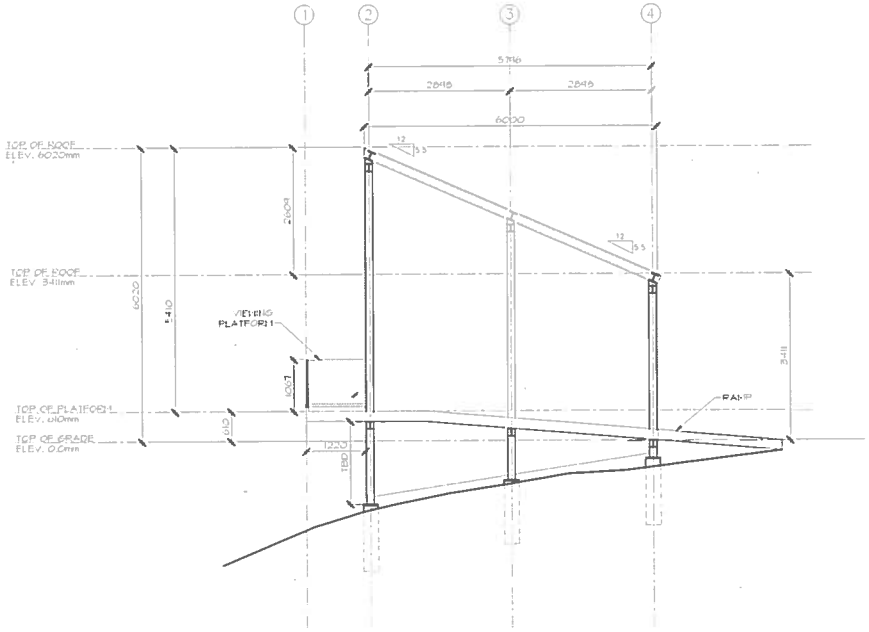

1/302 SECTION A

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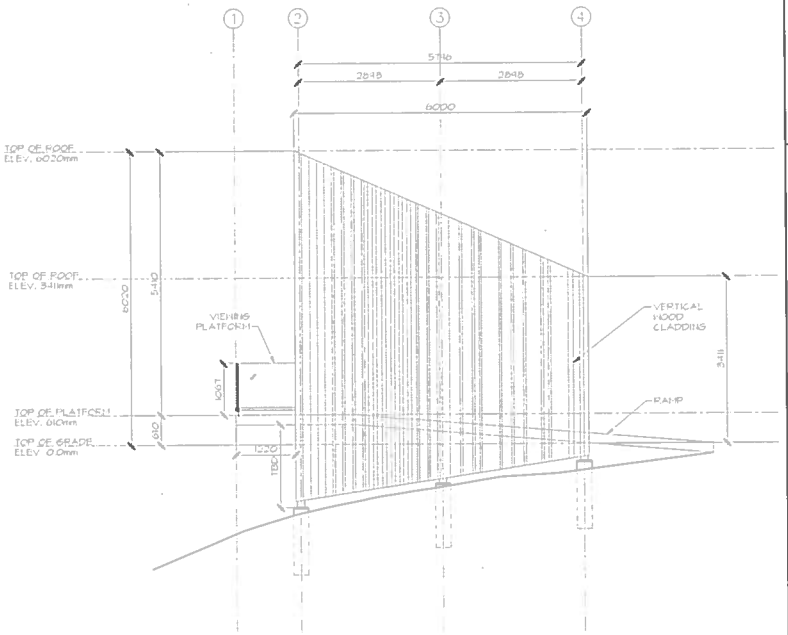

2/302 ELEVATION

SCALE : 1:50

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Public Works and Government Services Canada
Travaux Publics et Services gouvernementaux Canada

ekistics plan+design

revisions		date
1	ISSUED FOR 66% REVIEW	JULY 1? 2016

project / projet

TERRA NOVA
NATIONAL PARK
ENTRANCE
REHABILITION
PROJECT

drawing / dessin

NORTH SITE POND
LOOKOFF - ELEVATION
& SECTION

designed CC/JB/BR/SC/KP conçu
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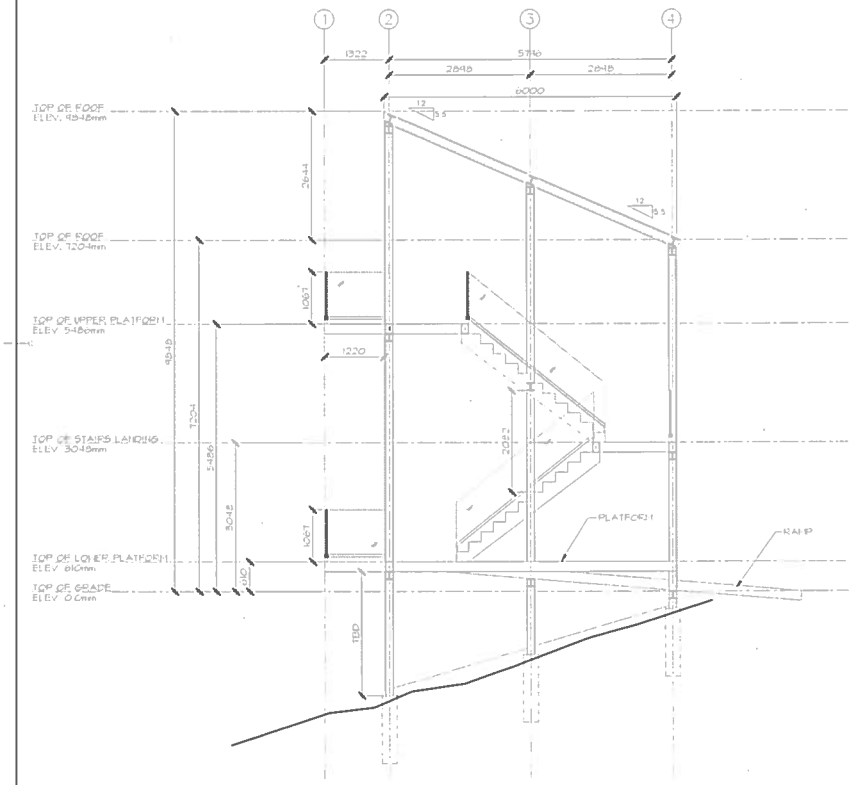

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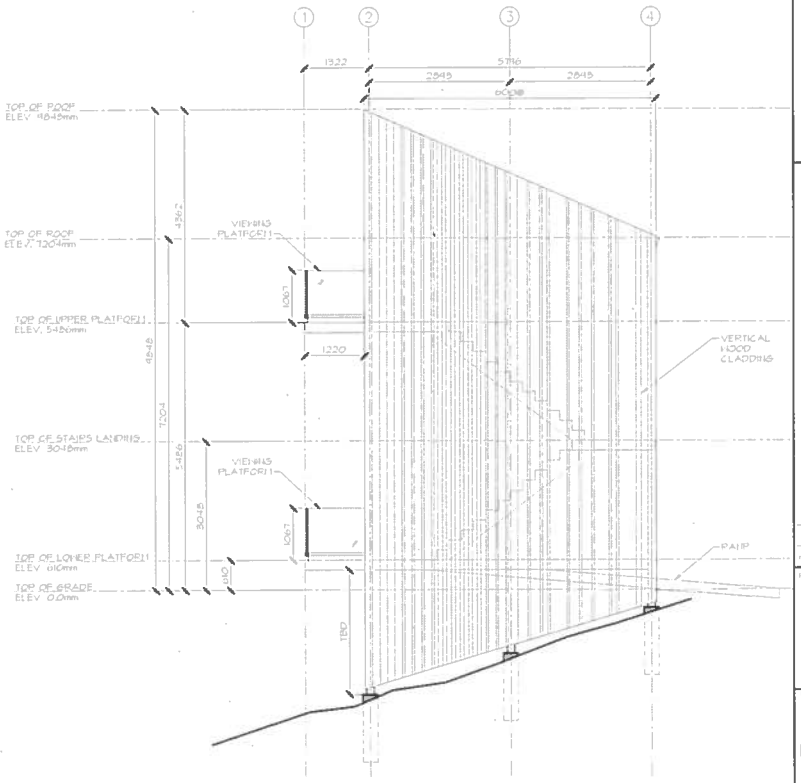

2/303 ELEVATION

SCALE : 1:50

Public Works and Government Services Canada / Travaux Publics et Services gouvernementaux Canada

ekistics plan+design

revisions		date
1	ISSUED FOR 66% REVIEW	JULY 14 2016

project: TERRA NOVA NATIONAL PARK ENTRANCE REHABILITION PROJECT

drawing: SOUTH SITE RIVER LOOKOFF - ELEVATION & SECTION

designed CC/JB/BR/SC/KP

date ----

drawn ----

date ----

reviewed

date

Tender

PWGSC Project Manager / Administrateur de projets TPSGC

project number / No. du projet ----

drawing no. / No. du dessin A-303

Attachment #2

Parks Canada National Best Management Practices; Campground and Day Use Area Maintenance and Modification

For

Park Entrance Construction Project

Basic Impact Analysis

Terra Nova National Park of Canada
Newfoundland and Labrador

August 2016

Parks Canada National Best Management Practices

Campground and Day Use Area Maintenance and Modification

Parks Canada National Best Management Practices for Campground and Day Use Area Maintenance and Modification

Approved by

Original signed by Nadine Crookes

_____

Nadine Crookes, Director Natural Resource Conservation Branch

Original signed by Ed Jager

_____

Ed Jager, Director Visitor Experience Branch

August 4, 2016

_____

Date

Contents

Introduction

The Best Management Practice (BMP) pathway is applied when there is a suite of routine, repetitive projects or activities, with well understood and predictable effects. This fulfils Park's Canada's obligations under the *Canadian Environmental Assessment Act 2012* as a manager of federal land (see the Guide to the Parks Canada EIA Process). The BMP maximizes efficiency through creation of a pre-approved impact assessment for the defined suite of projects, to which standard mitigation and environmental management measures can be applied.

National BMPs can be applied in the following ways:

- Direct application: Use as is as long as the proposed project falls within the scope of the BMP(s) and its application will ensure there are no significant residual adverse environmental effects.
- Application along with supplemental mitigations: *This will likely be the case when using a National BMP*. Slight modifications will likely be required to ensure all potential impacts are mitigated and to provide project-specific clarifications (e.g., critical timing windows, contact information, SAR considerations, which mitigations apply to the project and which ones do not apply).
- Application as part of a Basic Impact Analysis (BIA) or Detailed Impact Analysis (DIA): where one or more BMPs may not address all the potential adverse environmental effects of a proposed project, Field Units can apply the BMP(s) as part of a BIA or DIA.
- Develop a Field Unit specific BMP: use the National BMP as a resource to create a BMP to address site-specific needs (i.e., *rip off and duplicate*). In this case, the new BMP must be signed off and approved by the Field Unit Superintendent.

The impact assessment officer (IAO) will review a proposed project and advise the functional manager of the project if and how this BMP should be applied. The IAO's advice will be based on whether the project falls within the scope of the BMP, and whether application of the mitigation measures in the BMP will adequately address potential adverse effects of the project. The IAO will also be responsible for adding any required supplemental mitigations to ensure site specific considerations are addressed.

Project Managers are responsible to ensure all mitigation measures applicable to the project are added to the terms and conditions of any permits or contracts issued for the project.

The IAO must ensure the project, EIA pathway applied and determination are recorded in the Parks Canada National Impact Environmental Assessment Tracking System.

Scope of Application

This BMP applies to the maintenance and modification of existing campground and day use areas within national parks and national historic sites, including historic canals.

These facilities are an opportunity to engage and enhance visitor experience and include campsites, playgrounds, kitchen shelters, washroom and shower facilities, kiosks, outdoor theatres, interpretive venues and outdoor sports fields at parks with townsites.

General activities addressed in this BMP include:

- routine maintenance and repair of infrastructure (e.g., fencing, dirt roads, Class B pedestrian bridges[1], culverts) Note: bridge and culvert maintenance in non-fish bearing waterbodies only.
- burial of overhead lines, electrification of campgrounds or campsites, installation of electrical and water outlets
- maintenance and repair of utility lines (e.g., water, sewer)
- reconfiguration of campsites (e.g., tent-pads for tent-specific sites, pull-through RV sites)
- campsite renewal (e.g., gravel fill, cribbing, site delineation, levelling and widening, improved sight-lines, flow and drainage)
- modification, maintenance, repair and/or demolition of buildings and structures (e.g., washroom facilities, kiosks, kitchen shelters, outdoor theatres, fire wood storage, signs, interpretive and information panels)
- non-asphalt parking lot expansion (e.g., additional parking for walk-in sites)
- modification, maintenance and repair of playgrounds
- vegetation management for improved sight-lines, natural screens, hazardous trees, wildlife attractants and wildfire management (e.g., clearing and grubbing, trimming, re-vegetation)
- wildlife management (e.g., fencing)
- earthworks (e.g., trenching, excavation, implementation of sediment and erosion control measures)
- material transportation, handling and storage
- waste management (e.g., material collection and disposal, recycling)
- equipment operations (e.g., hand machinery, vehicles such as ATVs, excavators)

Exceptions

This BMP does NOT apply to the following:

- New campground, building or day use area construction projects in a natural, previously undisturbed area or in a re-established ecosystem.
- Modifications to existing campground, building or day use areas greater than 10%[2] of the land use footprint.
- Work below the High Water Mark[3] of a fish bearing waterbody.

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[1] Class B bridges are not suspension bridges, truss bridges nor viewing platforms or towers. They have a drop in elevation between the walking surface and the adjacent surface or streambed of 2.4 metres or less. They do not have a dangerous site condition such as: Fast flow during all or part of the year; Deep water; Hazardous streambed; The adjacent surface within 1.2m of the walking surface being of a slope of more than 1 in 2; or Any other condition deemed as being dangerous by the Parks Canada Professional Engineer having jurisdiction. Class B bridges have low risk of injury due to collapse or if a person should fall from the bridge. Source: Parks Canada, *Design, Construction and Inspection of Vehicular and Pedestrian Bridges* (2008)

[2] This number is intended as a guideline; if the BMP addresses the natural and cultural resource impacts, consider its use.

[3] High Water Mark is the usual or average level to which a body of water rises at its highest point and remains for a sufficient time so as to leave a mark on the land (Fisheries and Oceans, 2016). Upper Controlled Water Elevation (UCWE) is used as a definition of High Water Mark in managed waterways.

- The use of explosives near a fish bearing waterbody.
- Projects sited in an unstable environment that could affect the structure, such as a landslide zone, floodplain or area vulnerable to storm surge and sea level rise.
- Maintenance or modification of bridges that are NOT Class B pedestrian bridges (as defined in the Parks Canada Design, Construction and Inspection of Vehicular and Pedestrian Bridges); consult the National BMP for Roadway, Highway, Parkway and Related Infrastructure.
- New onsite wastewater management systems, such as septic fields and grey water pits, or major modification of an existing one.
- Re-paving of an existing parking lot, re-surfacing with asphalt or paved roadway work; consult the National BMP for Roadway, Highway, Parkway and Related Infrastructure.
- Geotechnical investigations; consult the National BMP for Geotechnical Investigations.
- Projects located within Zone I (Special Preservation).
- Work which may adversely impact heritage buildings.
- Work which may adversely impact any potential or established Aboriginal and Treaty rights or traditional use.
- If the project has the potential to have residual adverse effects on an individual or a residence of a listed species at risk (endangered, threatened, or extirpated status) or any adverse effects on the Critical Habitat of a listed species at risk.

Should any of the above conditions apply, the project will require use of another applicable BMP or combination of BMPs to fulfill impact assessment requirements or consideration of another environmental impact analysis pathway i.e., Basic Impact Analysis (BIA) or Detailed Impact Analysis (DIA). Some or all of the mitigation measures in this BMP may be used to prepare a BIA or DIA.

NOTE: Consult with the relevant Field Unit or national Parks Canada specialists (e.g., environmental impact analysis, species at risk, cultural resources, indigenous consultation, wildfire risk reduction, and visitor experience) for guidance as required.

Approved geographic area of application

This BMP is intended for use in all Parks Canada administered protected heritage places.

Components of the environment that may be affected

Soil/Land Resources:

- Soil compaction and rutting
- Soil erosion, loss of topsoil and exposure of subsoils
- Soil contamination from waste (e.g., garbage, litter, sewage, fuel)
- Increase in anthropogenic footprint

Air/Noise Quality:

- Temporary decreased ambient air quality (e.g., dust, equipment emissions)
- Temporary increased levels of CO_2 and other pollutants
- Increased ambient noise levels

Water Quality:

- Surface and groundwater contamination from waste (e.g., garbage, litter, sewage, fuel)
- Sedimentation, causing increased turbidity
- Changes in temperature regime and natural drainage patterns

Vegetation:

- Damage to and removal of vegetation; disturbance of adjacent natural areas; root exposure, resulting in physiological stress and, in the case of trees susceptibility to windfall
- Introduction of invasive alien species, or expansion of existing populations
- Impacts on valued and sensitive vegetation features
- Habitat destruction and mortality from wildfire

Wildlife:

- Wildlife disturbance during construction and ongoing use causing displacement/preferred habitat avoidance
- Wildlife habituation/attraction to artificial food sources from garbage or litter
- Damage to nests/dens/roosts and disruption of nesting/denning/roosting animals
- Loss of food sources and habitat
- Introduction of invasive alien species, or expansion of existing populations
- Habitat destruction and mortality from wildfire

Visitor Experience:

- Reduced quality of visitor experience due to noise and presence of construction equipment
- Increased visibility of human disturbance on the landscape and decreased aesthetic
- Reduced accessibility to portions of the site where work is taking place
- Hazard to visitors and staff due to construction activities (e.g., heavy equipment and hand tool operation, helicopter use, tree removal)
- Loss of educational opportunities

Cultural Resources:

- Adverse effects on the heritage value or character-defining elements of a cultural resource or a heritage place, including:
    - Impacts to archaeological resources (known or potential) from displacement or destruction resulting in loss of heritage value
    - Adverse effects on cultural landscapes or landscape features of heritage value
    - Wildfire risk

Mitigation Measures

This BMP includes a broad range of mitigation measures and as such, the IAO must review the document carefully to determine which apply to the project. To use this document efficiently and reduce the overall size and scope of the mitigations to present to contractors and project managers, follow the recommendations below:

Step 1) Go to the Microsoft Word toolbar and select the View tab, then check the Navigation Pane box. This allows you to see all the headings and will allow for efficient editing. For

example, if a whole section does not apply, simply right click on it in the Navigation Pane and choose delete.

Step 2) Section 1. Common Activities includes mitigation measures which should, in most part, apply to all campground and day use area maintenance and modification projects. Review this section and delete the mitigation measures that may not apply to the project.

Step 3) Review Sections 2 to 6; keep relevant sections and delete those that do not apply. Review relevant sections and delete mitigation measures that do not apply to the project.

Step 4) Add any supplementary mitigation measures to Section 7. Supplementary Mitigations. For example, reference to "designated Parks Canada staff" is made through this BMP; details on site and project specific contacts must be included in this section.

Step 5) Save the document as a pdf or print a paper copy and include with the EIA determination record.

1. Common Activities

Work Site Conditions/Staging/Laydown

1. All people working on the project must review the mitigation measures and any site specific considerations with designated Parks Canada staff[4] before work begins.
2. Staging and parking areas for material and equipment must be identified, including duration of use, within an existing disturbed footprint (e.g., roadway, gravel surface, previously disturbed area with high resiliency).
3. Material drop sites (via foot, vehicle, helicopter or boat) must be approved by designated Parks Canada staff.
4. When transporting material via helicopter:
    - Choose a drop point that is open and easily accessible from the construction site and that will minimize travel to and from the construction site.
    - Plan multiple drop sites at strategic locations to avoid doubling back to distribute materials.
5. Cover construction material with weighted tarps when appropriate. Minimise damage to adjacent plant material and rehabilitate if necessary.
6. Use existing roadways, trails, disturbed areas or other areas as approved by designated Parks Canada staff for site access, travel within the site and construction activities (e.g., sawing wood).
7. Clearly mark work site and restricted areas with stakes, biodegradable flagging tape or other means; remove when project is completed.
8. Keep disturbance footprint as small as possible and limit vehicle access to essential vehicles only.

[4] The following applies wherever "designated Parks Canada staff" is referenced in this BMP: for National Historic Sites and Parks: the Resource Conservation Manager/staff; for the Historic Waterways: the Waterway Environmental Assessment Officer; and for Jasper, Banff, Lake Louise, Yoho and Kootenay National Parks: the Integrated Land Use Policy and Planning Manager, unless otherwise specified.

Equipment Operations

9. Equipment must be properly tuned, clean and free of contaminants, in good operating order, free of leaks (e.g., fuel, oil or grease), and fitted with standard air emission control devices and spark arrestors prior to arrival on site.
10. During construction, any required cleaning of tools and equipment must be done greater than 30 meters from waterbodies to prevent the release of wash water that may contain deleterious substances.
11. Equipment operators must be fully trained and experienced.
12. Select equipment appropriate to the nature of work being conducted (e.g., avoid using large scale machinery when hand tools or smaller scale machinery could be used).
13. The crossing of any waterbody by construction equipment, or the use of such equipment within waterbodies must be approved by designated Parks Canada staff. If approved:
    - Consult with designated Parks Canada staff prior to project start-up to determine single entry and exit points for any watercourse crossings.
    - Use small scale equipment when at all possible (e.g., mini excavator, ATV, Ditch Witch)
    - Use established/constructed fords when available.
    - Protect access points (e.g., swamp mats, pads).
14. When crossings are not required, operate machinery above the High Water Mark and minimise disturbance to the banks and waterbody.
15. Use low pressure/rubber tracked equipment or access matting where feasible to minimize soil compaction and ground disturbance.
16. Heavy equipment operating on paved surfaces should be equipped with street pads; damage to paved surfaces must be restored to original conditions.
17. Minimize idling of engines, contingent on operating instructions and temperature consideration.
18. Machinery (e.g., excavators, bobcats, chainsaws, generators) must be stored, maintained and refuelled on a flat surface, outside the drip line[5] of trees and a minimum of 30 meters from waterbodies, as measured from the High Water Mark; increase the 30 meter buffer depending on level of risk and site specific conditions. Refueling must take place on a tarp or portable berm, or on compacted ground.
19. Consider using bio-degradable chain oil/vegetable oils in chain saws especially when working within 30 meters of a waterbody.
20. If operating chain saws directly over or adjacent to waterbodies is unavoidable, use measures such as tarps to trap and prevent debris from entering the waterbody as much as possible.
21. Gas generators must be secured to prevent movement during operation and set up on an impermeable fuel mat with a berm or within a container that can contain 150% of the volume of fuel in the generator.

Construction Materials and Practices

22. Ideally, use timber that contributes to sustainable practice, such as recycled old growth or certified materials (e.g., Forest Stewardship Council certification). Trees of significant importance to the landscape must not be used unless otherwise directed by designated Parks Canada staff.
23. When building with unfinished wood, consider using species native to the area as directed by designated Parks Canada staff.

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[5] The area defined by the outermost circumference of a tree canopy where water drips from and onto the ground.

24. Use natural material and environmentally-friendly finishes (e.g., paints and stains) and products whenever possible.
25. When practical, consider pre-fabrication at an approved off-site location to minimize on-site construction impacts.
26. When practical, treatment of wood products (e.g., preservatives, paints, stains) should be done at an approved location prior to transport to the site. Field treatments should be applied over tarps or in another approved contained area and not be applied over or within 30 meters of water. Treatments must be approved by designated Parks Canada staff.
27. Treated wood must be handled, installed, and disposed of according to the Parks Canada Guide for the Use, Handling and Disposal of Pressure Treated Wood 2009 or contact the Parks Canada Environmental Management Team for advice.
28. Minimise the number of saw cuts made to treated wood in the field. If unavoidable, cut treated wood away from waterbodies and over tarps to catch debris; cuttings, sawdust and other treated wood waste material must not enter waterbodies.
29. All cuttings, sawdust and other treated wood waste material must be collected and disposed of at an approved disposal facility.
30. Treated wood must not be burnt or left onsite to decay.

Invasive Alien Species

31. Footwear, clothing, equipment and machinery coming into contact with the terrestrial or aquatic environment must be free of invasive alien species individuals, seeds, propagules (i.e., any other material that may cause the spread of the species) and pathogens. In particular:
    - Equipment from outside the protected heritage place must be washed/steam cleaned prior to arrival.
    - Ensure that footwear, clothing and equipment are free of invasive alien species (e.g., seeds, propagules) when travelling between invaded and uninvaded terrestrial and aquatic sites within the protected heritage place.
32. All soil, gravel, untreated construction lumber, erosion and sediment control products (e.g., hay, straw, mulch), or other applicable materials from outside the protected heritage place must be from a certified weed-free source.
33. Ensure that organic material (e,g., topsoil, borrow and fill material, gravel) taken from the construction site is free of invasive alien species before using in other parts of the protected heritage place.
34. Minimise ground disturbance and vegetation removal, as practical and within project requirements.
35. Minimise bare soil exposure (e.g., cover stockpiled material with tarps, plant native species, cover with natural mulch/ground coverings).
36. Stabilize and re-vegetate disturbed areas as soon as possible with native plants, soil and seed mix approved by designated Parks Canada staff. If there is insufficient time remaining in the growing season, stabilize the site to prevent erosion and vegetate the following spring.
37. Monitor disturbed and re-vegetated areas for several growing seasons to ensure that native vegetation is growing successfully and invasive alien species spread is prevented.

Waste

38. All wildlife attractants must be secured (e.g., petroleum products, human food, recyclable drink containers and garbage) within wildlife-proof containers, a secure building or

vehicle. Keep food waste separate from construction waste and remove daily; if daily removal is not possible, secure until it can be removed.

39. Notify designated Parks Canada staff immediately should wildlife gain access to the above mentioned attractants.
40. Contain and stabilize waste material (e.g., dredging spoils, construction waste and materials, vegetation) above the High Water Mark to prevent them from entering any waterbody.
41. All construction materials must be removed from the site on project completion (e.g., refuse material, waste petroleum, unused concrete bases).
42. Contain wastes and transport to an approved waste landfill site outside the Parks Canada protected heritage place, unless otherwise directed; cover waste loads during transportation.
43. If required, portable sanitary facilities must be serviced on a regular basis and accumulated waste disposed at a sanitary waste disposal facility. The facilities must have sufficient capacity and be managed to ensure waste is not discharged to the receiving environment.

Hazardous Material

44. Prevent the release of hazardous substances into the environment, including but not limited to, petroleum products and their derivatives, antifreeze or solvents.
45. All on-site personnel must be briefed on reporting requirements for hazardous materials spills; spills must be reported immediately to designated Parks Canada staff.
46. All construction sites must be equipped with containers suitable for the secure, temporary storage of hazardous wastes, separated by type.
47. A spill contingency response kit including sorbent material and berms to contain 110% of the largest possible spill (i.e., fuel or other toxic liquids) related to the work must be available on site at all times. On-site personnel must be aware of its location and trained in its use. Any contaminants must be recovered at source and disposed according to applicable laws, policies and regulations.
48. Identify and handle all toxic/hazardous materials as required under the *Canadian Environmental Protection Act*, *Transportation of Dangerous Goods Act* and Workplace Hazardous Materials Information Service.
49. Petrochemical products, paints and chemicals must be stored a minimum of 30 meters away from waterbodies and secured overnight in a Parks Canada approved enclosed area under lock and key; increase the 30 meter buffer depending on level of risk and site specific conditions.
50. Any hazardous waste or contaminated material uncovered during excavation / construction, must be investigated, source identified, removed and disposed of outside the protected heritage place at an approved facility. Disposal documentation must be provided to designated Parks Canada staff.

Wildlife

51. On-site personnel must be made aware of and report any incidental sightings of species at risk immediately to designated Parks Canada staff.
52. Schedule operations to avoid critical wildlife life stages (breeding, nesting, denning, roosting, rearing, migration). Consult with designated Parks Canada staff to discuss site-specific wildlife concerns.
53. Follow Reducing Risk to Migratory Birds guidance from Environment and Climate Change Canada, including avoiding vegetation clearing during site-specific migratory bird timing windows. Consult with designated Parks Canada staff for specific approaches to avoiding impacts on migratory birds (e.g., nest surveys, exclusion zones for located nests, area avoidance).

54. Should active nests, dens, roosts or calving areas be discovered, stop work and contact designated Parks Canada staff immediately for direction.
55. Conduct activities during daylight hours, avoiding critical foraging times (dusk and dawn).
56. Construct and erect fences in a manner that minimises impacts on wildlife movement. Consult with designated Parks Canada staff to determine appropriate fence design and location.
57. Minimize the time excavations remain open and cover or fence when left unattended to reduce the potential for wildlife injury.
58. Never approach or harass wildlife (e.g., feeding, baiting, luring).
59. If wildlife is observed at or near the work site, allow the animal(s) the opportunity to leave the work area and away from areas of potential conflict.
60. Designated Parks Canada staff must be alerted immediately to any potential wildlife conflict (e.g., aggressive behaviour, persistent intrusion), distress or mortality. In the case of aggressive behaviour or persistent intrusion, stop work and evacuate the area.
61. On site workers must receive any required wildlife awareness training, according to field unit policy.

Vegetation

General:

62. Apply Wildlife mitigations #52-54.
63. Vegetation management around infrastructure should follow FireSmart guidelines where applicable; consult with the local Parks Canada Fire Management Officer/Fire Operations Coordinator for site specific considerations. As a general rule:
    - Maintain mowed grass 10 meters around infrastructure.
    - Vegetation selection around infrastructure should favor deciduous trees instead of coniferous trees.
    - Dispose of vegetation slash and dead woody debris away from infrastructure and out of visitor sight.
    - Coniferous trees in a 30 meter radius around infrastructure should be limbed/pruned to 3 meters in height.
64. Burning is not permitted within the protected heritage place unless approved by Parks Canada.
65. Where re-vegetation is required, use weed-free topsoil, native plants and seed mix approved by designated Parks Canada staff.

Clearing and Grubbing:

66. Apply General mitigations (#62-64).
67. Protect trees and plant species of high ecological, heritage or cultural value; all clearing activities must be flagged and pre-approved by designated Parks Canada staff.
68. Retain a 30 meter vegetated buffer, from the High Water Mark of waterbodies and a 15 meter buffer from steep slopes. If clearing is required within the buffer zone, conduct minimal selective clearing by hand to ensure soil stability and prevent run off. In sloped areas, buffers should increase in width as the slope increases.
69. Clear minimum area necessary; trees should be removed only as necessary for project completion, visitor safety or wildfire risk reduction.
70. When felling trees, precautions must be taken to minimise damage to surrounding vegetation.
71. The felling of trees with obvious wildlife use (e.g., snags with cavity nests, trees with stick nests) must be avoided wherever possible; if unavoidable, designated Parks Canada staff approval is required.

72. Cut stumps as close to the ground as possible. If clearing is conducted during winter in snow cover, return to site after snow melt to flush cut stumps as required.
73. All cut wood is the property of Parks Canada; consult with designated Parks Canada staff to determine appropriate cutting methods, use and disposal of cut wood and other plant material.
74. If woody debris is chipped, spread thinly within the surrounding forest with space between the chips to ensure native vegetation can grow and re-establish; spreading too thick may result in growth suppression and fire hazard.
75. Where practical, clear trees in a phased approach provided timing windows for critical wildlife life stages can be respected. Ideally, trees should not be cut until construction reaches them, in case last-minute adjustments are necessary.
76. Salvage and replant small trees when appropriate or dispose as directed by designated Parks Canada staff.
77. When possible, conduct work when the ground is frozen or under a condition (such as snowfall) that limits ground compaction. If not possible, consider the use of rig mats or other appropriate measures to minimise impacts.
78. Protect roots of trees to drip line to prevent disturbance or damage. Avoid traffic, dumping or storage of materials over root zone.
79. When log ends or stumps are freshly cut and exposed within sight lines, rub exposed area with soil to reduce the brightness of fresh saw cuts.

Vegetation Maintenance:

80. Apply General mitigations (#62-65).
81. Stay within existing disturbed areas as much as possible when conducting maintenance activities.
82. Consult designated Parks Canada staff to determine appropriate methods for handling dangerous or fallen trees blocking or encroaching on campsites and day use areas and on the proper disposal methods.
83. Natural features (e.g., trees, shrubs, rocks) should be left undisturbed as close to the campsite or day use area as possible unless otherwise directed by designated Parks Canada staff.
84. Employ pruning techniques to minimise risk of tearing the bark and harming the tree; ensure that only branch tissue is removed and stem or trunk tissue is left undamaged (refer to Appendix 1-Proper Pruning Method).
85. Carry cut branches 30 meters away from infrastructure to avoid becoming a fire hazard. Spread branches out with cut ends facing away from view.

Riparian Vegetation Maintenance:

86. Apply General mitigations (#62-65).
87. Removal of riparian vegetation should be kept to a minimum and undertaken only when absolutely required. When practical, prune or top vegetation instead of grubbing/uprooting.
88. Combined maintenance activities (e.g., mowing, brushing, topping, slashing) will affect no more than one third of the total woody vegetation, such as trees and shrubs, within 30 meters of the High Water Mark in any given year.
89. Use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction.
90. Ensure canopy vegetation immediately adjacent to waterbodies is maintained unless deemed a hazard.

91. When practical, alter riparian vegetation by hand. If machinery must be used, operate on land and minimize disturbance to the banks of the waterbody.
92. Restore banks to original condition should any damage occur.
93. When altering a tree on the bank of a waterbody, ensure the root structure and stability are maintained.
94. Organic material and debris must not be allowed to enter waterbodies.
95. Minimize removal of natural woody debris, rocks, sand or other materials from the banks of waterbodies and avoid any disturbance below the High Water Mark.

Erosion and Sediment Control

96. Apply Invasive Alien Species mitigations as appropriate.
97. Schedule operations to avoid wet, windy and rainy periods or very dry periods that may increase erosion and sedimentation.
98. Wet down dry, exposed soils, to reduce dust.
99. In areas prone to erosion, install erosion and sediment control measures before starting work, especially within 30 meters of a waterbody.
100. Regularly inspect and maintain erosion and sediment control structures during all phases of the project and modify measures as necessary.
101. Select erosion and sediment control products that correspond with the nature and duration of the project.
102. Use erosion and sediment control products made of 100% biodegradable materials (e.g., jute, sisal or coir fiber) when possible. Ensure backing materials are also biodegradable.
103. Use of hay or straw in erosion and sediment control are potential wildlife attractants and may contain invasive species; use must be approved by designated Parks Canada staff.
104. Use sediment and erosion control products that reduce potential for wildlife entanglement[6] when possible. These options include:
    - Net-less erosion control blankets made of excelsior or loose mulch and unreinforced silt fences.
    - Netting with a loose-weave wildlife safe design.
105. Limit duration of soil exposure; phase activities whenever possible and restore disturbed areas as soon as possible.
106. Avoid equipment operation on steep or unstable slopes and in areas prone to erosion such as sand dunes.
107. Manage water flowing onto the site as appropriate for the project:
    - Divert upland surface runoff away from exposed areas.
    - Filter water being pumped/diverted from the site; silt-laden water must not be pumped directly into a waterbody (e.g., pump/divert water to a vegetated area 30 meters from the waterbody, a constructed settling basin or other filtration system).
    - Minimise slope length and gradient of disturbed areas.
    - Cover erodible soils with mulch, vegetation, or rip-rap.
    - Construct check dams or similar devices in constructed swales and ditches.
108. Consider removing and maintaining sod mats for improved re-vegetation success and erosion control; disturbed areas should be reclaimed with topsoil.
109. Cover spoil piles with biodegradable mats or tarps or plant them with native grass or shrubs approved by Parks Canada.
110. Topsoil separation is required; stockpile topsoil away from subsoils and spoil material and more than 15 meters away from waterbodies, drainage features and/or the top of steep slopes.

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[6] Wildlife-Friendly Plastic-Free Netting in Erosion and Sediment Control Products

111. Store excavated soils on tarps to limit damage to underlying vegetation and cover with weighted tarps if left for an extended period of time.
112. Excess organic material will be distributed within the construction area or other existing un-vegetated areas.
113. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.
114. Remove temporary erosion and sediment control products, especially non-biodegradable materials, when they are no longer required.

Visitor Safety and Experience

115. If possible, schedule construction activities outside peak visitor season.
116. The work site will be closed and marked while active construction, repair or maintenance is underway; consider temporary detours or reroutes as appropriate.
117. If closing the area is not possible, maintain a safe working distance between work activities and visitors; consider the use of lookouts to manage traffic through the construction/hazard area.
118. As much as possible, schedule noisy activities to minimise impacts to visitors, especially around townsites, campgrounds and other high visitor use areas.
119. Secure and clearly mark unattended safety hazards (e.g., excavations, unsecured decking on a bridge, debris piles) with fencing, warning signs, area closures or combination thereof.

Cultural Resources

120. Apply any mitigation measures that may have been previously identified by a Parks Canada archaeologist, the Federal Heritage Buildings Review Office, and/or other conservation specialist (e.g., cultural landscapes or landscape features of heritage value) for the immediate area of work.
121. Avoid known and potential archaeological sites.
122. Stockpiled material must not be permitted to damage or bury known cultural resources.
123. If cultural resources are encountered, work must cease in the immediate area and designated Parks Canada staff notified.
124. Notify the site supervisor upon discovery of any archaeological resources. If features (i.e., structural remains and/or artifact concentrations) are encountered, leave in place, mark the location (e.g. with prominent flagging) and contact designated Parks Canada staff to take photographs and, if possible, depth measurements. The designated Parks Canada representative must provide the information immediately to the Terrestrial Archaeology section for an assessment of significance before work can resume.

2. Building Maintenance and Modification

General

125. Concrete mixing activities must take place over tarps and a minimum of 30 meters from waterbodies. Fresh, wet, uncured concrete and concrete dust must not come into contact with waterbodies.
126. Contain and remove any associated concrete waste to an approved disposal facility.
127. Fixtures and materials (e.g., benches, building material) should be reclaimed and considered for re-use if appropriate.

128. Ensure signs of construction on the surrounding environment (e.g., fresh saw or axe marks) are reduced or eliminated.
129. Maintain clean roofs and gutters on infrastructure for wildfire risk reduction.

Application of Paint, Sealant or End Cut Treatments

130. When practical, treatment of wood products (e.g., preservatives, paints, stains) should be done at an approved location prior to transport to the site. Field treatments should be applied over tarps or in another approved contained area and not be applied over or within 30 meters of water. Treatments must be approved by designated Parks Canada staff.
131. Use plastic drip tarps to capture and contain paint drips, spills and spray.
132. Transfer of paint or other sealants from storage and mixing containers into application containers or devices must be conducted over tarps; consider using secondary containment vessels with a minimum holding capacity of 110% of the paint containing vessel to minimize the risk of spillage.
133. Cleaning of painting equipment will be conducted in a location approved by Parks Canada; washwater must not be permitted to enter any waterbody.
134. All waste paint and paint-solvent solutions must be disposed of in accordance with applicable federal, provincial, and municipal legislation; no disposal of waste paint or paint-solvent mixtures is permitted at the project site.
135. If paint will be applied by spray, equipment must be adjusted to minimize spray drift.
136. On-site personnel will only carry minimum quantities of paints and solvents required in the work area.

3. Bridge, Boardwalk and Culvert Maintenance

This section includes mitigation measures for any activities taking place below the High Water Mark of a non-fish bearing waterbody.

137. This BMP excludes work below the High Water Mark of fish bearing waterbodies. However, when working in close proximity to fish bearing waterbodies or in/near waterbodies that feed directly into fish bearing waterbodies, respect timing windows[7] to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed.
138. Minimise the extent and duration of work within watercourses and bank areas.
139. Conduct in-stream work during periods of low flow or at low tide and not when flows are elevated due to local rain events or seasonal flooding.
140. Locate crossings at straight sections of the watercourse, perpendicular to the bank, whenever possible. Avoid crossing on meander bends, braided streams, alluvial fans, or any other area that is inherently unstable and may result in the erosion or scouring of the bed.
141. Avoid crossing streams or waterbodies with steep and highly erodible (e.g., dominated by organic materials and silts) banks and beds.
142. Machinery fording of a flowing watercourse must be limited to a one-time event (i.e., over and back) and only if no alternative crossing method is available. In addition:
    - For fording equipment without a temporary crossing structure, use stream bank and bed protection methods (e.g., swamp mats, pads) if minor rutting is likely to occur.
    - Grading of the stream banks for the approaches should not occur.

[7] http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/index-eng.html

143. Minimize the removal of natural woody debris, rocks, sand or other materials from the banks, the shoreline or the bed of waterbodies below the High Water Mark. If material is removed, set it aside and return it to the original location once construction activities are completed.
144. Ensure contingencies are in place for occurrence of unexpected high flow conditions during the activity.
145. When rock material is used in or near a watercourse:
    - Use clean, durable, non-ore-bearing, coarse granular aggregate material that is appropriately sized to resist displacement during peak flood events.
    - Do not obtain rocks from below the High Water Mark of any watercourse.
    - Do not use acid-generating rock or rock that fractures and breaks down easily.
    - Install rock at a similar slope to maintain a uniform stream bank and natural stream alignment.
    - Ensure rock does not constrict the natural channel width.
146. When removal and application of protective coatings on bridges is required implement the following:
    - Remove paint or protective coatings in a manner that prevents paints, paint flakes, primers, solvents or other waste material from entering the watercourse.
    - When feasible, use tarps to trap and prevent falling debris, spills or drips from entering the watercourse.
    - Store, mix and transfer paints and solvents on land and not on the bridge to prevent spills into the watercourse.
    - Contain paint flakes, abrasives and other waste materials and dispose at an approved location; waste materials must not be deposited into watercourses or riparian areas.
147. When removal of debris is required within culverts and around bridge piers and abutments, implement the following:
    - Remove materials with hand tools when feasible. If machinery is required, operate from land and minimise damage to the bank of the watercourse.
    - Limit removal of accumulated material (e.g., branches, stumps, woody materials, garbage) to the area within the culvert, immediately upstream of the culvert and to that which is necessary to retain culvert function and water flow. For bridges, only remove debris necessary to protect piers and abutments.
    - Remove accumulated material and debris slowly to allow clean water to pass, to prevent downstream flooding and reduce amount of sediment-laden water going downstream.
148. Boardwalks should be high enough above the existing ground surface to allow grasses and native shrubs to re-vegetate around the structure and beneath deck boards.
149. Limit ground disturbance under boardwalks to the installation of staircase posts and sills.
150. Stabilize shoreline or banks disturbed by any activity associated with the project.
151. Restore bed and banks of the waterbody to the original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct the natural water flow should be restored.
152. If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, ensure rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.

4. Trenching and Excavation

153. Apply Erosion and Sediment Control mitigations as required.
154. Excavations must be drained (but not directly into a waterbody), back-filled and compacted as soon as possible.

155. Under thawed conditions, backfill material will be compacted prior to topsoil replacement; distribute topsoil evenly over the excavated area as per Parks Canada specifications.
156. Under frozen ground conditions, material will be sufficiently spread over the excavated site to allow for settlement under thawed conditions. Where practical, topsoil replacement will be postponed until the backfill has thawed, settled and dried out.
157. Re-vegetation must be undertaken in consultation with designated Parks Canada staff after excavations have settled and are level with surrounding landscape.
158. Dispose of overburden as directed by designated Parks Canada staff.

5. Demolition

159. Prior to commencement of demolition activities, all structures must be surveyed by experienced personnel from within or approved by Parks Canada for the presence of wildlife (e.g., roosting bats, nests, dens). Work should not take place during critical wildlife stages. Should wildlife be discovered, work will cease in the immediate area and designated Parks Canada staff contacted for further direction.
160. Prior to commencement of demolition activities, water and septic systems, lines and/or fields must be identified and precautions taken during the operation of heavy equipment to avoid damaging them.
161. Residual septic systems, water lines and wells of no further use must be removed, capped or decommissioned according to the appropriate federal or provincial legislation.
162. All salvageable, non-combustible and non-hazardous materials will be removed, reused and recycled to the greatest extent possible. Remaining material considered to be waste and demolition debris is to be disposed of at an approved disposal facility.
163. Any hazardous material (asphalt shingles, creosote treated wood, asbestos, lead paint, moulds, animal excrement, paints, automotive products, electrical equipment) and pollutants such as fuels and solvents found on-site will be separated and removed to an approved disposal facility.
164. Burning or burying of hazardous materials or any materials (e.g., plastics) which may be harmful to the environment is prohibited.
165. If undocumented contamination is found, cease work immediately and contact designated Parks Canada staff.
166. Ensure that well closures are completed as quickly as possible according to the appropriate federal or provincial legislation and are securely covered if left unattended.
167. Consult with designated Parks Canada staff to determine whether full excavation and removal of all subsurface infrastructure (e.g., pipes, cement structures, wires) is required. Backfill any excavation with clean, weed-free topsoil.
168. Ensure wastes from demolition activities do not enter waterbodies (e.g., use tarps to capture debris). Any waste that does fall into a waterbody will be immediately retrieved, provided worker safety is not compromised, and if removal can be done without excessive disturbance of bottom sediment.
169. Cover and contain fine particulate matter during transport to and from the site.

6. Rehabilitation

170. Use stockpiled topsoil from the site to facilitate rehabilitation activities.
171. Shape loosened soils to match the local terrain.
172. Ensure noticeable construction impacts (e.g., ruts, holes, depressions, compacted areas) are appropriately re-graded, back-filled with topsoil, re-contoured and capped in preparation for restoration.

173. Transplant shrubs and small trees displaced during clearing and construction activities, in accordance with FireSmart guidelines and in consultation with the local Parks Canada Fire Management officer or Fire Operations Coordinator.
174. All exposed soil, following completion of construction activities, will be stabilized and/or re-seeded as soon as possible using native plants, soils, seed mix and seed application approved by designated Parks Canada staff. If there is insufficient time remaining in the growing season, stabilize the site to prevent erosion and vegetate the following spring.
175. Reclaim eroded areas and ensure long term erosion control measures are identified and installed as required.

7. Supplementary Mitigations

In the application of National BMPs, supplementary mitigations will likely be required to ensure all potential impacts are mitigated. For example, a few site-specific mitigation measures may be needed to protect cultural resources or species at risk, to specify a critical timing window and to provide contact information. NOTE: if the number of supplementary mitigations is considerable in extent and nature, it should be determined whether a Field Unit specific BMP is better suited to address the impacts or another EIA pathway selected.

In this circumstance, the relevant BMP should be indicated in the EIA Requirement Checklist, with a note that application of the BMP will be supplemented through the addition of mitigation measures to address project or site-specific requirements. All relevant mitigations and project-specific clarifications should be included as terms and conditions in any permits and authorization documents (e.g., contracts) for the project.

Supplementary mitigation measures may be included here:

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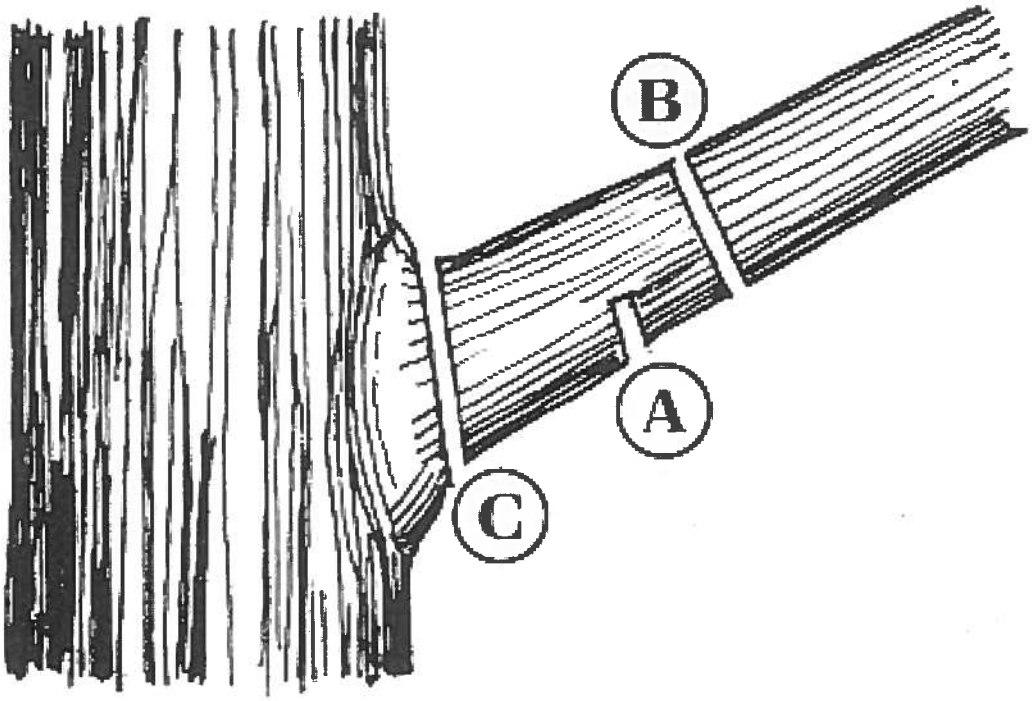
Last Update: June 13, 2016

Appendix 1 – Proper Pruning Method



To find the proper place to cut a branch, look for the branch collar, an often visible swelling that forms at the base of a branch where it is attached to its parent branch or to the tree's trunk. On the upper surface, there is usually a branch bark ridge that runs (more or less) parallel to the branch angle, along the stem of the tree. A proper pruning cut does not damage either the branch bark ridge or the branch collar.

A – The first cut is a shallow undercut to prevent bark tearing

B – The second cut completely removes the limb

C- The third cut removes the stub and is cut flush with the branch collar

Attachment #3

Parks Canada National Best Management Practices; Trails

For

Park Entrance Construction Project

Basic Impact Analysis

Terra Nova National Park of Canada
Newfoundland and Labrador

August 2016

Parks Canada National Best Management Practices

Trail Maintenance and Modification

Parks Canada National Best Management Practices for Trail Maintenance and Modification

Approved by

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Date

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Introduction

The Best Management Practice (BMP) pathway is applied when there is a suite of routine, repetitive projects or activities, with well understood and predictable effects. This fulfils Park's Canada's obligations under the *Canadian Environmental Assessment Act 2012* as a manager of federal land (see the Guide to the Parks Canada EIA Process). The BMP maximizes efficiency through creation of a pre-approved impact assessment for the defined suite of projects, to which standard mitigation and environmental management measures can be applied.

National BMPs can be applied in the following ways:

- Direct application: Use as is as long as the proposed project falls within the scope of the BMP(s) and its application will ensure there are no significant residual adverse environmental effects.
- Application along with supplemental mitigations: *This will likely be the case when using a National BMP*. Slight modifications will likely be required to ensure all potential impacts are mitigated and to provide project-specific clarifications (e.g., critical timing windows, contact information, SAR considerations, which mitigations apply to the project and which ones do not apply).
- Application as part of a Basic Impact Analysis (BIA) or Detailed Impact Analysis (DIA): where one or more BMPs may not address all the potential adverse environmental effects of a proposed project, Field Units can apply the BMP(s) as part of a BIA or DIA.
- Develop a Field Unit specific BMP: use the National BMP as a resource to create a BMP to address site-specific needs (i.e., *rip off and duplicate*). In this case, the new BMP must be signed off and approved by the Field Unit Superintendent.

The impact assessment officer (IAO) will review a proposed project and advise the functional manager of the project if and how this BMP should be applied. The IAO's advice will be based on whether the project falls within the scope of the BMP, and whether application of the mitigation measures in the BMP will adequately address potential adverse effects of the project. The IAO will also be responsible for adding any required supplemental mitigations to ensure site specific considerations are addressed.

Project Managers are responsible to ensure all mitigation measures applicable to the project are added to the terms and conditions of any permits or contracts issued for the project.

The IAO must ensure the project, EIA pathway applied and determination are recorded in the Parks Canada National Impact Environmental Assessment Tracking System.

Scope of Application

This BMP applies to the maintenance and modification of existing trails within national parks and national historic sites, including historic canals.

Parks Canada trails may require maintenance and modification to meet sustainable trail standards, correct poor design, ensure user safety and improve overall visitor experience. Trails also include a wide range of structures and fixtures that need to be maintained including benches, garbage bins, viewing platforms, stairs, and signage.

General activities addressed in this BMP include:

- trail tread maintenance (e.g., re-shaping tread, building up the tread, grading and outslope for drainage, removing obstacles, filling in potholes, covering roots and exposed rocks, broadcasting soil and area clean up)
- trail reroutes and extensions less than 500m long and located within 50m on either side of the existing trail tread (e.g., preparing trail base, excavation, grading, trail surfacing)
- trail widening within half a meter from either side of the existing trail tread (e.g., preparing trail base, excavation, grading, trail surfacing)
- vegetation management (e.g., clearing and grubbing, corridor clearing, trimming, re-vegetation)
- erosion control measures (e.g., slope stabilization, maintenance of crib or retaining walls, check dams and steps)
- drainage structure maintenance and installation (e.g., digging to create drainage dips/knick, rolling grade dips and/or installation of other trail drainage features, cleaning debris from existing drainage structures)
- routine repair and replacement of structures or fixtures (e.g., benches, garbage bins, barriers, handrails, trail signs, markers, pit privies)
- routine repair and replacement of rotted or damaged materials in Class B pedestrian bridges[1], boardwalks, stairways, culverts (Note: non-fish bearing waterbodies only)
- trail decommissioning and rehabilitation (e.g., blocking off and disguising the trail, restoration of damaged slopes, re-grading the tread, re-vegetation)
- operation of equipment (helicopters, hand machinery, vehicles such as ATVs, mini-excavators, mini-dozer, tracked dumping equipment)
- waste management related to construction activities

Exceptions

This BMP does NOT apply to the following:

- New trail construction projects, trail re-routes, or extensions greater than 500m in length and/or located more than 20m from either side of the existing trail tread (Note: further level of analysis is likely required for these projects but this BMP may be used as part of that analysis).
- Work below the High Water Mark[2] of a fish bearing waterbody.
- Realignment of a watercourse.

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[1] Class B bridges are not suspension bridges, truss bridges nor viewing platforms or towers. They have a drop in elevation between the walking surface and the adjacent surface or streambed of 2.4 metres or less. They do not have a dangerous site condition such as: Fast flow during all or part of the year; Deep water; Hazardous streambed; The adjacent surface within 1.2m of the walking surface being of a slope of more than 1 in 2; or Any other condition deemed as being dangerous by the Parks Canada Professional Engineer having jurisdiction. Class B bridges have low risk of injury due to collapse or if a person should fall from the bridge. Source: *Design, Construction and Inspection of Vehicular and Pedestrian Bridges* (2008)

[2] High Water Mark is the usual or average level to which a body of water rises at its highest point and remains for a sufficient time so as to leave a mark on the land (Fisheries and Oceans, 2016). Upper Controlled Water Elevation (UCWE) is used as a definition of high-water mark in managed waterways.

- The use of explosives near a fish bearing waterbody.
- Installation of a new boardwalk or full replacement of an existing boardwalk in an environmentally sensitive area (e.g., moss, wet areas, shoreline).
- Bridges that are NOT Class B pedestrian bridges (as defined in the Parks Canada Design, Construction and Inspection of Vehicular and Pedestrian Bridges).
- Installation of new parking lot or washroom facilities.
- Paving of an existing parking lot or re-surfacing a trail with asphalt (refer to Parks Canada National BMP for Roadway, Highway, Parkway and Related Infrastructure).
- Projects located within Zone I (Special Preservation).
- Work which may adversely impact any potential or established Aboriginal and Treaty rights or traditional use.
- If the project has the potential to have residual adverse effects on an individual or a residence of a listed species at risk (endangered, threatened, or extirpated status) or any adverse effects on the critical habitat of a listed species at risk.

Should any of the above conditions apply, the project will require use of another applicable BMP or combination of BMPs to fulfill impact assessment requirements or consideration of another environmental impact analysis pathway i.e., Basic Impact Analysis (BIA) or Detailed Impact Analysis (DIA). Some or all of the mitigation measures in this BMP may be used to prepare a BIA or DIA.

NOTE: Consult with the relevant Field Unit or national Parks Canada specialists (e.g., environmental impact analysis, species at risk, cultural resources, indigenous consultation, wildfire risk reduction, and visitor experience) for guidance as required.

Approved geographic area of application

This BMP is intended for use in all Parks Canada administered protected heritage places.

Components of the environment that may be affected

Soil/Land Resources:

- Soil compaction and rutting
- Soil erosion, loss of topsoil and exposure of subsoils
- Soil contamination from waste (e.g., garbage, litter, sewage, fuel)
- Increase in anthropogenic footprint
- Trail-side trampling

Air/Noise Quality:

- Temporary decreased ambient air quality (e.g., dust, equipment emissions)
- Temporary increased levels of CO_2 and other pollutants
- Increased ambient noise levels

Water Quality:

- Surface and groundwater contamination from waste (e.g., garbage, litter, sewage, fuel)
- Sedimentation, causing increased turbidity
- Changes in temperature regime and natural drainage patterns

Vegetation:

- Damage to and/or removal of vegetation from trail route clearing; side-trampling during use; root exposure, resulting in physiological stress and, in the case of trees, susceptibility to windfall
- Introduction of invasive alien species, or expansion of existing populations
- Impacts on valued and sensitive vegetation features
- Habitat destruction and mortality from wildfire

Wildlife:

- Wildlife disturbance during construction and on-going use of the trail causing displacement/preferred habitat avoidance
- Wildlife habituation/attraction to artificial food sources from garbage or litter
- Damage to nests/dens/roosts and disruption of nesting/denning/roosting animals
- Loss of food sources and habitat
- Introduction of alien invasive species, or expansion of existing populations
- Habitat destruction and mortality from wildfire

Visitor Safety and Experience:

- Reduced quality of visitor experience due to noise and presence of construction equipment
- Increased visibility of human disturbance on the landscape and decreased aesthetic
- Reduced accessibility to portions of the site where work is taking place
- Hazard to visitors and staff due to conflict with trail use and trail construction and maintenance activities (e.g., heavy equipment and hand tool operation, helicopter use, tree removal)

Cultural Resources:

- Adverse effects on the heritage value or character-defining elements of a cultural resource or a heritage place, including:
    - Impacts to archaeological resources (known or potential) from displacement or destruction resulting in loss of heritage value
    - Adverse effects on cultural landscapes or landscape features of heritage value
    - Wildfire risk

Mitigation Measures

This BMP includes a broad range of mitigation measures and as such, the IAO must review the document carefully to determine which apply to the project. To use this document efficiently and reduce the overall size and scope of the mitigations to present to contractors and project managers, follow the recommendations below:

Step 1) Go to the Microsoft Word toolbar and select the View tab, then check the Navigation Pane box. This allows you to see all the headings and will allow for efficient editing. For example, if a whole section does not apply, simply right click on it in the Navigation Pane and choose delete.

Step 2) Section 1. Common Activities includes mitigation measures which should, in most part, apply to all trail maintenance and modification projects. Review this section and delete the mitigation measures that may not apply to the project.

Step 3) Review Sections 2 to 4; keep relevant sections and delete those that do not apply. Review relevant sections and delete mitigation measures that do not apply to the project.

Step 4) Add any supplementary mitigation measures to Section 5. Supplementary Mitigations. For example, reference to "designated Parks Canada staff" is made through this BMP; details on site and project specific contacts must be included in this section.

Step 5) Save the document as a pdf or print a paper copy and include with the EIA determination record.

1. Common Activities

Work Site Conditions/Staging/Laydown

1. All people working on the project must review the mitigation measures and any site specific considerations with designated Parks Canada staff[3] before work begins. This may be done once seasonally for regular maintenance activities but projects such as trail re-routing or work in/near water, require individual start-up meetings.
2. Staging and parking areas for material and equipment must be identified, including duration of use, within an existing disturbed footprint (e.g., roadway, gravel surface, previously disturbed area with high resiliency).
3. Material drop sites (via foot, vehicle, helicopter or boat) must be approved by designated Parks Canada staff.
4. When transporting material via helicopter:
   - Choose a drop point that is open and easily accessible from the construction site and that will minimize travel to and from the construction site.
   - Plan multiple drop sites at strategic locations to avoid doubling back on the trail to distribute materials.
5. Cover construction material with weighted tarps when appropriate. Minimise damage to adjacent plant material and rehabilitate if necessary.
6. Use existing roadways, trails, disturbed areas or other areas as approved by designated Parks Canada staff for site access, travel within the site and construction activities (e.g., sawing wood).
7. Clearly mark work site and restricted areas with stakes, biodegradable flagging tape or other means; remove when project is completed.
8. Keep disturbance footprint as small as possible and limit vehicle access to essential vehicles only.

Equipment Operations

9. Equipment must be properly tuned, clean and free of contaminants, in good operating order, free of leaks (e.g., fuel, oil or grease), and fitted with standard air emission control devices and spark arrestors prior to arrival on site.

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[3] The following applies wherever "designated Parks Canada staff" is referenced in this BMP: for National Historic Sites and Parks: the Resource Conservation Manager/staff; for the Historic Waterways: the Waterway Environmental Assessment Officer; and for Jasper, Banff, Lake Louise, Yoho and Kootenay National Parks: the Integrated Land Use Policy and Planning Manager, unless otherwise specified.

10. During construction, any required cleaning of tools and equipment must be done greater than 30 meters from waterbodies to prevent the release of wash water that may contain deleterious substances.
11. Equipment operators must be fully trained and experienced.
12. Select equipment appropriate to the nature of work being conducted (e.g., avoid using large scale machinery when hand tools or smaller scale machinery could be used).
13. The crossing of any waterbody by construction equipment, or the use of such equipment within waterbodies must be approved by designated Parks Canada staff. If approved:
    - Consult with designated Parks Canada staff prior to project start-up, to determine single entry and exit points for any watercourse crossings.
    - Use small scale equipment when at all possible (e.g., mini excavator, ATV, Ditch Witch)
    - Use established/constructed fords when available.
    - Protect access points (e.g., swamp mats, pads).
14. When crossings are not required, operate machinery above the High Water Mark to minimise disturbance to the banks and waterbody.
15. Use low pressure or rubber tracked equipment or access matting where feasible to minimize soil compaction and ground disturbance.
16. Minimize idling of engines, contingent on operating instructions and temperature consideration.
17. Machinery (e.g., excavators, bobcats, chainsaws, generators) must be stored, maintained and refuelled on a flat surface, outside the drip line[4] of trees and a minimum of 30 meters from waterbodies, as measured from the High Water Mark; increase the 30 meter buffer depending on level of risk and site specific conditions. Refueling must take place on a tarp or portable berm, or on compacted ground.
18. Consider using bio-degradable chain oil/vegetable oils in chain saws, especially when working within 30 meters of waterbodies.
19. If operating chain saws directly over or adjacent to waterbodies is unavoidable, use measures such as tarps to trap and prevent debris from entering the waterbody as much as possible.
20. Gas generators must be secured to prevent movement during operation and set up on an impermeable fuel mat with a berm or within a container that can contain 150% of the volume of fuel in the generator.

Construction Materials and Practices

21. Ideally, use timber that contributes to sustainable practice, such as recycled old growth or certified materials (e.g., Forest Stewardship Council certification). Trees of significant importance to the landscape must not be used unless otherwise directed by designated Parks Canada staff.
22. When building with unfinished wood, consider using species native to the area as directed by designated Parks Canada staff.
23. Use natural material and environmentally-friendly finishes (e.g., paints and stains) and products whenever possible.
24. When practical, consider pre-fabrication (e.g., bench or parts of structures) at an approved off-site location to minimize on-site construction impacts.
25. When practical, treatment of wood products (e.g., preservatives, paints, stains) should be done at an approved location prior to transport to the site. Field treatments should be applied over tarps or in another approved contained area and not be applied over or

[4] The area defined by the outermost circumference of a tree canopy where water drips from and onto the ground.

within 30 meters of water. Treatments must be approved by designated Parks Canada staff.

26. Treated wood must be handled, installed, and disposed of according to the Parks Canada Guide for the Use, Handling and Disposal of Pressure Treated Wood 2009 or contact the Parks Canada Environmental Management team for advice.
27. Minimise the number of saw cuts made to treated wood in the field. If unavoidable, cut treated wood away from waterbodies and over tarps to catch debris; cuttings, sawdust and other treated wood waste material must not enter waterbodies.
28. All cuttings, sawdust and other treated wood waste material must be collected and disposed of at an approved disposal facility.
29. Treated wood must not be burnt or left onsite to decay.
30. Concrete mixing activities must take place over tarps a minimum of 30 meters from waterbodies. Fresh, wet, uncured concrete and concrete dust must not come into contact with waterbodies; contain and remove any associated concrete waste to an approved disposal facility.

Invasive Alien Species

31. Footwear, clothing, equipment and machinery coming into contact with the terrestrial or aquatic environment must be free of invasive alien species individuals, seeds, propagules (i.e., any other material that may cause the spread of the species) and pathogens. In particular:
    - Equipment from outside the protected heritage place must be washed/steam cleaned prior to arrival.
    - Ensure that footwear, clothing and equipment are free of invasive alien species (e.g., seeds, propagules) when travelling between invaded and uninvaded terrestrial and aquatic sites within the protected heritage place.
32. All soil, gravel, untreated construction lumber, erosion and sediment control products (e.g., hay, straw, mulch), or other applicable materials from outside the protected heritage place must be from a certified weed-free source.
33. Ensure that organic material (e,g, topsoil, borrow and fill material, gravel) taken from the construction site is free of invasive alien species before using in other parts of the protected heritage place.
34. Minimise ground disturbance and vegetation removal, as practical and within project requirements.
35. Minimise bare soil exposure (e.g., cover stockpiled material with tarps, plant native species, cover with natural mulch/ground coverings).
36. Stabilize and re-vegetate disturbed areas as soon as possible with native plants, soil and seed mix approved by designated Parks Canada staff. If there is insufficient time remaining in the growing season, stabilize the site to prevent erosion and vegetate the following spring.
37. Monitor disturbed and re-vegetated areas for several growing seasons to ensure that native vegetation is growing successfully and invasive alien species spread is prevented.

Waste

38. All wildlife attractants must be secured (e.g., petroleum products, human food, recyclable drink containers and garbage) within wildlife-proof containers, a secure building or vehicle. Keep food waste separate from construction waste and remove daily; if daily removal is not possible, secure until it can be removed.
39. Notify designated Parks Canada staff immediately should wildlife gain access to the above mentioned attractants.

40. Contain and stabilize waste material (e.g., dredging spoils, construction waste and materials, vegetation) above the High Water Mark to prevent them from entering any waterbody.
41. All construction materials must be removed from the site on project completion (e.g., refuse material, waste petroleum, construction materail).
42. Contain waste and transport to an approved waste landfill site outside the Parks Canada protected heritage place, unless otherwise directed; cover waste loads during transportation.

Hazardous Material

43. Prevent the release of hazardous substances into the environment, including but not limited to, petroleum products and their derivatives, antifreeze or solvents.
44. All on-site personnel must be briefed on reporting requirements for hazardous materials spills; spills must be reported immediately to designated Parks Canada staff.
45. All construction sites must be equipped with containers suitable for the secure, temporary storage of hazardous wastes, separated by type.
46. A spill contingency response kit including sorbent material and berms to contain 110% of the largest possible spill (i.e., fuel or other toxic liquids) related to the work must be available on site at all times. On-site personnel must be aware of its location and trained in its use. Any contaminants must be recovered at source and disposed according to applicable laws, policies and regulations.
47. Identify and handle all toxic/hazardous materials as required under the *Canadian Environmental Protection Act*, *Transportation of Dangerous Goods Act* and Workplace Hazardous Materials Information Service.
48. Petrochemical products, paints and chemicals must be stored a minimum of 30 meters away from waterbodies and secured overnight in a Parks Canada approved enclosed area under lock and key; increase the 30 meter buffer depending on level of risk and site specific conditions.
49. Any hazardous waste or contaminated material uncovered during excavation/construction, must be investigated, source identified, removed and disposed of outside the protected heritage place at an approved facility. Disposal documentation must be provided to designated Parks Canada staff.

Wildlife

50. On-site personnel must be made aware of and report any incidental sightings of species at risk immediately to designated Parks Canada staff.
51. Schedule activities to avoid critical wildlife life stages (breeding, nesting, denning, roosting, rearing, migration). Consult with designated Parks Canada staff to discuss localized wildlife concerns.
52. Follow Reducing Risk to Migratory Birds guidance from Environment and Climate Change Canada, including avoiding vegetation clearing during site-specific migratory bird timing windows. Consult with designated Parks Canada staff for specific approaches to avoiding impacts on migratory birds (e.g., nest surveys, exclusion zones for located nests, area avoidance).
53. Should active nests, dens, roosts or calving areas be discovered, stop work and contact designated Parks Canada staff immediately for direction.
54. Conduct trail activities during daylight hours, avoiding critical foraging times (dusk and dawn).
55. Minimize the time excavations remain open and cover or fence when left unattended to reduce the potential for wildlife injury.

56. Never approach or harass wildlife (e.g., feeding, baiting, luring).
57. If wildlife is observed at or near the work site, allow the animal(s) the opportunity to leave the work area and move away from areas of potential conflict.
58. Designated Parks Canada staff must be alerted immediately to any potential wildlife conflict (e.g., aggressive behaviour, persistent intrusion), distress or mortality. In the case of aggressive behaviour or persistent intrusion, stop work and evacuate the area.
59. On site workers must receive any required wildlife awareness training, according to field unit policy.

Vegetation

General:

60. Apply Wildlife mitigations #51-53.
61. Carry cut branches and slash away from trail infrastructure and out of trail user view. Spread branches out with cut ends facing away from trail.
62. Burning is not permitted within the protected heritage place unless approved by Parks Canada.
63. Where re-vegetation is required, use weed-free salvaged topsoil, native plants and seed mix approved by designated Parks Canada staff.

Clearing and Grubbing:

64. Apply General mitigations (#60-63).
65. Protect trees and plant species of high ecological, heritage or cultural value; all clearing activities must be flagged and pre-approved by designated Parks Canada staff.
66. Retain a 30 meter vegetated buffer, from the High Water Mark of waterbodies and a 15 meter buffer from steep slopes. If clearing is required within the buffer zone, conduct minimal selective clearing by hand to ensure soil stability and prevent run off. In sloped areas, buffers should increase in width as the slope increases.
67. Clear minimum area necessary; trees should be removed only as necessary for project completion, visitor/trail crew safety or wildfire risk reduction.
68. When felling trees, precautions must be taken to minimise damage to surrounding vegetation.
69. The felling of trees with obvious wildlife use (e.g., snags with cavity nests, trees with stick nests) must be avoided wherever possible; if unavoidable, designated Parks Canada staff approval is required.
70. Cut stumps as close to ground as possible. If clearing is conducted during winter in snow cover, return to site after snow melt to flush cut stumps as required.
71. All cut wood is the property of Parks Canada; consult with designated Parks Canada staff to determine appropriate cutting methods, use and disposal of cut wood and other plant material.
72. If woody debris is chipped, spread thinly within the surrounding forest with space between the chips to ensure native vegetation can grow and re-establish; spreading too thick may result in growth suppression and fire hazard.
73. Where practical, clear trees in a phased approach provided timing windows for critical wildlife life stages can be respected. Ideally, trees should not be cut until construction reaches them, in case last-minute adjustments are necessary.
74. Salvage and replant small trees when appropriate or dispose as directed by designated Parks Canada staff.
75. When possible, conduct work when the ground is frozen or under a condition (such as snowfall) that limits ground compaction. If not possible, consider the use of rig mats or other appropriate measures to minimise impacts.

76. Protect roots of trees to drip line to prevent disturbance or damage. Avoid traffic, dumping or storage of materials over root zone.
77. All holes left in the tread width from clearing and grubbing shall be filled with native material and compacted to ensure a stable, even tread surface.
78. When log ends or stumps are freshly cut and exposed within the sight lines of the trail corridor, rub exposed area with soil to reduce the brightness of fresh saw cuts.

Vegetation Maintenance:

79. Apply General mitigations (#60-63).
80. Stay within the existing trail tread when conducting maintenance activities.
81. Remove trail obstructions that impede use and safety of the trail corridor.
82. Natural features (e.g., trees, shrubs, rocks) should be left undisturbed as close to the trail edge and its fixtures as possible unless otherwise directed by designated Parks Canada staff.
83. Employ pruning techniques to minimise risk of tearing the bark and harming the tree; ensure that only branch tissue is removed and stem or trunk tissue is left undamaged (refer to Appendix 1-Proper Pruning Method).
84. Exposed roots creating erosion control issues should be covered with an appropriate layer of approved soil or fill. Consult with designated Parks Canada staff when such coverage is not possible.

Riparian Vegetation Maintenance:

85. Apply General mitigations (#60-63).
86. Removal of riparian vegetation should be kept to a minimum and undertaken only when absolutely required. When practical, prune or top vegetation instead of grubbing/uprooting.
87. Combined maintenance activities (e.g., mowing, brushing, topping, slashing) will affect no more than one third of the total woody vegetation, such as trees and shrubs, within 30 meters of the High Water Mark in any given year.
88. Use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction.
89. Ensure canopy vegetation immediately adjacent to waterbodies is maintained unless deemed a hazard.
90. When practical, alter riparian vegetation by hand. If machinery must be used, operate on land and minimize disturbance to the banks of the waterbody.
91. Restore banks to original condition should any damage occur.
92. When altering a tree on the bank of a waterbody, ensure the root structure and stability are maintained.
93. Organic material and debris must not be allowed to enter waterbodies.
94. Minimize removal of natural woody debris, rocks, sand or other materials from the banks of waterbodies and avoid any disturbance below the High Water Mark.

Erosion and Sediment Control

95. Apply Alien Invasive Species mitigations as appropriate.
96. Schedule operations to avoid wet, windy and rainy periods or very dry periods that may increase erosion and sedimentation.
97. In areas prone to erosion, install erosion and sediment control measures before starting work, especially within 30 meters of a waterbody.
98. Regularly inspect and maintain erosion and sediment control structures during all phases of the project and modify measures as necessary.

99. Select erosion and sediment control products that correspond with the nature and duration of the project.
100. Use erosion and sediment control products made of 100% biodegradable materials (e.g., jute, sisal or coir fiber) when possible. Ensure backing materials are also biodegradable.
101. Use of hay or straw in erosion and sediment control are potential wildlife attractants and may contain invasive species; use must be approved by designated Parks Canada staff.
102. Use sediment and erosion control products that reduce potential for wildlife entanglement[5] when possible. These options include:
    - Net-less erosion control blankets made of excelsior or loose mulch and unreinforced silt fences.
    - Netting with a loose-weave wildlife safe design.
103. Limit duration of soil exposure; phase activities whenever possible and restore disturbed areas as soon as possible.
104. Avoid equipment operation on steep or unstable slopes and in areas prone to erosion such as sand dunes.
105. Manage water flowing onto the site as appropriate for the project:
    - Divert upland surface runoff away from exposed areas.
    - Filter water being pumped/diverted from the site; silt-laden water must not be pumped directly into a waterbody (e.g., pump/divert water to a vegetated area 30 meters from the waterbody, to a constructed settling basin or other filtration system).
    - Minimise slope length and gradient of disturbed areas. Backslopes must be sloped to a 45 degree angle or less or to best match existing side slopes.
    - Cover erodible soils with mulch, vegetation, or rip-rap.
    - Construct check dams or similar devices in constructed swales and ditches.
106. Consider removing and maintaining sod mats for improved re-vegetation success and erosion control; disturbed areas should be reclaimed with topsoil.
107. Cover spoil piles with biodegradable mats or tarps or plant them with native grass or shrubs approved by Parks Canada.
108. Topsoil separation is required; stockpile topsoil away from subsoils and spoil material and more than 15 meters away from waterbodies, drainage features and/or the top of steep slopes.
109. Store excavated soils on tarps to limit damage to underlying vegetation and cover with weighted tarps if left for an extended period of time.
110. Excess organic material will be distributed on the trail tread or other existing un-vegetated areas.
111. Immediately stabilize disturbed areas, shoreline or banks, preferably through re-vegetation, with native species approved by designated Parks Canada staff. If there is insufficient time remaining in the growing season, the site should be stabilized, (e.g., cover exposed areas with erosion control blankets to keep soil in place) and/or vegetated the following spring; maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.
112. Maintain effective sediment and erosion control measures until re-vegetation of disturbed areas is achieved.
113. Remove temporary erosion and sediment control products, especially non-biodegradable materials, when they are no longer required.

Visitor Safety and Experience

114. If possible, schedule construction activities outside peak visitor season.

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[5] Wildlife-Friendly Plastic-Free Netting in Erosion and Sediment Control Products

115. The work site will be closed and marked while active construction, repair or maintenance is underway; consider temporary detours or reroutes as appropriate.
116. If closing the area is not possible, maintain a safe working distance between work activities and visitors; consider the use of lookouts to manage traffic through the construction/hazard area.
117. As much as possible, schedule noisy activities to minimise impacts to visitors, especially around townsites, campgrounds and other high visitor use areas.
118. Secure and clearly mark unattended safety hazards (e.g., excavations, unsecured decking on a bridge, debris piles) with fencing, warning signs, area closures or combination thereof.

Cultural Resources

119. Apply any mitigation measures that may have been previously identified by a Parks Canada archaeologist and/or other conservation specialist (e.g., cultural landscapes or landscape features of heritage value) for the immediate area of work.
120. Avoid known and potential archaeological sites.
121. Stockpiled material must not be permitted to damage or bury known cultural resources.
122. Apply any mitigation measures that may have been previously identified by a Parks Canada archaeologist and/or other conservation specialist for the immediate area of work.
123. If cultural resources are encountered, work must cease in the immediate area and designated Parks Canada staff notified.
124. Notify the site supervisor upon discovery of any archaeological resources. If features (i.e., structural remains and/or artifact concentrations) are encountered, leave in place, mark the location (e.g. with prominent flagging) and contact designated Parks Canada staff to take photographs and, if possible, depth measurements. The designated Parks Canada representative must provide the information immediately to the Terrestrial Archaeology section for an assessment of significance before work can resume.

2. Trail Modification and Re-routing

125. The final route of new trail segments will be determined on site and approved by designated Parks Canada staff[6].
126. Biodegradable flagging tape must be collected and disposed of as required when the project is completed.
127. Stay within the flagged area during trail rerouting activities.
128. If excavating, sod mats or topsoil should be salvaged and stockpiled for future rehabilitation. Remaining soil should be broadcasted and raked to a soil thickness of 25 millimeters or less; ensure that vegetation is uncovered (e.g., on grassy slopes gently rake grass to stand back up).
129. Use a clinometer to confirm trail grades meet sustainable trail guidelines[7].
130. Plan construction work so each section of the trail is completed as quickly as possible.
131. Carefully follow the designed layout for the trail and ensure natural drainage patterns are preserved.
132. Remove loose rocks from the trail tread and fill in any resulting holes.

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[6] When several options are being contemplated, consider discussing with an archaeologist to identify the best option in order to limit impacts and reduce the need for mitigation measures.

[7] Refer to The Five Essential Elements of Sustainable Trails in *Trail Solutions: IMBA's Guide to Building Sweet Singletrack*, Pg 63-69 or contact the Trails Team .

133. When constructing gravel trails, source gravel from local gravel pits to minimise hauling distance.
134. Reclaim materials whenever possible (e.g., use non-salvageable woody debris, excavated soil and surface material from new sections of trail on decommissioned sections of trail, use gravel from decommissioned sections on new sections of trail).
135. Shape loosened soils to match the local terrain.
136. Dispose of stockpiled vegetation as directed by designated Parks Canada staff.
137. When using borrow pits[8]:
    - Locate borrow pits well off the trail for safety and aesthetic considerations.
    - Do not locate borrow pits adjacent to tree root-balls.
    - Do not disturb soils from tipped up root-balls of fallen trees as they provide micro-habitats for small mammals and increase structure and plant diversity.
    - Scout for suitable soil deposits with a hand auger; look for above average grade deposits (mounds) with a minimal organic layer and vegetation cover.
    - Fewer, larger pits are preferable to multiple smaller pits.
    - Stockpile organic soils for later decommissioning of exhausted borrow pits.
    - Create only a single access trail to the borrow pit to minimize off trail impact. Flag access route if necessary (particularly on construction days).
    - Flag and record locations of active borrow pits for future use and eventual restoration.
    - Restore borrow pit when exhausted by grading area and covering with stockpiled organic soil. Any required replanting or reseeding must be done using native plants/seed mixture approved by Parks Canada

3. Bridge, Boardwalk and Culvert Maintenance

138. This BMP excludes work below the High Water Mark of fish bearing waterbodies. However, when working in close proximity to fish bearing waterbodies or in/near waterbodies that feed directly into fish bearing waterbodies, respect timing windows[9] to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed.
139. Minimise the extent and duration of work within watercourses and bank areas.
140. Conduct in-stream work during periods of low flow or at low tide and not when flows are elevated due to local rain events or seasonal flooding.
141. Locate machinery crossings at straight sections of the watercourse, perpendicular to the bank, whenever possible. Avoid crossing on meander bends, braided streams, alluvial fans, or any other area that is inherently unstable and may result in the erosion or scouring of the bed.
142. Machinery fording of a flowing watercourse must be limited to a one-time event (i.e., over and back) and is to occur only if no alternative crossing method is available. In addition:
    - For fording equipment without a temporary crossing structure, use stream bank and bed protection methods (e.g., swamp mats, pads) if minor rutting is likely to occur.
    - Grading of the stream banks for the approaches should not occur.
143. Minimize the removal of natural woody debris, rocks, sand or other materials from the banks, the shoreline or the bed of waterbodies below the High Water Mark. If material is

[8] An area from which material (soil, gravel) has been excavated for use at another location. Typically borrow pits are used when the trail tread surface needs to be raised and fill material is required.

[9] http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/index-eng.html

removed, set it aside and return it to the original location once construction activities are completed.

144. Ensure contingencies are in place for occurrence of unexpected high flow conditions during the activity.
145. When rock material is used in or near a watercourse:
    - Use clean, durable, non-ore-bearing, coarse granular aggregate material that is appropriately sized to resist displacement during peak flood events.
    - Do not obtain rocks from below the High Water Mark of any watercourse.
    - Do not use acid-generating rock or rock that fractures and breaks down easily.
    - Install rock at a similar slope to maintain a uniform stream bank and natural stream alignment.
    - Ensure rock does not constrict the natural channel width.
146. When removal and application of protective coatings is required implement the following:
    - Remove paint or protective coatings in a manner that prevents paints, paint flakes, primers, solvents or other waste material from entering the watercourse.
    - When feasible, use tarps to trap and prevent falling debris, spills or drips from entering the watercourse.
    - Store, mix and transfer paints and solvents on land and not on the bridge to prevent spills into the watercourse.
    - Contain paint flakes, abrasives and other waste materials and dispose at an approved location; waste materials must not be deposited into watercourses or riparian areas.
147. When removal of debris is required within culverts and around bridge piers and abutments, implement the following:
    - Remove materials with hand tools when feasible. If machinery is required, operate from land and minimise damage to the bank of the watercourse.
    - Limit removal of accumulated material (e.g., branches, stumps, woody materials, garbage) to the area within the culvert, immediately upstream of the culvert and to that which is necessary to retain culvert function and water flow. For bridges, only remove debris necessary to protect piers and abutments.
    - Remove accumulated material and debris slowly to allow clean water to pass, to prevent downstream flooding and reduce amount of sediment-laden water going downstream.
148. Boardwalks should be high enough above the existing ground surface to allow grasses and native shrubs to re-vegetate around the structure and beneath deck boards.
149. Limit ground disturbance under boardwalks to the installation of staircase posts and sills.
150. Stabilize shoreline or banks disturbed by any activity associated with the project.
151. Restore bed and banks of the water body to the original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct the natural water flow should be restored.
152. If replacement rock reinforcement/armouring is required to stabilize eroding or exposed areas, ensure rock is installed at a similar slope to maintain a uniform bank/shoreline and natural stream/shoreline alignment.

4. Decommissioning and Rehabilitation

Trails

153. Remove culverts and any existing trail surfacing material, including underlying geotextile fabric and dispose of as required by designated Parks Canada staff. Then, completely break up, or scarify, the compacted subsurface of the full length of the old trail tread to 10cm depth.

154. Cover and camouflage the old trail with topsoil, plants, grasses and re-plant small trees taken from re-route construction, where feasible.
155. Use stockpiled topsoil from the site to facilitate rehabilitation activities.
156. Re-grade visible decommissioned trail ends to surrounding slopes.
157. Reclaim eroded areas and ensure proper erosion control measures are identified and installed in the decommissioned section (e.g., check dams made of logs or rocks fixed across the trail to trap soil; for rocky trails with little soil covering, fill burlap bags with soil and rocks and use as check dams, consider transplanting a local shrub in the bag).
158. Reduce the visibility of the old trail so the transition areas are unrecognizable and the decommissioned trail is effectively closed (e.g., drag logs and branches over the tread and plant deadfall in the ground vertically to block the corridor at eye level; rake leaves and other organic matter over the tread to disguise the area.)
159. Ensure closed sections are clearly blocked off to users and create a natural, seamless transition to the new section; install signs if required.
160. Any replanting or reseeding must be done using native plants/seed mixture approved by Parks Canada.
161. Decommissioned trails will be monitored for visitor use, erosion, non-native plants and vegetation establishment; corrective actions will be implemented if necessary.

Trail Structures and Fixtures (e.g., boardwalks, viewing platforms, stairs, railing, benches)

162. Confine work to the existing footprint of the item to be decommissioned.
163. Rehabilitate the site to a natural condition, in consultation with designated Parks Canada staff.
164. Ensure any holes or depressions left from removal of structures or fixtures are filled.
165. Ensure wastes from demolition activities do not enter waterbodies (e.g., use tarps to capture debris). Any waste that does fall into a waterbody will be immediately retrieved, provided worker safety is not compromised, and if removal can be done without excessive disturbance of bottom sediment.
166. Consider re-use of structures, fixtures and materials (e.g., benches, building material) where practical and appropriate elsewhere in the protected heritage area. If not salvageable, materials must be disposed of outside the national protected place at an approved disposal facility unless otherwise directed by designated Parks Canada staff.

5. Supplementary Mitigations

In the application of National BMPs, supplementary mitigations will likely be required to ensure all potential impacts are mitigated. For example, a few site-specific mitigation measures may be needed to protect cultural resources or species at risk, to specify a critical timing window and to provide contact information. NOTE: if the number of supplementary mitigations is considerable in extent and nature, it should be determined whether a Field Unit specific BMP is better suited to address the impacts or another EIA pathway selected.

In this circumstance, the relevant BMP should be indicated in the EIA Requirement Checklist, with a note that application of the BMP will be supplemented through the addition of mitigation measures to address project or site-specific requirements. All relevant mitigations and project-specific clarifications should be included as terms and conditions in any permits and authorization documents (e.g., contracts) for the project.

Supplementary mitigation measures may be included here:

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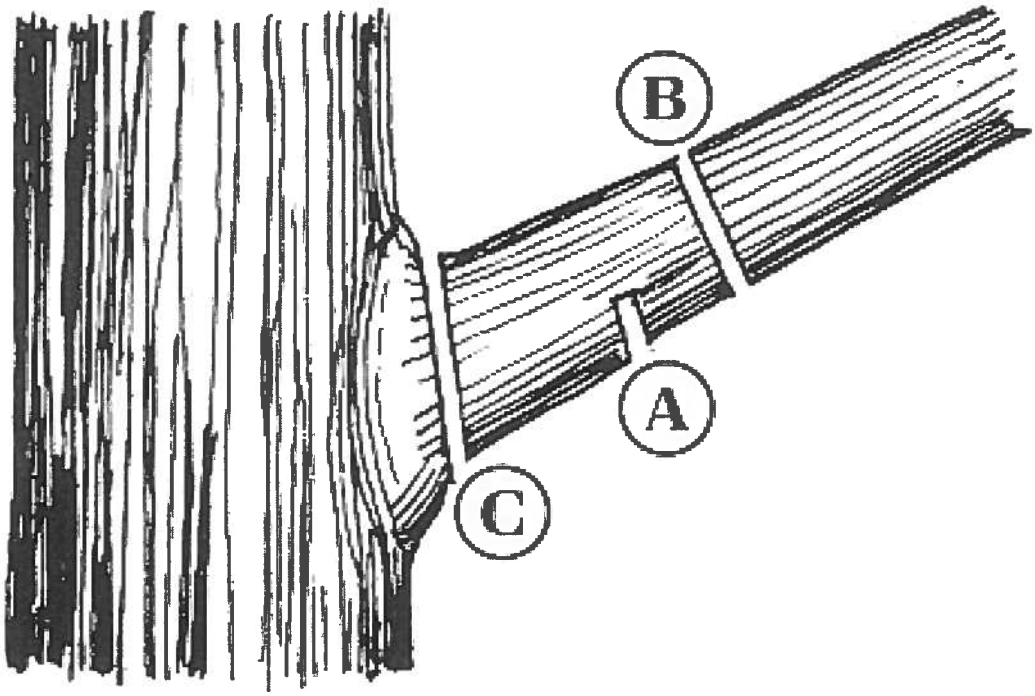
Last Update: June 27, 2016

Appendix 1 - Proper Pruning Method



To find the proper place to cut a branch, look for the branch collar, an often visible swelling that forms at the base of a branch where it is attached to its parent branch or to the tree's trunk. On the upper surface, there is usually a branch bark ridge that runs (more or less) parallel to the branch angle, along the stem of the tree. A proper pruning cut does not damage either the branch bark ridge or the branch collar.

A – The first cut is a shallow undercut to prevent bark tearing

B – The second cut completely removes the limb

C- The third cut removes the stub and is cut flush with the branch collar

Part 1 General

1.1 SUMMARY

.1 Section includes methods and procedures for demolishing, deconstructing, salvaging, reusing, recycling, and removing items designated for removal, completely or in part and for backfilling resulting trenches and excavations.

.2 Coordinate with requirements indicated on Drawings and with other trades as required.

1.2 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 31 11 00 – Clearing and Grubbing.

.3 Section 31 14 13 – Soil Stripping and Stockpiling.

.4 Section 32 01 90.33 – Tree and Shrub Preservation.

1.3 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI A10.8-2011, Safety Requirements for Scaffolding & Comparison Document.

.2 Canadian Federal Legislation

.1 Motor Vehicle Safety Act (MVSA), 1995.

.2 Hazardous Materials Information Review Act, 1985.

.3 Transportation of Dangerous Goods Act, 1992 (1992, c. 34).

.3 CSA International (CSA)

.1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.5 National Fire Protection Association (NFPA)

.1 NFPA (FIRE) 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations, 2013 Edition.

.6 National Research Council Canada (NRC)

.1 National Building Code of Canada 2010 (NBC).

.2 National Fire Code of Canada 2010 (NFC).

.7 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

.8 U.S. Environmental Protection Agency (EPA)

.1 EPA CFR 86.098-10, Emission standards for 1998 and later model year Otto-cycle heavy-duty engines and vehicles.

.2 EPA CFR 86.098-11, Emission standards for 1998 and later model year diesel heavy-duty engines and vehicles.

.3 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 DEFINITIONS

.1 Demolition: rapid destruction of building following removal of hazardous materials.

.2 Deconstruction: systematic dismantling of structure in a manner that achieves safe removal/disposal of hazardous materials and maximum salvage/recycling of materials.

.1 Ultimate objective is to recover potentially valuable resources while diverting from landfill what has traditionally been significant portion of waste system.

.3 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos, lead-based paint, PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly.

.4 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.5 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form.

.1 Recycling does not include burning, incinerating, or thermally destroying waste.

.6 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from remodelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.7 Salvage: removal of structural and non-structural materials by deconstruction/ disassembly methods for purposes of reuse or recycling.

.8 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.

.9 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.10 Waste Reduction Workplan (WRW): written report that addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Site Meetings:

.1 Convene pre-demolition meeting one week prior to beginning work of this Section in accordance with Section 01 11 10 – General Requirements: Construction Schedule to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other trades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.

.3 Hold project meetings every week.

.4 Ensure key personnel, site supervisor, project manager, major subcontractor representatives and WM attend.

.5 Reporting Requirements: WMC to complete.

.6 WMC shall provide verbal report on status of waste diversion activity at each meeting.

.7 Departmental Representative will provide written notification of change of meeting schedule established upon contract award 24 hours prior to scheduled meeting.

.2 Scheduling: meet project time lines without compromising heath and safety, environmental, and waste diversion requirements.

.1 Notify Departmental Representative in writing when unforeseen delay(s) occur.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.

.2 Submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.

.3 Hazardous Materials:

.1 Provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.

.3 Waste Management:

.1 Manage demolition waste in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: ensure Work complies with regulations under Canadian Environmental Protection Act, Canadian Environmental Assessment Act, and Transportation of Dangerous Goods Act, and applicable Provincial regulations.

.2 Comply with the requirements of Section 01 11 10 – General Requirements: Work Restrictions.

.3 Comply with requirements indicated on the Contract Drawings. Work shall conform to CSA S350.

.4 Regulatory Requirements: Perform work as follows; use most restrictive requirements where differences occur between the municipal, provincial and federal jurisdictions:

.1 Provincial and Federal Requirements: Perform work in accordance with governing environmental notification requirements and regulations of the Authority Having Jurisdiction.

.2 Local Requirements: Perform hauling and disposal operations in accordance with regulations of authority having jurisdiction.

.3 Collection and transport of hazardous materials, if required, shall comply with The Transportation of Dangerous Goods (TDG) Act.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Store and manage hazardous materials in accordance with Section 01 35 43 - Environmental Procedures.

.2 Storage and Protection.

.3 Protect in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.4 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to Departmental Representative.

.5 Remove and store materials to be salvaged, in manner to prevent damage.

.6 Store and protect in accordance with requirements for maximum preservation of material.

.7 Handle salvaged materials as new materials.

1.9 SITE CONDITIONS

.1 Site Environmental Requirements.

.2 Perform work in accordance with Section 01 35 43 - Environmental Procedures.

.3 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

.4 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.

.5 Ensure proper disposal procedures are maintained throughout the project.

.6 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

.7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with as directed by Departmental Representative.

.8 Protect trees, plants and foliage on site and adjacent properties where indicated.

1.10 EXISTING CONDITIONS

.1 Remove contaminated or hazardous materials as defined by authorities having jurisdiction from site prior to start of demolition Work, and dispose of in safe manner in accordance with TDGA and other applicable regulatory requirements.

.2 Structures to be demolished are based on their condition on date that bid is accepted.

.1 Remove, protect and store salvaged items as directed by Departmental Representative.

.2 Salvage items as identified by Departmental Representative.

.3 Deliver to Departmental Representative as directed.

Part 2 Products

2.1 EQUIPMENT

.1 Use equipment suitable for Work required, compliant with Section 01 11 10 – General Requirements: Work Restrictions.

.2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

2.1 RESTORATION AND REPAIR MATERIALS

.1 Use materials identical to existing materials:

.1 If identical materials are unavailable or cannot be used, use materials that match existing adjacent materials to the fullest extent possible.

.2 Use materials whose installed performance equals or surpasses that of existing materials.

.3 Comply with material and installation requirements specified by manufacturers per printed installation instructions, technical datasheets, specifications and details.

Part 3 Execution

3.1 PREPARATION

.1 Work in accordance with Section 01 35 43 – Environmental Procedures.

.2 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.3 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.4 Notify and obtain approval of utility companies and Departmental Representative before starting demolition.

.5 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.

.6 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 PROTECTION

.1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features and parts of building to remain in place. Provide bracing and shoring required.

.2 Keep noise, dust, and inconvenience to occupants of adjacent properties to a minimum.

.3 Protect adjacent property systems, services, and equipment.

.4 Provide temporary dust screens, covers, railings, supports, and other protection as required to meet regulations and requirements of authorities having jurisdiction.

.5 Do Work in accordance with the Occupational Health & Safety Act and applicable regulations of Newfoundland and Labrador.

3.3 REMOVAL OF HAZARDOUS WASTES

.1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

3.4 DEMOLITION AND REMOVAL

.1 Deconstruct, salvage, transport and store items indicated on Drawings to be salvaged and provided to Departmental Representative, or re-used as part of Contract. Store safely and protect from elements and damage. Provide to Departmental Reprehensive as directed.

.2 Demolish and remove items as indicated.

.3 Do not disturb items designated to remain in place.

.4 Removal of pavements, curbs and gutters:

.1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.

.2 Protect adjacent joints and load transfer devices.

.3 Protect underlying and adjacent granular materials.

.5 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving,

.6 Excavate at least 300 mm below pipe invert when removing pipes under existing or future pavement area.

.7 Remove only designated trees during demolition.

.1 Obtain written approval of Departmental Representative prior to removal of trees.

.8 Sell or donate trees designated for removal that are healthy and marketable.

.1 Grind, chip, or shred other vegetation for mulching and composting, or use as mill pulp or process fuel.

.9 Stockpile topsoil for final grading and landscaping:

.1 Provide erosion control and seeding if not immediately used.

.10 Salvage: divert waste from landfill and carbon-generating power plants to the extent practicable

.1 Dismantle items containing materials for salvage and stockpile salvaged materials at locations approved by Departmental Representative.

.11 Disposal of Material:

.1 Dispose of materials not designated for salvage or reuse on site at authorized facilities.

.2 Trim disposal areas to approval of Departmental Representative.

.12 Backfill:

.1 Backfill in areas as indicated and in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.13 Remove following materials and equipment, clean, store, protect, ready for installation by other trades:

.1 Site light standards.

.2 Flagpoles.

3.5 SCHEDULE

.1 North Entrance:

.1 Comply with notes on Drawings.

.2 Salvage, stockpile and reuse boulders as indicated.

.3 Salvage and re-install at new location park entrance sign.

.4 Soils and bog material removed during trail construction to be stockpiled for reuse on site; excess materials to be transported to Big Brook Quarry (Terra Nova).

.5 Existing paving stones: remove, transport, and stockpile at Big Brook Quarry (Terra Nova). For re-use at site at new location.

.6 Existing picnic tables (benches): remove, salvage, return to Departmental Representative.

.7 Existing shelter to be removed and disposed of including footings, foundations, paved surfaces, signage infrastructure. Sign panels to be salvaged and returned to Departmental Representative.

.8 Salvage and relocate flag pole with new footing/foundation. Match existing demolished footing/foundation. Coordinate with other trades as required.

.2 South Entrance:

.1 Comply with notes on Drawings.

.2 Salvage and relocate flag pole with new footing/foundation. Match existing demolished footing/foundation. Coordinate with other trades as required.

.3 Existing waste receptacle to be removed, protected, stored and reinstated where indicated. Coordinate with other trades as required..

.4 Existing light standard to be removed, protected, stored and relocated to new site entrance per Electrical Drawings.

.5 Existing picnic tables to be salvaged and returned to Departmental Representative.

.6 Outhouse decommissioned by Departmental Representative.

.7 Remove paving stones, stockpile for reuse per L-103 and L-501, relocate units not reused to Bid Brook Quarry (Terra Nova).

.8 Existing wood structure to be deconstructed, removed and disposed, including footings and foundations, paving materials, sign infrastructure, and base granular materials.

.9 Sign panels to be salvaged and returned to Departmental Representative.

.10 At indicated areas, strip and reuse topsoil where possible. Stockpile excess topsoil at Big Brook Quarry (Terra Nova).

.11 Remove and relocate park entrance sign as indicated.

3.6 STOCKPILING

.1 Label stockpiles, indicating material type and quantity.

.2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.

.3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.

.4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

3.7 REMOVAL FROM SITE

.1 Remove stockpiled material when it interferes with operations of project.

.2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.

.3 Transport material designated for alternate disposal in accordance with applicable regulations and the requirements of this specification Section.

.4 Written authorization from Departmental Representative is required to deviate from identified receiving organizations.

.5 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

.6 Written authorization from Departmental Representative is required to deviate from identified disposal facilities.

3.8 RESTORATION

.1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work.

.2 Use soil treatments and procedures that are not harmful to health or the environment, are not injurious to plants, and do not endanger wildlife, adjacent water courses, or ground water.

3.9 FIELD QUALITY CONTROL

.1 Verification requirements include:

- .1 Materials and resources.
- .2 Storage and collection of recyclables.
- .3 Construction waste management.
- .4 Salvage and storage of items designated for reuse.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

- .1 Leave Work area clean at end of each day.
- .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work
- .3 Use cleaning solutions and procedures that are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate and divert waste materials from landfill in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.11 PROTECTION

.1 Repair damage to adjacent materials or property caused by selective site demolition.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 11 10 – General Requirements: Construction/Demolition Waste Management and Disposal.

.2 Section 03 20 00 - Concrete Reinforcing.

.3 Section 03 30 00 - Cast-in-place Concrete.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-O86S1, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.

.3 CSA O121, Douglas Fir Plywood.

.4 CSA O151, Canadian Softwood Plywood.

.5 CSA S269.1, Falsework for Construction Purposes.

.6 CAN/CSA-S269.3, Concrete Formwork.

1.3 SUBMITTALS

.1 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3, for formwork drawings.

.2 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.3 Indicate sequence of erection and removal of formwork/falsework as directed by Owner's Representative.

.4 Each shop drawing submission shall bear stamp and signature of qualified professional engineer licensed in Province of Newfoundland and Labrador, Canada.

Part 2 Products

2.1 MATERIALS

.1 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.

.2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.

.2 Form ties:

.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.3 Form liner:

.1 Plywood: medium density overlay Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151, T and G thickness as indicated.

.4 Form release agent: chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps, non-toxic, biodegradable.

.5 Falsework materials: to CSA-S269.1.

.6 Sealant: to Section 07 92 00 - Joint Sealing.

Part 3 Execution

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Fabricate and erect falsework in accordance with CSA S269.1.

.3 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.4 Do not place shores and mud sills on frozen ground.

.5 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.6 Fabricate and erect formwork in accordance with CAN/CSA-S269.3, to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.7 Align form joints and make watertight. Keep form joints to minimum.

.8 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.

.9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.11 Construct forms for architectural concrete, and place ties as indicated and/or as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Ensure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 3 days for walls and sides of beams.

.2 5 days for columns.

.3 1 day for footings and abutments.

.2 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.3 Space reshoring in each principal direction at not more than 3000 mm apart.

.4 Re-use formwork and falsework subject to requirements of CSA-A23.1A23.2.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 03 10 00 – Concrete Forming and Accessories.

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

1.2 REFERENCES

.1 American Concrete Institute (ACI)

.1 ANSI/ACI 315, Details and Detailing of Concrete Reinforcement.

.2 ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A185/A185M, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.2 ASTM A497/A497M, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

.3 Canadian Standards Association (CSA)

.1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of test and Standard Practices for Concrete.

.2 CSA-A23.3, Design of Concrete Structures.

.3 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement, a National Standard of Canada.

.4 CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel /Structural Quality Steel.

.5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 SUBMITTALS

.1 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Owner’s Representative, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada. ANSI/ACI 315 and ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

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

Part 2 Products

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Owner's Representative.

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

.3 Cold-drawn annealed steel wire ties: to ASTM A497/A497M.

.4 Welded steel wire fabric: to ASTM A185/A185M. Provide in flat sheets only.

.5 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

.6 Mechanical splices: subject to approval of Owner's Representative.

.7 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1A23.2, ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Obtain Owner's Representative's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Owner's Representative, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Owner's Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.

.2 Upon request inform Owner's Representative of proposed source of material to be supplied.

Part 3 Execution

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Owner's Representative.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA-A23.1/A23.2.

.2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.

.3 Prior to placing concrete, obtain Owner's Representative approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 11 10 – General Requirements: Construction/Demolition Waste Management and Disposal.

.2 Section 03 10 00 - Concrete Forming and Accessories.

.3 Section 03 20 00 - Concrete Reinforcing.

.4 Section 03 35 00 - Concrete Finishing.

1.2 MEASUREMENT PROCEDURES

.1 Cast-in-place concrete will not be measured but will be paid for as a fixed price item.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.3 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.

.4 ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

.5 ASTM D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

.6 ASTM D1751, Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.3 Canadian Standards Association (CSA)

.1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CAN/CSA-A23.2, Methods of Test for Concrete.

.3 CAN3-A266.4, Guidelines for the Use of Admixtures in concrete.

.4 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.5 CSA-A3001, Cementitious Materials for Use in Concrete.

1.4 ACRONYMS AND TYPES

.1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).

.1 Type GU or GUb - General use cement.

1.5 SUBMITTALS

.1 At least 4 weeks prior to commencing work, inform Owner's Representative of proposed source of aggregates and provide access for sampling.

.2 Submit testing results and reports for review by Owner's Representative and do not proceed without written approval when deviations from mix design or parameters are found.

.3 Certificates:

.1 Minimum 4 weeks prior to starting concrete work submit to Owner's Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:

.1 Portland cement.

.2 Blended hydraulic cement.

.3 Supplementary cementing materials.

.4 Grout.

.5 Admixtures.

.6 Aggregates.

.7 Water.

.8 Waterstops.

.9 Waterstop joints.

.10 Joint filler.

.2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1/A23.2.

.3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1/A23.2.

1.6 SOURCE QUALITY CONTROL

.1 Have all concrete produced and delivered by a ready-mix plant that is a member of the Atlantic Provinces Ready Mixed Concrete Association (APRMCA) and holds a current “Certificate of Ready Mixed Concrete Production Facilities” issued by the Association. Submit a copy of this certificate to the Owner’s Representative for approval.

1.7 QUALITY ASSURANCE

.1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01 11 10 – General Requirements: Quality Control for Owner’s Representative approval for following items:

- .1 Falsework erection.
- .2 Hot weather concrete.
- .3 Cold weather concrete.
- .4 Curing.
- .5 Finishes.
- .6 Formwork removal.
- .7 Joints.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.

- .1 Modifications to maximum time limit must be agreed to Owner’s Representative and concrete producer as described in CSA A23.1/A23.2.
- .2 Deviations to be submitted for review by Owner’s Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.3 Waste Management and Disposal:

- .1 Divert unused concrete materials from landfill to local facility approved by Owner’s Representative.
- .2 Provide an appropriate area on the job site where concrete trucks can be safely washed.
- .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the Owner’s Representative.
- .4 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.5 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial and National regulations.

Part 2 Products

2.1 MATERIALS

.1 Portland cement: to CAN/CSA-A3001, Type GU.

.2 Water: to CAN/CSA-A23.1.

.3 Aggregates: to CSA-A23.1.

.4 Coarse aggregates to be normal density to CSA-A23.1/A23.2.

.5 Admixtures:

.1 Air entraining admixture: to ASTM C260.

.2 Chemical admixtures: to ASTM C494, Owner’s Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.6 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days.

.7 Ribbed waterstops: extruded PVC of sizes indicated shop welded corner and intersecting pieces.

.1 Tensile strength: to ASTM D412, method A, Die "C".

.2 Elongation: to ASTM D412, method A, Die "C", minimum 275%.

.3 Tear resistance: to ASTM D624, method A, Die "B".

.8 Premoulded joint fillers:

.1 Bituminous impregnated fiber board: to ASTM D1751.

.9 Polyethylene film: minimum mm thickness to ASTM C171.

.10 Bonding adhesive: as approved by Owner’s Representative.

2.2 MIXES

.1 Proportion normal density concrete in accordance with CSA-A23.1/A23.2, Alternative 1 to give following quality and yield for all concrete.

.1 Cement:
  .1 Type GU Portland cement.
.2 Minimum compressive strength at 28 days: 25 MPa.
.3 Minimum cement content: 300 kg/m^3 of concrete.
.4 Class of exposure: Exterior walkways: C1, Exterior beams/linels: F2 Interior: N.
.5 Nominal size of coarse aggregate: 20 mm.
.6 Slump at time and point of discharge: 100 to 150 $\pm$ 25mm.
.7 Air content: 4 to 7 %.
.8 Chemical admixtures: admixtures in accordance with ASTM C494.
.9 Fly Ash 25%.

PART 3 Execution

3.1 PREPARATION

.1 Obtain Owner's Representative approval before placing concrete. Provide 24 hour notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 During concreting operations:

  .1 Development of cold joints not allowed.
  .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete is permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing of concrete obtain Owner's Representative approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Protect previous Work from staining.

.8 Clean and remove stains prior to application for concrete finishes.

.9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.10 Do not place load upon new concrete until authorized by Owner's Representative.

3.2 CONSTRUCTION

.1 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2.

.2 Sleeves and inserts.

.1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Owner's Representative.

.2 Where approved by Owner's Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Owner's Representative.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Owner's Representative before placing of concrete.

.4 Check locations and sizes of sleeves and openings shown on drawings.

.5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor bolts.

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

.2 With approval of Owner's Representative, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be manufacturers's recommendations.

.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.4 Set bolts and fill holes with shrinkage compensating grout.

.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

.4 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

.5 Finishing.

.1 Finish concrete in accordance with CSA-A23.1/A23.2.

.2 Use procedures acceptable to Owner's Representative or those noted in CSA-A23.1/A23.2, to remove excess bleed water. Ensure surface is not damaged.

.3 Wet cure using polyethylene sheets placed over sufficiently hardened concrete to prevent damage. Overlap adjacent edges 150 mm and tightly seal with sand on wood planks. Weigh sheets down to maintain close contact with concrete during the entire curing period.

.4 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.

.5 Finish concrete floor to meet requirements of CSA-A23.1/A23.2.

.6 Concrete floor to have finish hardness equal or greater than Mohs hardness in accordance with CSA-A23.1/A23.2.

.7 Provide swirl-trowelled finish for exterior walks, ramps, pads.

.8 Provide float finish for interior floor slabs.

.9 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.

.6 Waterstops.

.1 Install waterstops to provide continuous water seal.

.2 Do not distort or pierce waterstop in such a way as to hamper performance.

.3 Do not displace reinforcement when installing waterstops.

.4 Use equipment to manufacturer's requirements to field splice waterstops.

.5 Tie waterstops rigidly in place.

.6 Use only straight heat sealed butt joints in field.

.7 Use factory welded corners and intersections unless otherwise approved by Owner's Representative.

.7 Joint fillers.

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Owner's Representative.

.2 When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Locate and form, isolation, construction and expansion joints as indicated. Install joint filler.

.4 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

.8 Dampproof membrane.

.1 Install dampproof membrane under concrete slabs-on-grade inside building.

.2 Lap dampproof membrane minimum 150 mm at joints and seal.

.3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.

3.3 SITE TOLERANCE

.1 Concrete tolerance in accordance with CSA-A23.1, Straight Edge Method F_F =30, F_L = 20.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Owner's Representative in accordance with CSA-A23.1/A23.2, and Section 01 11 10 – General Requirements: Quality Control.

.2 Owner's Representative will pay for costs of tests as specified in Section 01 11 10 – General Requirements: Payment Procedures for Testing Laboratory Services. Costs of retesting due to deficient work will be paid for by contractor, by credit change order.

.3 Owner's Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.4 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.1/A23.2.

.5 Provide Certificate of Field Quality Inspection and Testing to Owner's Representative for inclusion in Commissioning Manual.

.6 Inspection or testing by Owner's Representative will not augment or replace Contractor quality control nor relieve the Contractor of his contractual responsibility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

1.2 REFERENCES

.1 American Concrete Institute (ACI):

.1 ACI 302.1R-15, Guide for Floor and Slab Construction.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

.2 ASTM D1752-04a(2013) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.4 Canadian Standards Association (CSA)

.1 CSA A23.1-14/A23.2-14 - Concrete materials and methods of concrete construction / Test methods and standard practices for concrete.

.2 CSA A23.3-14, Design of Concrete Structures.

.3 CAN/CSA A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014), Update No. 3 (2014).

.5 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1113-16, Architectural Coatings.

1.3 PERFORMANCE REQUIREMENTS

.1 Product quality and quality of work in accordance with Section 01 11 10 – General Requirements: Common Product Requirements.

.2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

.3 Concrete works: refer to structural drawings and specifications for concrete requirements. Concrete shall comply with CSA A23.1, CSA A23.2, CSA A23.3, and CAN/CSA A3000.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.

.2 Include application instructions for concrete floor treatments.

.2 Submit closeout data in accordance with Section 01 11 10 – General Requirements: Closeout Submittals.

.1 Provide manufacturer's printed recommendations for general maintenance, including cleaning instructions and submit a complete list of floor care products that will be required for on-going maintenance.

.3 Submit concrete cube tests of concrete at 24 hours, 3 days and 28 days in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

1.5 ENVIRONMENTAL REQUIREMENTS

.1 Temporary lighting: Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.

.2 Electrical power: Provide sufficient electrical power to operate equipment normally used during construction.

.3 Work area: Make the work area water tight protected against rain and detrimental weather conditions.

.4 Temperature: Maintain ambient temperature of not less than 10°C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.

.5 Moisture: Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.

.6 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

.7 Ventilation:

.1 Arrange for ventilation system to be operated during installation of concrete floor treatment materials by use of approved portable supply and exhaust fans.

.2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.

.3 Provide continuous ventilation during and after coating application.

Part 2 Products

2.1 PERFORMANCE/DESIGN CRITERIA

.1 F3-Finishing: Floors having an overall F number of FF 30 x FL 25; similar to CSA A23.1 Class C Slab Finishing.

2.2 LEVELLING MATERIALS

.1 Patching and flash patching materials: construction-grade, cementitious-based, polymer-modified, fine aggregate, single-component, rapid-curing, early-strength floor patching compounds purpose-made to have high adhesion and for application in thicknesses from 4 mm to 25 mm.

.2 Primers and accessories: provide patching material manufacturer's recommended primer and accessories as required.

2.3 HARDENER

.1 Liquid Chemical Sealer and Hardener, Type: 1 Sodium silicate, permanent penetrating sealer and hardener, having the following minimum properties:

- .1 Liquid applied, water based, chemically reactive.
- .2 Non-toxic, non-flammable, and anti-dusting have low or no VOC.
- .3 Colour: colourless.
- .4 Compressive strength, to ASTM C39: 38% or greater increase at 28 days compared to untreated samples.
- .5 Impact Resistance, to ASTM C805: 13% or greater increase in impact resistance compared to untreated samples.
- .6 Coefficient of Friction, to ASTM C1028: Dry: 0.86 or better; Wet: 0.69 or better.
- .7 Abrasion Resistance, to ASTM C779: at least 32% increase in 30 minutes compared to untreated samples.

2.4 SEALER COMPOUNDS

.1 Surface sealer: to CAN/CGSB-25.20, Type 2 - water based, clear.

- .1 Surface sealers manufactured or formulated with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, hexavelant chromium and their compounds are not acceptable.
- .2 Surface sealer shall be compatible with the hardener and shall be manufactured by hardener manufacturer.
- .3 Surface sealer shall have less than 100g/l of VOC in accordance with SCAQMD Rule #1113.

2.5 CURING COMPOUNDS

.1 Select low-VOC, water-based, organic-solvent-free curing compounds.

- .1 Concrete Curing Compounds: maximum VOC limit 100 g/L in accordance with SCAQMD Rule #1113.

2.6 MIXES

.1 Mixing, ratios and application in accordance with manufacturer’s instructions.

2.7 ACCESSORIES

.1 Water: potable.

.2 Joint sealants: to Section 07 92 00 – Joint Sealants.

.3 Joint Filler Strips:

- .1 Floor Isolation Joints: ASTM D1751, bituminous impregnated fibreboard, or ASTM D1752, cork or self-expanding cork, 13 mm thick minimum.
- .2 Edge Joint Filler: ASTM D1751, bituminous impregnated fibreboard, 13 mm thick minimum.

.4 Control Joint Filler:

.1 Two-component, epoxy-urethane, load-bearing, self-levelling sealant; purpose-made for application; commercial grade.

Part 3 Execution

3.1 GENERAL CONCRETING PROCEDURES

.1 Comply with the requirements of Structural Drawings, and as follows:

.1 Avoid over-troweling.

.2 Do not finish concrete surfaces when bleed water is present.

.3 Keep concrete continuously moist for at least 24 hours.

.4 Never add water on site to plant-supplied concrete during placement or finishing.

.5 Maintain concrete above 10°C during and for three days after concrete placement.

.6 Protect fresh concrete from rapid drying, direct sun and wind.

.7 Supply and place layer of sand over vapour retarder to allow some moisture loss at bottom of slab.

.8 Never place concrete on frozen substrate.

.9 Locate mesh no more than 50 mm below surface of slab. Lap mesh at least one square. Use chairs to support mesh at the correct height during concrete placement (do not use the hook and pull method).

.10 Ensure the minimum concrete cover over reinforcing steel is at least 76 mm.

.11 Lap steel at least 24 bar diameters, but not less than 300 mm.

.12 Install wing insulation at perimeter of grade beams, and insulate exterior vertical face of grade beams. Refer to Section 07 21 13 – Board Insulation for insulation specifications.

3.2 EXAMINATION

.1 Prepare floor surface in accordance with CSA A23.1.

.2 Verify that slab surfaces are ready to receive work and elevations are as required.

3.3 REPAIR OF CONCRETE

.1 Examine all concrete surfaces and clearly mark out defective areas to be repaired. Obtain the Departmental Representative's authorization of the delineated repair areas and the proposed method and equipment to be used for the repairs prior to commencing with the work.

.2 Completely remove all damaged, deteriorated, loosened, or unbonded concrete down to sound concrete. Remove microfractured surfaces resulting from the initial concrete removal process.

.3 Sawcut the perimeter of areas requiring concrete removal and replacement perpendicular to the surface to a minimum depth of 25 mm. Do not use any repair method that produces a featheredge.

.4 Prior to filling, provide a repair area that is clean and saturated surface dry except where the repair technique requires a dry surface.

.5 Use dry-pack mortar for filling holes left by the removal of form ties, for narrow grooves cut for repair of cracks, and for repair of small honeycombed areas where lateral restraint can be obtained. Pre-soak the repair area, allow the area to attain a saturated surface dry condition, and apply a cement paste bond coat prior to filling with mortar. Dry-pack mortar shall consist of 1 part Portland cement to 2.5 parts sand, by mass.

.6 Mortar filling with a polymerized mortar placed under pressure by use of a mortar gun or head box may be used for repairing defects that are too wide for dry-pack filling, too shallow for concrete placement, and no deeper than the far side of the reinforcement that is nearest the surface. Treat the surface of the concrete to be repaired with a compatible acrylic bonding agent as authorized by the Departmental Representative prior to mortar filling.

.7 Completely remove honeycombed areas down to sound concrete or to the required depth behind the reinforcing steel, whichever is greater. The depth required beyond the reinforcing steel is 1.5 times the maximum aggregate size of the replacement concrete or 25 mm, whichever is greater. Treat the surface of the concrete to be repaired with a high percentage solids epoxy bonding agent or acrylic bonding agent as authorized by the Departmental Representative prior to concrete replacement. Construct the repair area slightly proud of the general surface and then grind it to match within the specified tolerances.

.8 Repair abrupt and gradual irregularities that exceed the specified tolerances by no more than 10 mm by grinding. Limit the depth of grinding such that no aggregate particles are exposed more than 3 mm in cross section at the finished surface.

.9 Where surface grinding results or will result in exposure of aggregate particles that exceed the specified limits, or where the abrupt and gradual irregularities exceed the specified tolerances by more than 10 mm, repair the irregularities by removing the concrete to a depth below the reinforcing steel of 1.5 times the maximum aggregate size of the replacement concrete or 25 mm, whichever is greater. Treat and construct the repair area as specified for honeycombed areas.

.10 Provide replacement concrete that has the same strength and durability characteristics as the adjacent specified concrete. Use cement that provides a finish colour that matches the surrounding concrete surfaces in areas that are permanently exposed.

.11 Following repairs, promptly initiate curing. Provide completed repair areas that are tightly bonded.

3.4 MEASURING

.1 Classification of Surface Irregularities:

.1 Local surface irregularities are classified as abrupt or gradual.

.2 Abrupt irregularities mean offsets or fins caused by displaced or misplaced form sheeting, lining, or form sections or by defective form lumber, or improper screeding or trowelling. Abrupt irregularities also include any isolated irregularity in which the maximum dimension of the irregularity perpendicular to the surface is greater than the maximum dimension of the irregularity in the plane of the surface.

.3 Gradual irregularities mean bulges or depressions resulting in gradual changes in the concrete surface.

.2 Measuring Surface Irregularities:

.1 Measure irregularities as deviations from a surface, with a straightedge or shaped template authorized by the Departmental Representative. Move the position of the straightedge about the irregularity as necessary to locate the point where the maximum height and slope exists. Provide 3 m long straightedges for taking measurements.

.2 For irregularities protruding above the surface, place 1 end of the straightedge on top of the irregularity. The height of the irregularity is determined by measuring the gap perpendicular to the straightedge. The length of the irregularity is determined by measuring the distance along the straightedge from the gap to the point of contact at the top of the irregularity.

.3 For irregularities extending below the surface, place the straightedge across the irregularity. The height of the irregularity is determined by measuring the gap between the straightedge and the surface. The length of the irregularity is the distance along the straightedge from the gap to the point of contact with the surface.

.4 Check finished concrete surfaces immediately after final working, and again at the end of the curing period and verify their compliance with the specified tolerances.

3.5 PREPARATION OF SLAB

.1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.

.2 Saw cut control joints to CSA A23.1, 24-hours maximum after placing of concrete.

.3 The tops of all floor slabs, including slabs on grade, are to be brought to an even, level or sloping surface as indicated on the drawings, ready to receive the specified finish.

.4 Interior floors indicated as exposed concrete are to be finished in accordance with the slab finishing schedule on the structural drawings. For slab areas not noted in the finishing schedule, slabs shall be smooth concrete with steel trowel finish.

.5 Depress floor slabs where shown and as required for floor finishes.

.6 Remove any curing agents used during concrete installation a minimum of 28 days prior to installation of flooring materials.

.7 Use mechanical stripping to remove chlorinated rubber or existing surface coatings.

.8 Use protective clothing, eye protection, and respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

3.6 FINISHING FORMED SURFACES

.1 Requirements listed below apply to normal structural concrete; refer to Division 03 Structural Drawings, Notes and Specifications for additional requirements for formed exposed architectural concrete.

.2 Unspecified Finish: Provide following finishes as applicable when finish of formed surfaces is not specifically indicated:

- .1 Unexposed Surfaces:
  - .1 Rough form finish for concrete not exposed to view.
  - .2 Smooth form finish for concrete to receive membrane waterproofing.
- .2 Exposed Surfaces:
  - .1 Smooth form finish for concrete surfaces exposed to view.
- .3 Exposed Surfaces at Retaining Wall:
  - .1 Board formed liner, rough form finish.

.3 Rough Form Finish: Leave surfaces with texture imparted by forms; patch tie holes and defects; remove fins longer than 6 mm high.

.4 Smooth Form Finish: Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces with number of seams kept to a minimum, uniformly spaced in an orderly pattern; patch tie holes and defects; completely remove fins.

.5 Sack Rubbed Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes; add white hydraulic cement in amounts determined by trial patches so colour of dry grout will match adjacent surfaces; rub surfaces with clean burlap and keep damp by fog spray for a minimum of 36 hours after grout whitens.

.6 Related Unformed Finish: Strike-off concrete smooth and finish with using texture matching adjacent formed surfaces at tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces; continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces.

3.7 FINISHING FLOORS AND SLABS

.1 Finish floors and slabs in accordance with CSA A23.1 and ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces; do not wet concrete surfaces.

.2 Float (Initial) Finishing:

- .1 Consolidate surface with power driven floats or by hand floating if area is small or inaccessible to power driven floats.
- .2 Re-straighten, cut down high spots, and fill low spots.
- .3 Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
- .4 Apply float finishing to surfaces receiving trowel finishing and receiving waterproofing.

.3 Trowel (Final) Finishing:

- .1 Commence trowel finishing after all bleed water has disappeared and when the concrete has stiffened sufficiently to prevent the working of excess mortar to the surface.

.2 Apply first trowelling and consolidate concrete by hand or power-driven trowel after applying float finishing; continue trowelling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance; repair or smooth any surface defects that would telegraph through applied coatings or floor covering.

.3 Apply a trowel finishing to surfaces exposed to view or receiving waterproofing, and as directed.

.4 Finish surfaces to the tolerances indicated above.

.4 Fine Broom Finishing:

.1 Apply a fine broom finishing to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

.2 Slightly roughen trafficked surface by brooming with fibre bristle broom perpendicular to main traffic route immediately after float finishing.

.3 Coordinate required final finishing with Departmental Representative before application.

3.8 CURING

.1 Comply with the requirements of Structural Drawings, and as follows:

.1 Maintain all material and equipment required for curing and protection on hand at the Site prior to placing any concrete.

.2 Do not commence curing until after finishing.

.3 Commence curing of exposed surfaces as soon as the concrete has hardened sufficiently to prevent surface damage.

.4 Continuously moist cure all concrete for a minimum duration of 7 consecutive days at an ambient temperature maintained above 10°C.

.5 Continuously moist cure concrete by covering with absorptive mat or fabric kept wet by using a system of perforated pipes, mechanical sprinklers, porous hoses, or by other methods that keep all surfaces continuously wet. Initially cure formed surfaces by leaving forms in position and keeping such forms continuously wet.

.6 Do not use curing water that is more than 11°C cooler than the concrete temperature.

.7 Do not use curing compound except on slabs as specified in the Contract Documents, and specifically authorized in writing by the Departmental Representative.

.8 If authorized by the Departmental Representative, apply curing compounds at a uniform rate by mechanical application methods. Provide complete coverage by applying 2 coats at right angles to each other. Minimum coverage is 0.20 L/m^2. Apply curing compound immediately after finishing and as soon as the free water on the surface has disappeared and no water sheen is visible, but not so late that the compound will be absorbed into the concrete.

3.9 APPLICATION: LIQUID APPLIED FLOOR HARDENER

.1 Mechanical and electrical rooms shall have hardened concrete floors, and as indicated on Drawings.

.2 Apply liquid floor hardener in accordance with manufacturer's written instructions after initial floating.

.3 Cure concrete in accordance with manufacturer’s recommended instructions.

3.10 APPLICATION: JOINT SEALANTS AND SURFACE SEALERS

.1 After floor treatment is dry, seal horizontal control joints, and joints at junction of floor with vertical surfaces, with Control Joint Filler.

.2 Apply floor treatment in accordance with sealer manufacturer's written instructions.

.3 Mask as required. Clean overspray. Clean sealant from adjacent surfaces.

3.11 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 –General Requirements: Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 –General Requirements: Cleaning.

.4 Waste Management: Separate and recycle waste materials in accordance with Section 01 11 10 –General Requirements: Waste Management and Disposal.

3.12 PROTECTION

.1 Protect finished installations in accordance with manufacturer's printed instructions.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Section 01 11 10 – General Requirements: Construction/Demolition Waste Management and Disposal.

.3 Section 05 31 00 - Steel Decking.

.4 Section 05 50 00 - Metal Fabrications.

.5 Section 09 91 00 - Painting.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/ G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CAN/CSA-S16, Limit States Design of Steel Structures.

.4 CAN/CSA-S136, Cold Formed Steel Structural Members.

.5 CSA-S136.1, Commentary on CSA Standard S136.

.6 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.7 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding of Structural Steel.

.8 CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.9 CSA W59, Welded Steel Construction (Metal Arc Welding) Metric.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-85.10, Protective Coatings for Metals.

.3 American Society for Testing and Materials International (ASTM)

.1 ASTM A36/A36M, Specification for Structural Steel.

.2 ASTM A325M, Specification for High-Strength Bolts for Structural Steel Joints Metric.

.4 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA).

.1 CISC/CPMA 1-73a, Quick-Drying, One Coat Paint for Use on Structural Steel.

.2 CISC/CPMA 2, Quick-Drying, Primer for use on Structural Steel.

.5 The Society for Protective Coatings (SSPC)

.1 SSPC SP 1, Solvent Cleaning.

.2 SSPC SP 7, Brush-Off Blast Cleaning.

1.3 SHOP DRAWINGS

.1 Submit shop drawings including fabrication and erection documents and materials list.

.2 On erection drawings: indicate details and information necessary for assembly and erection purposes such as, description of methods, sequence of erection, type of equipment used in erection and temporary bracings. Show detail of all non-standard connections such as bracing connections, truss connections, moment connections and hanger assemblies and other non-standard connections as requested by the Owner's Representative.

.3 Erections drawings to be stamped by a qualified professional Owner's Representative licensed to practice in the Province of Newfoundland and Labrador. The erection drawings are to contain a clause stating that the professional Owner's Representative who stamped the erection drawings is responsible for all fabricator designed assemblies, components and connections required for this project.

.4 Drawings for all fabricator designed assemblies, components and connections are to be stamped and signed by the professional Owner's Representative who stamped the erection drawings.

1.4 SAMPLES

.1 Prepare sample of typical exposed structural connections in accordance with approval of Owner's Representative. Samples to be judged upon alignment of surfaces, uniform contact between surfaces, smoothness and uniformity of finished welds. When approved, sample units will serve as a standard for workmanship, appearance and material acceptable for entire project.

1.5 DESIGN REQUIREMENTS

.1 Design details and connections in accordance with requirements of CAN/CSA-S16 and CAN/CSA-S136 with CSA-S136.1 to resist forces, moments, shears and allow for movements indicated.

.2 Unless noted otherwise on the drawings or in the specifications connection design is the responsibility of the structural steel fabricator. Fully detailed connections shown on the contract drawings including bolt and welded sizes are deemed to have been designed by the Owner's Representative.

.3 If connection for shear only (standard connection is required):

.1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction".

.2 If shears are not indicated, select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam.

.4 For non-standard connections, submit sketches and design calculations stamped and signed by qualified professional Owner's Representative licensed in the Province of Newfoundland and Labrador.

1.6 SOURCE QUALITY CONTROL

.1 If requested submit on certified copy of mill reports covering chemical and physical properties of steel used in this work.

1.7 QUALITY ASSURANCE

.1 At least 2 weeks prior to fabrication of structural steel submit to Owner's Representative a letter from the fabricators Welding engineer stating the Welding engineer is responsible for welding procedures and practices for this project as outlined in CSA S47.1

.2 Provide certificate of Quality Compliance from steel fabricator upon completion of structural steel fabrication stating that the work has been designed and fabricated in accordance with the requirements of the contract documents.

.3 If requested, submit to the Owner's Representative one copy of all approved welding procedures for this project.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Structural steel: to CAN/G40.21 Grade as indicated, 300W and/or CAN/CSA-S136.

.2 Cold formed structural members: to CAN/CSA S-136.

.3 Anchor bolts: to CAN/G40.21, Grade 300W.

.4 Bolts, nuts and washers: to ASTM A325M

.5 Welding materials: to CSA W59 and certified by Canadian Welding Bureau.

.6 Shop paint primer:

.1 To CISC/CPMA 2 – 75 color gray.

.7 Hot dip galvanizing: galvanize steel for exterior steel to CAN/CSA-G164, minimum zinc coating of 600 g/m^2.

.8 Shear studs: to CSA W59, Appendix H.

2.2 FABRICATION

.1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with approved reviewed shop drawings.

.2 Install shear studs in accordance with CSA W59.

.3 Continuously seal members by continuous welds where indicated.

.4 Provide holes in top bottom flanges for attachment of wood nailers.

2.3 SHOP PAINTING

.1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16.

.2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface by brush-off blast cleaning to SSPC SP 7.

.3 Apply one coat of primer in shop to steel surfaces except:

.1 Surfaces to be encased in concrete.
.2 Surfaces to receive field installed stud shear connections.
.3 Surfaces and edges to be field welded.
.4 Faying surfaces of friction-type connections.
.5 Below grade surfaces in contact with soil.

.4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5˚ C.

.5 Maintain dry condition and 5˚C minimum temperature until paint is thoroughly dry.

.6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

PART 3 EXECUTION

3.1 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S16.

.2 Welding: in accordance with CSA W59.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.2 CONNECTION TO EXISTING WORK

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

3.3 MARKING

.1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

.2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.4 ERECTION

.1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with approved reviewed erection drawings.

.2 Field cutting or altering structural members: to approval of Owner's Representative.

.3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.

.4 Continuously seal members by continuous welds where indicated. Grind smooth.

3.5 FIELD PAINTING

.1 Paint in accordance with Section 09 91 23 – Interior Painting.

.1 Touch up damaged surfaces and surfaces without shop coat with primer to SSPC SP 7 except as specified otherwise. Apply in accordance with CAN/CGSB 85.10.

3.6 FIELD QUALITY CONTROL

.1 Inspection and testing of materials and workmanship will be carried out by an Inspection and Testing company designated by Owner's Representative.

.2 The Inspection and Testing Company will carry out vertical and horizontal alignment checks, torque testing and inspection of representative connection welds.

.3 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Owner's Representative.

.4 Submit test reports to Owner's Representative within 2 weeks of completion of inspection.

.5 Owner will pay costs of inspection and testing. Costs for any re-inspection and/or re-testing as a result of deficient work will be paid for by the contractor, by credit change order.

.6 Prior to inspection & testing by the Inspection and Testing company the structural steel erection contractor will carry out an inspection of the work and make the inspection results available to the Owner's Representative and the Inspection and Testing company. The inspection report will identify the areas of work inspected, deficiencies identified and measures taken to correct the deficiencies.

.7 Test shear studs in accordance with CSA W59.

.8 Copies of test reports and inspections to be included in Commissioning Manual

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Section 01 11 10 – General Requirements: Construction/Demolition Waste Management and Disposal.

.3 Section 05 12 23 - Structural Steel for Buildings.

.4 Section 05 50 00 – Metal Fabrications.

.5 Section 07 92 00 – Joint Sealants.

.6 Section 09 91 00 - Painting.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CSA C22.2 No.79, Cellular Metal and Cellular Concrete Floor Raceways and Fittings.
- .2 CAN/CSA-S16.1, Limit States Design of Steel Structures.
- .3 CSA-S136, Cold Formed Steel Structural Members.
- .4 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
- .5 CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
- .6 CSA W59, Welded Steel Construction, (Metal Arc Welding) Metric.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

.3 American Society for Testing and Materials, (ASTM)

- .1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 Canadian Sheet Steel Building Institute (CSSBI)

- .1 CSSBI 10M, Standard for Steel Roof Deck.
- .2 CSSBI 12M, Standard for Composite Steel Deck.

1.3 DESIGN REQUIREMENTS

.1 Design steel deck using limit states design in accordance with CSA S136 and CSSBI 10M and CSSBI 12M.

.2 Steel deck and connections to steel framing to carry dead, live and other loads including lateral loads, diaphragm action, composite deck action, and uplift as indicated.

.3 Deflection under specified live load not to exceed 1/240 of span, except that when gypsum board ceilings are hung directly from deck, live load deflection not to exceed 1/360 of span.

.4 Where vibration effects are to be controlled as indicated, dynamic characteristics of decking system to be designed to be in accordance with CAN/CSA-S16.1, Appendix 'G'.

1.4 SHOP DRAWINGS

.1 Submit drawings stamped and signed by qualified professional Owner's Representative registered or licensed in the Province of Newfoundland and Labrador, Canada.

.2 Submit design calculations if requested by Owner's Representative.

.3 Indicate deck plan, profile, dimensions, base steel thickness, metallic coating designation, connections to supports and spacings, projections, openings, reinforcement details and accessories.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Zinc-iron Alloy (ZF) coated steel sheet: to ASTM A653/A653M structural quality Grade 230, 255, with ZF75 coating, for interior surfaces not exposed to weather, minimum base steel thickness as indicated on the drawings.

.2 Decks to be painted: zinc-iron alloy coated decks suitable for finish painting.

.3 Acoustic insulation: fibrous glass 17.5 kg/m^3 density profiled to suit deck flutes.

.4 Closures: as indicated in accordance with manufacturer's recommendations.

.5 Cover plates, cell closures and flashings: steel sheet with minimum base steel thickness of 0.76 mm. Metallic coating same as deck material.

.6 Primer: zinc rich, ready mix to CAN/CGSB-1.181.

.7 Caulking: to Section 07 92 00 – Joint Sealants.

.8 Painting: to Section 09 91 23 – Interior Painting.

.9 Shear studs: to CSA W59.

2.2 TYPES OF DECKING

.1 Steel roof deck: non-cellular, interlocking side laps. Base steel thickness, depth & profile as shown on the drawings.

.2 Acoustic steel roof deck: non-cellular, perforated on vertical face of flutes, interlocking side lap, base steel thickness, depth & profile as shown on the drawings. Flat sheet for cellular deck, 0.76 mm minimum base steel thickness.

.3 Composite steel floor deck: non-cellular, upright embossed fluted profile, interlocking side lap, base steel thickness, depth & profile as shown on the drawings. Flat sheet for cellular deck, 0.76 mm minimum base steel thickness.

.4 Cellular roof deck for electrical raceway: to CSA C22.2No.79.

PART 3 EXECUTION

3.1 GENERAL

.1 Structural steel work: in accordance with CAN/CSA-S136 and CSSBI 10M and CSSBI 12M.

.2 Welding: in accordance with CSA W59, except where specified otherwise.

.3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel and/or CSA W55.3 for resistance welding.

3.2 ERECTION

.1 Erect steel deck as indicated and in accordance with CSA S136 CSSBI 10M and CSSBI 12M and in accordance with approved reviewed erection drawings.

.2 For cellular deck butt ends: to 1.5 to 3 mm gap. Install steel cover plates over gaps wider than 3 mm.

.3 For non-cellular deck lap ends to 50 mm minimum.

.4 Weld and test stud shear connectors through steel deck to steel joists/beams below in accordance with CSA W59.

.5 Immediately after deck is permanently secured in place, touch up metallic coated top surface with compatible primer where burned by welding.

.6 Prior to concrete placement, steel deck to be free of soil, debris, standing water, loose mil scale and other foreign matter.

.7 Temporary shoring, if required, to be designed to support construction loads, wet concrete and other construction equipment. Do not remove temporary shoring until concrete attains 75% of its specified 28 day compression strength.

.8 Place and support reinforcing steel as indicated.

3.3 CLOSURES

.1 Install closures in accordance with approved details.

3.4 OPENINGS AND AREAS OF CONCENTRATED LOADS

.1 No reinforcement required for openings cut in deck which are smaller than 150 mm square.

.2 Frame deck openings with any one dimension between 150 to 300 mm as recommended by manufacturer, except as otherwise indicated.

.3 For deck openings with any one dimension greater than 300 mm and for areas of concentrated load, reinforce in accordance with structural framing details, except as otherwise indicated.

3.5 CONNECTIONS

.1 Install connections in accordance with CSSBI recommendations as indicated on the drawings whichever is the most stringent.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 10 – Rough Carpentry.

.2 Section 06 15 00 – Wood Decking.

.3 Section 07 61 00 – Sheet Metal Roofing.

.4 Section 09 21 16 – Gypsum Board Assemblies.

.5 Section 09 91 00 – Painting.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A123/A123M-12, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM A269-10, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.4 ASTM A276-13, Standard Specification for Stainless Steel Bars and Shapes.

.5 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.6 ASTM A312/A312M-13b, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

.7 ASTM A325-10e1, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

.8 ASTM A666-10, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

.9 ASTM A780/A780M-09, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

.10 ASTM B188 - 10, Standard Specification for Seamless Copper Bus Pipe and Tube.

.11 ASTM B209-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.12 ASTM B221-12, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.13 ASTM B308/B308M-10, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.

.14 ASTM B429/B429M-10e1, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

.15 ASTM B632/B632M-08, Standard Specification for Aluminum-Alloy Rolled Tread Plate.

.16 ASTM F468-12, Standard Specification for Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws, and Studs for General Use.

.17 ASTM F593-13, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CSA S16-09, Design of steel structures, Includes Update No. 1 (2010), Update No. 2 (2010), Update No. 3 (2013).

.3 CSA W47.1-09, Certification of companies for fusion welding of steel, Includes Update No. 3 (2011), Update No. 5 (2012).

.4 CSA W48-06 (R2011), Filler metals and allied materials for metal arc welding.

.5 CSA W55.3-08, Certification of companies for resistance welding of steel and aluminum.

.6 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

.7 CSA W178.2-08 (R2013), Certification of Welding Inspectors.

.3 National Association of Architectural Metal Manufactures (NAAMM)

.1 NAAMM AMP 555-92, Code of Standard Practice for the Architectural Metal Industry.

.4 National Ornamental & Miscellaneous Metals Association (NOMMA)

.1 NOMMA Guideline 1: Joint Finishes, 1994.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:

.1 Submit manufacturer's printed product literature, specifications, and data sheets.

.2 Submit shop drawings in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:

.1 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.2 For items where structural design is delegated to fabricator, provide shop drawings signed and sealed by the professional engineer registered in Province of Work, responsible for the design.

1.4 QUALITY ASSURANCE

.1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Detail and fabricate metal fabrications in accordance with the NAAMM AMP 555.

.4 Perform Work to the highest standard of modern shop and field practice, by personnel experienced in this Work. Accurately fit joints and intersecting members in true planes with adequate fastening. Build and erect the Work plumb, true, square, straight, level, accurate to the sizes shown, and free from distortion or defects.

.5 Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

.6 Welding: Qualify procedures and personnel according to the following:

.1 Welders shall be qualified by Canadian Welding Bureau for classification of work being performed.

.2 The fabricator shall be certified to CSA W47.1, Division 1 or 2.1.

.3 Do welding inspection to CSA W178.

.4 Resistance welding: to CSA W55.3.

.5 Fusion welding: to CSA W59.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Exercise due care in storing, handling and erecting all materials and support all materials properly at all times so that no piece will be bent, twisted or otherwise damage structurally or visibly.

.2 Correct damaged material and where the Departmental Representative deems damage irreparable, replace the affected items at no additional expense to the Departmental Representative or Agency.

.3 Apply protective covering to face of all exposed finished metalwork before it leaves shop, covering to remain until item installed.

.4 Fabricate large assemblies so they can be safely and easily transported and handled to their place of installation.

1.6 JOB CONDITIONS

.1 Coordinate this Work with the remainder of the Work and exercise the necessary scheduling to ensure that all Work is carried out and all items incorporated during the appropriate construction phase.

.2 Provide instructions and drawings to other trades for setting bearing plates, anchors blots, and other members that are built into work of other trades.

.3 Protect other Sections of the Work from damage by this Section of the Work.

Part 2 Products

2.1 MATERIALS

.1 Steel sections and plates: to CAN/CSA G40.20/G40.21, Grade 300W.

.2 Hollow structural sections: to CAN/CSA G40.20/G40.21, Grade 350W, Class C.

.3 Steel pipe: to ASTM A53/A53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads, galvanized finish.

.4 Steel tubing: to ASTM A500, shapes and configuration as indicated, 6 mm wall thickness, sizes and dimensions as indicated.

.5 Welding materials: to CSA W59.

.6 Welding electrodes: to CSA W48 Series.

.7 Fasteners: Bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws, and machine bolts.

.1 Unfinished fasteners: In areas not exposed to public, use unfinished bolts conforming to ASTM A307, Grade A, with hexagon heads and nuts. Supply bolts of lengths required to suit the thickness of the material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.

.2 Finished fasteners:

.1 In areas exposed to public use, bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts to be hot dip galvanized in accordance with ASTM A153/A153M or CAN/CSA-G164.

.2 For joining stainless steel components use stainless steel fasteners of same type.

.8 Structural bolts: to ASTM A325.

.9 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours; 40 MPa at 28 days

2.2 FABRICATION

.1 Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

.2 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.3 Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and night sky heat loss.

.1 Temperature change (Range): 100 deg F (38 deg C).

.4 Shear and punch metals cleanly and accurately. Remove burrs.

.5 Ease exposed edges to a radius of approximately 0.794 mm (1/32 inch), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

.6 Remove sharp or rough areas on exposed traffic surfaces.

.7 Weld corners and seams continuously to comply with American Welding Society (AWS) recommendations, and the following:

.1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

.2 Obtain fusion without undercut or overlap.

.3 Remove welding flux immediately.

.4 At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

.8 Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

.9 Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

.10 Shop Assembly: preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

.11 Cut, reinforce, drill and tap miscellaneous metalwork as indicated to receive finish hardware, screws, and similar items.

.12 Ensure exposed welds are continuous for length of each joint.

.13 Grind or file exposed welds and steel sections smooth and flush with adjacent surfaces. Weld locations not to be visible after application of paint finishes.

.14 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.

.15 Accurately form connections with exposed faces flush; mitres and joints tight.

.16 Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

.17 All welding is to be performed by CWB Certified Welders.

2.3 ROUGH HARDWARE

.1 Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required. Fabricate items to sizes, shapes, and dimensions required.

2.4 MISCELLANEOUS FABRICATIONS

.1 Miscellaneous Framing and Supports: Provide steel framing and supports for applications indicated that are not a part of structural steel framework, as required to complete work.

.2 Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitred joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

.3 Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

.4 Miscellaneous Steel Trim: Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination for assembly and installation with other work.

2.5 FINISHES

.1 Prior to applying primer or other finishes, clean metal to equivalent of commercial sand blast SSPC-SP6, remove sandblast in residue.

.2 Hot dip galvanizing: hot dip galvanize all exterior steel after fabrication to ASTM A123, minimum zinc coating of 600 g/m².

.3 Touch up galvanized surfaces with zinc rich coating, to ASTM A780: DOD-P-21035 zinc rich paint, minimum DFT 8 mils.

.4 Zinc Rich Paint: Conforming to DOD-P-21035 zinc rich paint. Apply one coat of zinc rich paint to all surfaces exposed after assembly to minimum dry film thickness of 60 μm (2.5 mil). Apply coating immediately after cleaning.

.5 Isolation Coating: Apply an isolation coating to contact surfaces in contact with cementitious materials, wood materials and dissimilar metals except stainless steel.

.6 Finish paint finishes: to Section 09 91 00 – Painting.

Part 3 Execution

3.1 ERECTION

.1 Install Work in accordance with manufacturer's or fabricator's (as applicable) written instructions, and Drawings.

.2 Do welding work in accordance with CSA W59 unless specified otherwise.

.3 Supply finished items to be built-in to those trades along with instructions for proper installation.

.4 Apply architectural metalwork using hidden mechanical fasteners. Installation shall be by skilled Architectural metalworkers experienced in highest quality work.

.5 Fasteners to draw adjoining sections together in proper, true alignment, and are capable of field adjustment.

.6 All fasteners, mountings to be non-loosening and installed so that they will be hidden at completion.

.7 Install all Work to true, straight lines, accurate to profile, all properly aligned.

.8 Isolate dissimilar metals in a manner approved by the Departmental Representative to prevent electrolytic action or corrosion.

.9 Install finish hardware supplied under other Sections required for completion of components of this Section.

.10 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.11 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.12 Make field connections with high tensile bolts to CSA S16 and weld to prevent loosening.

.13 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.14 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

.15 Repair galvanized areas damaged by welding, flame cutting or during handling, transport or erection in accordance with ASTM A780. Touch-up with organic zinc-rich paint to DOD-P-21035 zinc rich paint, minimum DFT 8 mils.

3.2 PRE-MANUFACTURED DOOR OPERATOR PEDESTALS

.1 Install in accordance with manufacturer's printed installation instructions, data sheet, and standard details. Coordinate with electrical and door hardware trades.

3.3 MISCELLANEOUS ITEMS

.1 Supply and install miscellaneous metal fabrications as indicated or specified, or as otherwise required in accordance with the design intent of the project.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.4 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 05 50 00 – Metal Fabrications.

.2 Section 06 10 10 – Rough Carpentry.

.3 Section 06 15 00 – Wood Decking.

.4 Section 07 92 00 – Joint Sealants.

.5 Section 09 91 00 – Painting.

.6 Division 03: cast-in-place concrete, forming, curing.

1.2 REFERENCES

.1 ASTM International, (ASTM)

.1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.3 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.4 ASTM A276-10, Standard Specification for Stainless Steel Bars and Shapes.

.5 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.6 ASTM A312/A312M-12a, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

.7 ASTM A325M-10, Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric).

.8 ASTM A500/A500M-10a, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

.9 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.10 ASTM B209-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.11 ASTM B221-12, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.12 ASTM B241/B241M-12, Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.

.2 CAN/CGSB-1.181-99, Ready-Mixed, Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA International)

.1 CAN/CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).

.4 CAN/CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2009), Update No. 2 (2010), Update No. 3 (2011).

.4 National Association of Architectural Metal Manufactures (NAAMM)

.1 NAAMM AMP 500-06, Metal Finishes Manual.

.2 NAAMM AMP 510-92, Metal Stair Manual.

.3 NAAMM AMP 521-01(R2012), Pipe Railing Systems Manual.

.4 NAAMM AMP 555-92, Code of Standard Practice for the Architectural Metal Industry.

.5 Steel Structures Painting Council (SSPC), Systems and Specifications Manual, Volume 2.

1.3 DEFINITIONS

.1 Metal: means steel, aluminum, stainless steel, iron.

.2 Usage Classifications: NAAMM AMP 510 provides four usage classifications for finishing of metal stair and railing systems as follows:

.1 Industrial Class: NAAMM Industrial Class stairs are purely functional in character, design for interior or exterior locations for industrial or fire escape applications, primarily for use by building occupants only; not including stairs integral with industrial equipment.

.2 Service Class: NAAMM Service Class stairs are intended for use in enclosed stairways and to provide a secondary or emergency means of travel between floors or levels in a multi-storey building, primarily for use by building occupants, tenants and the public.

.3 Commercial Class: NAAMM Commercial Class stairs are intended for use in enclosed stairways to provide primary means of travel between floors or levels in a multi-storey institutional or commercial building where appearance and finish are important considerations.

.4 Architectural Class: NAAMM Architectural Class stairs are intended to serve as an architectural feature and can be located in either an open area or in and enclosed stairway in an instiutional or commercial building where appearance and finish are of prime importance.

1.4 PRE-INSTALLATION MEETINGS

.1 Pre-Installation Meetings: convene pre-installation meeting to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building trades.

.4 Review manufacturer's installation instructions.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:

.1 Submit manufacturer's printed product literature, specifications and data sheets.

.2 Submit shop drawings in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:

.1 Indicate construction details, sizes of metal sections, and thickness of metal sheet. Include connections to other materials, such as glass panels and wood railings.

.2 Indicate fasteners, welds and connection details between stringers; treads; risers; headers; newels; platforms; struts, columns and hangers; railings; balusters; pickets; handrails; brackets; reinforcements; anchors; and welded and bolted connections.

.3 Submit shop drawings bearing stamp of a qualified professional engineer registered in Province of Newfoundland and Labrador.

1.6 QUALITY ASSURANCE

.1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Qualifications:

.1 Use a fabricator experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

.2 Welders shall be qualified by Canadian Welding Bureau for classification of Work being performed.

.3 Welding of load supporting components shall be performed by companies certified by Canadian Welding Bureau in accordance with CSA W47.1.

.4 Delegated Design:

.1 Retain a Professional Engineer, registered in the Province of the work, to design fabrication and erection of the work of this Section in accordance with applicable Building Code and Contract Documents requirements.

.2 Sign and seal shop drawings and design submittals.

.3 Review installations.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Store materials in a location and manner to avoid damage; stack materials to prevent bending or applying stress to components; keep handling of materials on-site to a minimum.

.2 Store components and materials in clean, dry location, away from uncured concrete or masonry; cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that permits air circulation inside of covering.

.3 Correct damaged material and where damage is deemed irreparable by the Departmental Representative, replace the affected item at no additional expense to the Departmental Representative.

.4 Apply protective covering to face of all exposed finished metalwork before it leaves shop, covering to remain until item installed and ready for final finishing.

.5 Fabricate large assemblies so they can be safely and easily transported and handled to their place of installation.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Provide engineered design as required.

.2 Design Requirements:

.1 Design metal stairs, balustrades, and landings in accordance with National Building Code of Canada for vertical and horizontal live load requirements.

.2 Detail and fabricate stairs to NAAMM Metal Stairs Manual.

.3 Design pipe railings to NAAMM Pipe Railing Manual.

2.2 MATERIALS

.1 Steel sections and plates: to CAN/CSA G40.20/G40.21, Grade 300W.

.2 Hollow structural sections: to CAN/CSA G40.20/G40.21, Grade 350W, Class C.

.3 Steel pipe: to ASTM A53/A53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads, galvanized finish.

.4 Steel tubing: to ASTM A500, shapes and configuration as indicated, 6 mm wall thickness, sizes and dimensions as indicated.

.5 Welding materials: to CSA W59.

.6 Welding electrodes: to CSA W48 Series.

.7 Fasteners: Bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws, and machine bolts.

.1 Unfinished fasteners: In areas not exposed to public, use unfinished bolts conforming to ASTM A307, Grade A, with hexagon heads and nuts. Supply bolts of lengths required to suit the thickness of the material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.

.2 Finished fasteners:

.1 In areas exposed to public use, bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts to be hot dip galvanized in accordance with ASTM A153/A153M or CAN/CSA-G164.

.2 For joining stainless steel components use stainless steel fasteners of same type.

.8 Structural bolts: to ASTM A325.

.9 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours; 40 MPa at 28 days.

.10 Eastern White Cedar materials (treads, landings and deck), coordinate with the following specification sections:

.1 Section 06 10 10 – Rough Carpentry.

.2 Section 06 15 00 – Wood Decking.

.11 Coordinate and cooperate with other trades as required for a complete construction in compliance with the Construction Schedule.

2.3 FABRICATION

.1 Fabricate in accordance with NAAMM, Metal Stair Manual.

.2 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.

.3 Accurately form connections with exposed faces flush.

.1 Make mitres and joints tight.

.2 Make risers of equal height.

.4 Grind or file exposed welds and steel sections smooth.

.5 Shop-fabricate stairs in sections as large and complete as practicable.

.6 Insulate dissimilar materials to prevent electrolysis arising from metal to metal contact or metal to masonry or concrete contact; use bituminous paint or other acceptable method acceptable to Departmental Representative.

2.4 STEEL AND CEDAR STAIRS

.1 Refer to Structural Drawings and specifications.

.2 Fabricate stairs with open riser construction, framing designed for insertion of Eastern White Cedar treads.

.3 Fabricate treads from Eastern White Cedar. Secure tread assembly to L 35 x 35 x 5 horizontal members welded to stringers.

.4 Form wall stringers from MC 310 x 15.8.

.5 Form outer stringers from MC 310 x 15.8 with 5 mm thick plate fascia welded on.

.6 Extend stringers around mid-landings to form steel framing for Eastern White Cedar decking. Support cedar decking with L 55 x 55 x 6 mm framing.

.7 Close ends of stringers where exposed.

2.5 RAILINGS AND BALUSTRADES

.1 Fabricate galvanized steel balusters to accommodate and fit Eastern White Cedar treads.

.2 Fabricate balusters and handrails from steel pipe or tubing as indicated to Architectural Class, as defined by NAAMM, Metal Stair Manual.

.3 Cap and weld exposed ends of balusters and handrails.

.4 Terminate at abutting wall with end flange.

.5 Fabricate railings to NAAMM, Metal Stair Manual and as follows:

.1 Fabrication Tolerance: Fabricate steel to one half the normal tolerance as specified in the CISC/AISC Code of Standard Practice Section 10.

.2 Welds Ground Smooth: Fabricator shall grind welds of exposed steel smooth; make groove welds flush to the surfaces each side and be within +1.5 mm, -0 mm of plate thickness.

.3 Contour and blend of welds where fillet welds are ground contoured, or blended, oversize welds as required and grind to provide a smooth transition and to match profile on accepted sample.

.4 Continuous weld where noted of uniform size and profile.

.5 Minimize weld show through at locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel to a smooth profile with adjacent material.

.6 Maintain a uniform gap of 3 mm ± 0.8 mm at copes and blocks.

.7 Maintain a uniform gap tolerance of 3 mm ± 0.8 mm at connections.

.8 Fabricate exposed steel so that piece marks are fully hidden in the final structure or made with media to permit full removal after erection.

.9 Deliver steel with no mill marks (stencilled, stamped, raised) in exposed locations; cut off mill material to appropriate lengths where possible; fill or grind to a surface finish consistent with the accepted sample where cutting is not possible.

.10 Grind edges of sheared, punched or flame-cut steel to match accepted sample.

.11 Rolled members shall be fully shaped in the shop and tied during shipping to prevent stress relieving; distortion of the web or stem, and of outstanding flanges or legs of angles will be visibly acceptable to the Departmental Representative when viewed from a distance of 6100 mm under any lighting condition; tolerances for the vertical and horizontal walls of rectangular HSS members after rolling shall be ±13 mm.

.12 Seal weld open ends of round and rectangular hollow structural section with 10 mm closure plates; provide continuous, sealed welds at angle to gusset plate connections and similar locations where exposed steel is exposed to weather.

.6 Fabricate work square, true straight and accurate to required size, with joints closely fitted and properly secured.

.7 Where work of other Sections is attached to work of this section, prepare work by drilling and tapping holes as required facilitating installation of such work.

2.6 ACCESSORIES

.1 Handrails and Wall Brackets: constructed of same material as railing with rod and mounting flange, purpose-made to suite application.

.2 Sealant: in accordance with Section 07 92 00 – Joint Sealants.

2.7 FINISHES

.1 Prior to applying primer or other finishes, clean metal to equivalent of commercial sand blast SSPC-SP6, remove sandblast in residue.

.2 Galvanizing: all exterior steel shall be hot dipped galvanized with zinc coating 600 g/m^2 to ASTM A12. Galvanize after fabrication where possible. Follow recommended precautions to avoid embrittlement of the base metal by overpickling, overheating or during galvanizing.

.3 Touch up galvanized surfaces with zinc rich coating, to ASTM A780: DOD-P-21035 zinc rich paint, minimum DFT 8 mils.

.4 Zinc Rich Paint: Conforming to DOD-P-21035 zinc rich paint. Apply one coat of zinc rich paint to all surfaces exposed after assembly to minimum dry film thickness of 60 μm (2.5 mil). Apply coating immediately after cleaning.

.5 Painting: to Section 09 91 00 – Painting, colour as selected by Departmental Representative.

2.8 SHOP PAINTING

.1 Clean surfaces in accordance with Steel Structures Painting Council Manual Volume 2.

.2 Apply one coat of shop primer except interior surfaces of pans.

.3 Apply two coats of primer of different colours to parts inaccessible after final assembly.

.4 Use primer as prepared by manufacturer without thinning or adding admixtures. Paint on dry surfaces, free from rust, scale, and grease. Do not paint when temperature is below 7 degrees C.

.5 Do not paint surfaces to be field welded.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal stairs and ladders 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 PREPARATION

.1 Provide anchorage devices and fasteners to other Sections where necessary for securing stairs to in-place construction; include threaded fasteners for inserts, through-bolts, lag bolts, and other connectors.

.2 Perform cutting, drilling, and fitting required for installing stairs.

.3 Field check and verify that structural framing, enclosures, weld plates, blocking, and that size and location of pockets are placed in accordance with engineered shop drawings.

.4 Report discrepancies to Departmental Representative, and recommend corrective action by responsible parties.

.5 Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

.6 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates and instructions for installation.

3.3 INSTALLATION OF STAIRS, RAILINGS AND BALUSTERS

.1 Install in accordance with NAAMM, Metal Stair Manual.

.2 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.

.3 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.4 Do welding work in accordance with CSA W59 unless specified otherwise.

.5 Touch up shop primer to bolts, welds, and burned or scratched surfaces at completion of erection.

.6 Install wood treads and decking for a complete installation; coordinate with other trades as required.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.4 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications.

.2 Section 06 15 00 – Wood Decking.

.3 Section 06 20 00 – Finish Carpentry.

.4 Section 07 46 23 – Wood Siding.

.5 Section 07 61 00 – Sheet Metal Roofing.

.6 Section 07 62 00 – Sheet Metal Flashing and Trim.

.7 Section 08 50 13 – Aluminum Windows.

.8 Section 09 21 16 – Gypsum Board Assemblies.

.9 Section 09 91 00 – Painting.

.10 Division 32 – Exterior Improvements.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI/NPA A208.1-2009, Particleboard.

.2 ANSI A208.2-2009, Medium Density Fibreboard (MDF) for Interior Applications.

.2 ASTM International (ASTM)

.1 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM C954-11, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness

.4 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood.

.5 ASTM D5055-12, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

.6 ASTM D5456-11a, Standard Specification for Evaluation of Structural Composite Lumber Products.

.7 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.

.8 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.3 American Wood Preservers Association (AWPA):

.1 AWPA Book of Standards, 2012

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-11.3-M87, Hardboard.

.2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.3 CAN/CGSB-51.34-M86 Amend., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.4 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.

.5 CSA International (CSA)

.1 CSA A123.2-03 (R2008), Asphalt Coated Roofing Sheets.

.2 CAN/CSA-A247-M86 (R1996), Insulating Fiberboard.

.3 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 CAN/CSA O80 Series-08, Wood Preservation.

.5 CSA O86-14, Engineering Design in Wood.

.6 CSA O112 Series-M1977 (R2006), CSA Standards for Wood Adhesives.

.7 CSA O121-08, Douglas Fir Plywood.

.8 CSA O122-06 (R2011), Structural Glued-Laminated Timber.

.9 CSA O141-05 (R2014), Softwood Lumber.

.10 CSA O151-09, Canadian Softwood Plywood.

.11 CSA O153-M1980(R2008), Poplar Plywood.

.12 CAN/CSA-O325-07, Construction Sheathing.

.13 CSA O437 Series-93(R2011), Standards on OSB and Waferboard

.6 National Lumber Grading Association (NLGA):

.1 NLGA SPS2-2010, Special Products Standards on Machine Stress-Rated Lumber.

.2 Standard Grading Rules for Canadian Lumber 2010.

.7 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)

.1 SCAQMD Rule 1113-04, Architectural Coatings.

.2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.8 Truss Plate Institute of Canada (TPIC)

.1 Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses – Limit States Design, 2011.

.9 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC S102-10, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:

.1 Submit manufacturer's printed product literature, specifications and data sheets.

.2 Submit MSDS sheets or official manufacturer literature stating no added urea-formaldehyde was used in the manufacturing of composite wood.

.3 Submit engineered shop drawings in accordance with Section 01 11 12 – Project General Requirements: Submittal Procedures.

.1 Provide shop drawings signed and sealed by the professional engineer registered in Province of Work, responsible for design.

.2 Indicate details of construction, profiles, jointing, fastening, and other related details.

.3 Indicate materials, thicknesses, finishes, and hardware.

1.4 QUALITY ASSURANCE

.1 Lumber identification: Grade stamp of an agency certified by the Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: Grade mark in accordance with applicable CSA standards.

.3 Each board of fire retardant treated material to shall bear the ULC label indicating 'Flame Spread Classification' (FSC), and smoke developed.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver wood products bundled or crated to provide adequate protection during transit. Inspect wood products for damage upon delivery and remove and replace damaged materials.

.2 Store materials a minimum of 150 mm off the ground on blocking. Keep materials under cover and dry. Provide for air circulation within and around stacks and under temporary coverings.

.3 Protect sheet materials to prevent breaking of corners and damage to surfaces.

Part 2 Products

2.1 GENERAL

.1 Use CLS grade marked lumber conforming to the Standard Grading Rules for Canadian Lumber published by the National Lumber Grades Authority.

.2 Framing and board lumber: in accordance with requirements of National Building Code of Canada (NBC), 2010 and amendments, and CSA O86-14, Engineering Design in Wood.

2.2 STRUCTURAL FRAMING AND PANEL MATERIALS

.1 Lumber: kiln dried, Stud Grade to CAN/CSA-O141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:

- .1 Moisture Content: maximum 8% at time of installation.
- .2 Maximum moisture content when used for attachment of drywall: 8%.
- .3 Stud (No.3) Grade or better, having the following minimum properties:
  - .1 Sizes: 38 mm or 89 mm wide by maximum 140 mm depth as noted on drawings.
  - .2 Bending at extreme fibre (F_b): 7.0 MPa.
  - .3 Longitudinal shear (F_v): 1.0 MPa.
  - .4 Compression parallel to grain (F_c): 7.0 MPa.
  - .5 Compression perpendicular to grain (F_{cp}): 5.3 MPa.
  - .6 Tension parallel to grain (F_t): 3.2 MPa.
  - .7 Modulus of elasticity (E/ E_{O5}): 9000/5500 MPa.
  - .8 Finger jointed material will not be acceptable without written acceptance from the Departmental Representative.

.2 Lumber: kiln dried, Structural Light Framing and Structural Joists and Planks to CAN/CSA O141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:

- .1 Moisture Content: maximum 8% at time of installation.
- .2 Maximum moisture content when used for attachment of drywall: 8%.
- .3 Grade: No. 2 or better, and having the following minimum properties:
  - .1 Sizes: 38 mm or 89 mm wide by depth as indicated on drawings.
  - .2 Bending at extreme fibre (F_b): 11.8 MPa.
  - .3 Longitudinal shear (F_v): 1.0 MPa.
  - .4 Compression parallel to grain (F_c): 11.5 MPa.
  - .5 Compression perpendicular to grain (F_{cp}): 4.6 MPa.
  - .6 Tension parallel to grain (F_t): 5.5 MPa.
  - .7 Modulus of elasticity (E/ E_{O5}): 9500/6500.

.3 Light-frame trusses: in accordance with Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses – Limit States Design, The Truss Plate Institute of Canada.

.4 Sheathing for structural shear wall and diaphragms:

- .1 Plywood: Douglas Fir (DFP) Exterior Grade Sheathing to CSA O121, thickness as indicated.

.5 Other paneling:

- .1 Plywood: Douglas Fir (DFP) Exterior Grade to CSA O121, thickness as indicated.
- .2 Fire Rated Plywood Panels to CSA O325, FSC-Certified, Class A fire retardant produced under Performance Standard PS-1, certified by the American Plywood Association.
- .3 Interior sheathing shall be ULC-labelled fire-resistant, provide grade stamp or certification as noted for fire-retardant pressure-treated lumber.

.6 Panels shall have no added urea-formaldehyde.

2.3 MISCELLANEOUS LUMBER

.1 Provide lumber for support or attachment of other construction, including furring, blocking, nailing strips, ground, rough bucks, cants, curbs, fascia, backing sleepers, and similar members.

.2 Fabricate miscellaneous lumber from dimension lumber of sizes indicated, and into shapes shown on drawings.

.3 Moisture Content: 19% maximum for lumber items not specified to receive wood preservative treatment.

.4 Grade: for dimension lumber sizes provide No. 2 or Standard grade lumber per NLGA. For board-sized lumber, provide sheathing grade, S2S.

2.4 CEDAR LUMBER AND TIMBER

.1 Eastern white or western red cedar as indicated: cedar decking, balustrades, railings, treads, log steppers, posts, cedar dowels, and landscape logs:

.1 Eastern white or western red cedar as indicated: solid wood lumber, graded to meet NLGA Grading Standards and WRCLA, S4S.

.2 Grade: WRCLA Custom Clear.

.3 Edges: square or circular (round log shape) as indicated; vertically placed posts shall have bevelled tops, 10 mm radius.

.4 Texture: finely machined.

.5 Moisture Content: seasoned.

.6 Sizes: as indicated or as otherwise required to meet design intent.

2.5 ACCESSORIES

.1 Sealants: in accordance with Section 07 92 00 – Joint Sealants.

.2 Adhesives: exterior grade, recommended by manufacturer.

.3 Fasteners, Connectors and Rough Hardware: Type 304 stainless steel, sized as required.

.1 Notwithstanding any notes to the contrary that may be encountered on Drawings, all metal components shall be Type 304 stainless steel.

.2 Nails, spikes, and staples: to ASTM F1667.

.3 Screws, to ASTM F593: 2-¼” #7 trim head screws.

.4 Bolts, to ASTM F593.

.5 Nuts and Washers, to ASTM F594: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers, lengths as required.

.6 Carriage and Lag Bolts, to ASTM F593.

.7 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

.8 Joist hangers: minimum 1 mm thick sheet steel.

.9 Saddle posts: to create positive connection between piles and beams. Provide to other trades as required for embedment in concrete in accordance with Construction Schedule.

.10 Heavy-duty, commercial-quality, ties, hangers and connectors to provide positive connection between members, and capable of resisting wind and seismic forces.

.1 Provide manufacturer's specified fasteners in matching material.

.2 Gauges as required to withstand loads as calculated in accordance with National Building Code of Canada, 2010, and CSA O86-14, Engineering Design in Wood.

.11 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, fibre, formed to prevent dishing; stainless steel. Bell or cup shapes not acceptable.

Part 3 Execution

3.1 COMPLIANCE

.1 Minimum Requirements: Part 9 of the National Building Code of Canada, 2010, and Amendments, and CSA O86-14, Engineering Design in Wood.

.2 Structural framing and construction shall be engineered, with shop drawings stamped and signed by a professional structural engineer licenced to practice in the province of Newfoundland and Labrador.

.3 Accurately frame and properly assemble rough carpentry work. Include all necessary nails, fasteners and other connectors; stainless steel corrosion resistance unless otherwise specified.

3.2 WOOD FRAME CONSTRUCTION

.1 Space framing members as indicated on drawings. Construct members of continuous pieces of longest possible length.

.2 Install spanning members, including joists, rafters and beams, with "crown-edge" up.

.3 Provide 38 x 89 mm blocking at 610 mm O/C between engineered floor joists for lateral support of wall plates where walls run parallel to joists.

.4 Make allowance for erection stresses. Securely brace members in place to maintain plumb and true until permanently fixed and held to structure.

.5 Install fire blocking as detailed.

.6 Fabricate wood frame construction to the requirements of the National Building Code of Canada, 2010, Part 9, except where more stringent requirements are indicated on the drawings.

.7 Minimum sizes and spacing of members, thickness of materials, allowable species and lumber grades, shall meet the requirements of the above noted standards, unless indicated or specified otherwise.

.8 Minimize cutting of framing members for pipes, etc. by prior consultation with other trades. Cutting limitations in accordance with Part 9 of the Building Code.

.9 Construct framing as necessary to accommodate the work of other trades.

3.3 FASTENINGS AND ROUGH HARDWARE

.1 Unless indicated otherwise, fasten to hollow masonry units with toggle bolts; to solid masonry or concrete surfaces with expansion shields and bolts.

.2 Where screws are required use lead or inorganic fibre plugs. Wood or organic plugs not permitted.

.3 Powder actuated fasteners may be used in lieu of bolts if approved by the Departmental Representative in writing prior to materials arriving on site.

.4 Provide all rough hardware such as nails, bolts, nuts, washers, screws, clips and strap metal.

.5 Counter sink lag bolts at cedar construction and plug with cedar dowel (adhered in place with waterproof exterior-grade wood glue).

.6 Pre-drill pilot holes for lag bolts, screws, and other fasteners that may split the wood substrate; diameter of pre-drilled hole sufficient to prevent splitting.

3.4 BLOCKS, PLATES, STRAPPING AND FURRING

.1 Install wood plates where indicated. Erect plumb and true. Rigidly support and securely anchor to masonry, concrete, and metal stud framing, as required.

.2 Provide and install wood strapping or furring indicated on drawings or as required.

.3 Strapping: Shimmed out plumb, square and true to line. Use 19 mm x 64 mm at 406 mm on centre, unless indicated otherwise.

.4 Furring: As indicated.

.5 Install at least one row of solid blocking to wood stud walls not more than 2440 mm high, two rows if over 2440 mm high.

.6 Install blocking behind all sheathing and wallboard joints, and where required for items to be fixed to walls.

3.5 SHEATHING INSTALLATION

.1 Install wall sheathing horizontally to wood framing using minimum 50 mm long coated nails at 150 mm along edges and 305 mm along vertical members in the middle of the sheets.

.2 Leave 2 mm to 3 mm between sheets to allow for shrinkage of wood framing.

.3 Install blocking behind all sheathing joints.

3.6 ROOF FRAMING AND PLATES

.1 Wood exposed to weather and water shall be pressure preservative treated.

.2 Unexposed wood in contact with roofing membranes shall not be pressure preservative treated.

.3 Construct wooden roof curbs around openings in the roof for vents, ducts, and flues. Curbs to be of height that will provide a minimum projection of 200 mm above the roof membrane. Ensure base for curb is same thickness as insulation.

.4 Form sloped tops to all wood parapet plates and wood upstands more than 38 mm wide to roofs that receive metal flashings. Tops shall slope not less than 1 in 12. If details are at variance notify the Departmental Representative prior to construction for further instructions.

.5 Provide continuous wood backing for flashings.

.6 Provide solid wood or plywood sheathing and backing, a to receive membrane and metal flashings, to roofer's requirements conforming to CRCA Manual.

.7 Fasten plywood sheathing securely to the walls of parapets with mechanical fasteners; nails will not be acceptable.

3.7 MISCELLANEOUS

.1 Install wood stud framing for temporary weather closure and cladding. Construct to resist wind pressures.

.2 Install bracing to masonry walls and piers during construction until structure provides sufficient lateral support.

.3 Install support for masonry lintels.

.4 Install plywood shims at window openings.

.5 Construct planter retaining walls of pressure preservative treated timbers. Treat cut ends with two heavy coats of brush applied oil borne preservative.

3.8 EXTERIOR CARPENTRY WORK

.1 Construct exterior work using stainless steel nails, screws or bolts. Bolts, nuts and washers shall be stainless steel.

.2 Plane all sides and backs; sand exposed faces and surfaces, round all edges to prevent checking of edges.

.3 Countersink bolts and washers, fill holes with matching wood plugs.

.4 Apply two liberal coats of clear surface applied wood preservative, allowing the first coat to soak in completely prior to applying second coat in accordance with manufacturers instructions.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.4 Waste Management: separate and divert waste materials from landfill in accordance with Section 01 11 10 – General Requirements: Construction Waste Management.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.10 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by rough carpentry installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 05 50 00 – Metal Fabrications.

.3 Section 06 10 10 – Rough Carpentry.

.4 Section 07 62 00 – Sheet Metal Flashing and Trim.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM D2394-05(2011), Standard Test Methods for Simulated Service Testing of Wood and Wood-Base Finish Flooring.

.2 ASTM F593-13a, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.3 ASTM F594-09e1, Standard Specification for Stainless Steel Nuts.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.2 CSA O86-09, Engineering Design in Wood, Includes Update No. 1 (2010), Update No. 2 (2011), Update No. 4 (2012).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit manufacturer's printed product literature, specifications, installation instructions, and data sheets in accordance with Section 01 11 10 – Project General Requirements: Submittal Procedures.

.2 Submit warranties.

.3 Submit engineered shop drawings in accordance with Section 01 11 10 – Project General Requirements: Submittal Procedures.

.1 Provide shop drawings signed and sealed by professional engineer registered in Province of Work responsible for design.

.2 Indicate details of construction, profiles, jointing, fastening, and other related details.

.3 Indicate materials, thicknesses, finishes, and hardware.

.4 Closeout Submittals: submit operations and maintenance data in accordance with in accordance with Section 01 11 10 – Project General Requirements: Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Comply with the requirements of Section 01 11 10 – Project General Requirements: Quality Control.

.2 Wood deck system shall be designed by a professional engineer licenced to practice in the Province of the Work.

.3 Manufacturer's qualifications: manufacturer shall have been established for a minimum of 20 years, manufacturing composite board products similar to those specified in this Section.

.4 Installer: shall be certified and approved in writing by the decking manufacturer for installation of their products.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – Project General Requirements: Common Product Requirements.

.2 Deliver, store, and handle materials in accordance with the manufacturer's guidelines.

.3 Protect materials from weather upon delivery to job site.

.4 Store materials on raised supports. Cover materials with waterproof covering. Provide adequate air circulation and ventilation.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – Project General Requirements: Waste Management and Disposal.

1.7 WARRANTIES

.1 Correct any deficiencies and labour or material found in the work performed for a period of 2 years from the date of Substantial Performance.

.2 Submit composite deck manufacturer's 20-year limited warranty.

Part 2 Products

2.1 MATERIALS

.1 Deck Boards: to CSA 0118.2, Eastern White Cedar, graded to meet NLGA Grading Standards and WRCLA, and as follows:

.1 Grade: WRCLA Custom Clear.

.2 Square edges, S4S.

.3 Texture: finely machined.

.4 Moisture Content: seasoned.

.2 Deck board thickness and width (nominal), to NLGA: 32 mm (1-¼ inch) thick x 152 mm (6-inch) wide, or as otherwise indicated on Drawings.

.3 Deck board length: 10% of quantity supplied shall be approximately 2 metres in length; 45% of quantity supplied shall be approximately 3 metres.

.4 Trim boards, balusters and miscellaneous lumber as required for a complete installation:

.1 Eastern White Cedar: solid wood lumber, graded to meet NLGA Grading Standards and WRCLA, S4S.

.2 Grade: WRCLA Custom Clear.

.3 Texture: finely machined.

.4 Moisture Content: seasoned.

.5 Edges: square.

2.2 ACCESSORIES

.1 Miscellaneous rough carpentry: Eastern White Cedar lumber, to Section 06 10 10 – Rough Carpentry.

.2 Adhesives: exterior grade, recommended by manufacturer.

.3 Fasteners, Connectors and Rough Hardware: Type 304 stainless steel, sized as required.

.1 Steel blind fastening system, as required to create a fastener-free deck surface.

.2 Steel splitless ring-shanked flooring nails.

.3 Screws, to ASTM F593: 2-¼" #7 trim head steel screws.

.4 Bolts, to ASTM F593.

.5 Nuts and Washers, to ASTM F594: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers, lengths as required.

.6 Carriage Bolts, to ASTM F593.

.7 Proprietary steel fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

.8 Steel joist hangers: minimum 1 mm thick sheet steel.

.9 Steel saddle posts: to create positive connection between piles and beams. Provide to other trades as required for embedment in concrete in accordance with Construction Schedule.

.10 Heavy-duty, commercial-quality, steel ties, hangers and connectors to provide positive connection between members, and capable of resisting wind and seismic forces.

.1 Provide manufacturer's specified fasteners, stainless steel.

.2 Gauges as required to withstand loads as calculated in accordance with National Building Code of Canada, 2010.

Part 3 Execution

3.1 COMPLIANCE

.1 Minimum Requirements: Part 9 of the National Building Code of Canada, 2010, and Amendments, and CSA O86-14, Engineering Design in Wood.

.2 Comply with the deck board manufacturer's printed installation instructions, technical datasheets, specifications and details.

.3 Deck, balustrades and railings shall be engineered, with shop drawings stamped and signed by a professional structural engineer licenced to practice in the province of Newfoundland and Labrador.

3.2 INSPECTION

.1 Verify condition and dimensions of previously installed work upon which this Section depends. Report defects to Departmental Representative. Commencement of Work means acceptance of existing conditions.

3.3 PREPARATION

.1 Obtain measurements from site.

.2 Protect finished surfaces and materials of other trades from damage.

3.4 PATTERN

.1 Multiple Span: Every piece shall bear on at least one support and every third piece shall bear on two supports. Stagger end joints at least 750 mm.

.2 Single and double spans: End joints shall be over support.

3.5 CONSTRUCTION

.1 Deck beams and joists and other rough carpentry: Eastern White Cedar, to Section 06 10 10 – Rough Carpentry; sizes as required and indicated.

.2 Cut and trim boards to suite design and layout, and to fit around other elements as required. Finish sand as required.

.3 Cut and trim balustrades, pickets, and trim board as required for a complete installation to meet design intent. Finish sand as required.

.4 Racking the Boards: Mix bundles, and mix shades, colors, and lengths, using the natural variety in the wood to create a random pattern. Lay out the boards in the order of planned installation.

.5 Fasten deck board to joists using stainless steel hidden fastener system. Where face-nailing is required, and to prevent splitting face-nailed boards, drill 1/16-inch (1.6 mm) diameter holes for the nails, 1-inch (2.54 cm) from edges. Space the holes so the nails hit a joist.

.6 Nail first board into place along side perimeter trim. Install deck boards level, square, true and parallel. Drill pilot holes where face-nailed, and drive nails at a 45-degree angle through wood (toe-nail decking in place), spaced at 12” centres.

.7 To keep the courses parallel, use steel spacer for aligning boards when nailing. Offset neighboring joints by 2 inches.

.8 Measure before cutting the last piece in each course, and cut with a power miter saw or a circular saw. Every six courses, stretch a string line to check for straightness.

.9 Cut casings at the bottom, using a scrap of flooring as a guide. To fit around other irregularities, scribe with a compass and cut with a saber saw.

.10 Measure and cut last course to fit. Allow space for expansion. Drill pilot holes and drive finishing nails through the face of the boards perimeter boards. Set the nails and fill with wood putty.

.11 Install trim and moulding to cover the expansion gap against building wall. Secure to wall, not floor. Nail threshold or transition strips in place where the edge of the floor is exposed.

.12 Double joists at butt joints to ensure adequate purchase of fasteners.

.13 Stagger butt joints for best overall appearance; confirm layout with Departmental Representative prior to cutting.

.14 Allow overhang and install trim as indicated.

.15 Finish materials on all sides and ends.

3.6 CLEANING

.1 Clean surfaces, free of dirt, dust, or stains.

.2 Repair any marks, scratches or marring.

.3 Remove and replace damaged, marked, or stained finish work.

.4 Remove construction debris and leave area clean, to Division 01 requirements.

3.7 MAINTENANCE

.1 Explain proper maintenance procedures to Owner or Owner's representative at project closeout.

.2 Inspect decking for loose fasteners and finish condition prior to Certificate of Substantial Performance and 2 months before end of 12-month warranty period. Re-apply coating as necessary.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications.

.2 Section 06 10 10 – Rough Carpentry.

.3 Section 06 15 00 – Wood Decking.

.4 Section 07 46 23 – Wood Siding.

.5 Section 09 91 00 – Painting.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI A208.1-2009, Particleboard.

.2 ANSI A208.2-2009, Medium Density Fibreboard (MDF) for Interior Applications.

.3 ANSI/HPVA HP-1-2009, Standard for Hardwood and Decorative Plywood.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emissions Rates from Wood Products Using a Large Chamber.

.2 ASTM F1667-13, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)

.1 Architectural Woodwork Standards (AWS), 1st Edition, 2009.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-11.3-M87, Hardboard.

.5 Canadian Plywood Association (CanPly)

.1 The Plywood Handbook 2005.

.6 Canadian Standards Association (CSA International)

.1 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.2 CSA O121-08, Douglas Fir Plywood.

.3 CAN/CSA O141-05 (R2009), Softwood Lumber.

.4 CSA O151-09, Canadian Softwood Plywood.

.5 CSA O153-M1980(R2008), Poplar Plywood.

.6 CSA Z760-94 (R2001), Life Cycle Assessment.

.7 National Hardwood Lumber Association (NHLA)

.1 Rules for the Measurement and Inspection of Hardwood and Cypress 1998.

.8 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2007.

.9 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC S104-10, Standard Method for Fire Tests of Door Assemblies.

.3 CAN/ULC S105-09, Standard Specification for Fire Door Frames, meeting the Performance Required by CAN4 S104.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.1 Indicate details of construction, profiles, jointing, fastening and other related details.

.2 Indicate materials, thicknesses, finishes and hardware.

.3 For structural elements, shop drawings shall be engineered, stamped and signed by professional engineer licenced in the province of Newfoundland and Labrador.

.2 Submit samples in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.1 Submit samples, 300 mm x 300 mm of each wood species to receive finish, to the Departmental Representative for review.

.2 Submit natural wood samples unfinished and finished for initial colour selection, and also for quality control.

.1 For finished samples, apply stain and topcoat as specified, and allow cure before submission.

.2 Confirm staining requirements with Departmental Representative prior to ordering materials.

.3 Submit 250 mm long samples of each type of trim, moulding and handrail.

.4 Reviewed samples shall become the standard for the work.

.3 Closeout Submittals:

.1 Provide operations and maintenance data in accordance with Section 01 11 10 – General Requirements: Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Wood paneling is permitted in the building as noted provided it has a thickness not greater than 25 mm, and a flame spread rating not greater than 150, to CAN/ULC S102.

.2 Architectural Woodwork Standards (AWS) published by the Architectural Woodwork Manufacturers Association of Canada, together with authorized additions and amendments will be used as a reference standard and shall form part of this project specification. Where differences occur between the drawings and specifications requirements and the AWS, the more restrictive requirement shall prevail.

.3 Any reference to Custom or Premium grade in this specification shall be as defined in the AWS.

.4 Any item not given a specific quality grade shall be Premium grade as defined in the AWS.

.5 A copy of the AWS shall be made readily available for reference purposes on the job site.

.6 References in this specification to part and item numbers mean those parts and items contained within the AWS.

.7 Materials and installation shall be in Metric measurements as specified.

1.5 DELIVERY, STORAGE AND HANDLING

.1 The Architectural Woodwork Manufacturer and the Contractor shall be jointly responsible to make certain that architectural woodwork is not delivered until the building and storage areas are sufficiently dry so that the architectural woodwork will not be damaged by excessive changes in moisture content.

.2 Architectural woodwork delivery, storage and handling shall be in accordance with Section 2 Care and Storage of the AWS.

.3 Delivered materials which are damaged in any way or do not comply with these specifications will be rejected by the Departmental Representative and shall be removed from the job site and replaced with acceptable materials.

1.6 PROJECT CONDITIONS

.1 Environmental Conditions: Comply with the AWS Section 2 – Care & Storage for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized.

1.7 COORDINATION

.1 Coordinate provision of concealed blocking or supports.

.2 Ensure that back-priming of finish carpentry surfaces concealed after installation, has been performed as specified in Section 09 91 00 – Painting, prior to installation.

Part 2 Products

2.1 CEDAR LUMBER

.1 Eastern White Cedar lumber: where cedar construction is indicated (cedar decking, balustrades, railings, treads, cedar dowels, etc.):

.1 Eastern White Cedar: solid wood lumber, graded to meet NLGA Grading Standards and WRCLA, S4S.

.2 Grade: WRCLA Custom Clear.

.3 Edges: square or circular (round log shape) as indicated; vertically placed posts shall have bevelled tops, 10 mm radius.

.4 Texture: finely machined.

.5 Moisture Content: seasoned.

.6 Sizes: as indicated or as otherwise required to meet design intent.

2.2 ACCESSORIES

.1 Fasteners: to suit size and nature of components being fastened.

.2 Nails and staples: to ASTM F1667; Type 304 stainless steel for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.

.3 Wood screws: stainless steel, type and size to suit application.

.4 Splines: wood.

.5 Adhesives: exterior grade, recommended by manufacturer.

2.3 SITE FABRICATION

.1 Fabricate items rigid, plumb and square, as detailed, with tight, bevelled, hairline joints. Sand work smooth, set all nails and screws.

.2 Countersink bolts and washers, fill holes with matching wood plugs.

.3 Fabricate handrails to provide butt and dowel joints.

.4 Fit shelves with hardwood edging.

2.4 WOOD FINISHES

.1 Finishes: refer to Section 07 46 23 – Wood Siding, item 2.2 Finishes.

Part 3 Execution

3.1 COMPLIANCE

.1 Minimum Requirements: Part 9 of the National Building Code of Canada, 2010, and Amendments, and CSA O86-14, Engineering Design in Wood.

.2 Structural framing and construction shall be engineered, with shop drawings stamped and signed by a professional structural engineer licenced to practice in the province of Newfoundland and Labrador.

3.2 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood products installation in accordance with manufacturer's written instructions.

.2 Visually inspect substrate in presence of Departmental Representative.

.3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.3 INSTALLATION

.1 Do finish carpentry to Premium Quality Standards of the AWS. Comply with Part 9 of the National Building Code 2010 and Amendments, and CSA O86-14, Engineering Design in Wood.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.3 Form joints to conceal shrinkage.

3.4 INSPECTION

.1 Contractor, Owner, and Departmental Representative to visit site at 80% completion and note state of Work and finishes in the various areas in which cabinet and millwork to be installed.

.2 Ensure surfaces are ready to receive Work. All surfaces of other Work to be finished and painted before being built-over or covered in any way or millwork installed.

3.5 CONSTRUCTION

.1 Fastening:

- .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
- .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
- .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
- .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

.2 Stairs: Install stairs and treads to location and details as indicated.

.3 Balustrades, handrails, and wall rails:

- .1 Install handrails, wall rails, and benches in locations indicated.
- .2 Make joints hair line, dowelled and glued.
- .3 Install support brackets as required.
- .4 Install brackets at ends and at minimum 400 mm on centre minimum at intermediate spacing.
- .5 Install metal backing plates between studs at bracket locations to ensure proper support for brackets and bolts or self-tapping screws.
- .6 Secure using counter sunk screws plugged with matching wood plugs; glue in place with exterior-grade waterproof adhesive.

.4 Site or Shop Fabricated Cedar Benches:

.1 To the extent possible, fabricate in shop.

.2 Construct and install benches as indicated.

.3 Make joints hair line, dowelled and glued.

.4 Butt and cope internal joints to make snug, tight, joint. Cut right angle joints with mitred joints.

.5 Secure using counter sunk screws plugged with matching wood plugs; glue in place with exterior-grade waterproof adhesive.

.6 Secure to structure using stainless steel bolts, screws, or nails, countersink and plug larger diameter bolt holes or fill screw or nail holes with matching wood filler. Sand to match adjacent texture and appearance.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by finish carpentry installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 07 26 16 – Under-Slab Vapour Retarder.

.3 Section 31 00 99 – Common Work Results for Earthworks.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM D1621-10, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

.2 ASTM D2842-12, Standard Test Method for Water Absorption of Rigid Cellular Plastics.

.2 Canadian Gas Association (CGA).

.1 CAN/CGA B149.1-10, Natural Gas and Propane Installation Code.

.2 CAN/CGA B149.2-10, Propane Storage and Handling Code.

.3 Underwriters Laboratories of Canada (ULC).

.1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC S604-M91, Standard for Factory Built Type A Chimneys.

.3 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.4 CAN/ULC S716.2-12, Standard for Exterior Insulation and Finish Systems (EIFS) – Installation.

1.3 PRE-INSTALLATION MEETINGS

.1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with contractor's representative and Departmental Representative in accordance with Section 01 11 10 – General Requirements: Construction Schedule to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building trades.

.4 Review manufacturer's installation instructions.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.3 Submit warranties.

1.5 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria, and physical requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Storage and Handling Requirements:

.1 Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

.2 Protect insulation as follows:

.1 Do not expose to sunlight, except to extent necessary for period of installation and concealment.

.2 Protect against ignition at all times. Do not deliver insulating materials to Project site before installation time.

.3 Complete installation and concealment of materials as rapidly as possible in each area of construction.

.4 Care for insulation in accordance with PIMA technical bulletin 109.

Part 2 Products

2.1 INSULATION

.1 Foundation and Under-Slab Insulation: commercial-grade, extruded polystyrene (XPS) to CAN/ULC S701 and as follows:

.1 Type: 4.

.2 Thermal Resistance: RSI 0.87/25 mm minimum.

.3 Edges: ship-lapped.

.4 Size: 610 mm x 2440 mm x thickness as indicated on Drawings.

.5 Compressive Strength: minimum 170 kPa at 10% deformation in accordance with ASTM D1621.

.6 Water Absorption: maximum 0.7% (% by volume) in conformance with ASTM D2842.

2.2 ACCESSORIES

.1 Protection Board: asphalt-impregnated fibreboard: 13 mm thickness.

.2 Adhesives: as recommended by board manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's printed installation instructions, data sheets, standard details, and specifications.

3.2 EXAMINATION

.1 Examine substrates and immediately inform Departmental Representative in writing of defects.

.2 Prior to commencement of work, ensure that substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.3 INSULATION – GENERAL

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation tight around protrusions.

.4 Use only insulation boards, free from chipped or broken edges, that are dry and unsoiled.

.5 Use largest possible dimensions to reduce number of joints.

.6 Do not cover insulation until it has been reviewed by Departmental Representative.

3.4 UNDERSLAB INSULATION

.1 Coordinate with other trades as required for a complete installation complying with Construction Schedule.

.2 Place 50 mm thick boards to fully insulate slabs-on-grade, and as follows:

.1 Lay boards on level compacted drainage layer, fitted tightly to ensure continuity of thermal barrier. Ensure full contact with aggregate base fill.

.2 Install under-slab vapour retarder to Section 07 26 16 requirements.

.3 Protect vapour retarder and insulation from damage during concrete work by installation of protection board on top; place without adhesive.

3.5 PERIMETER WING INSULATION

.1 Coordinate with other trades as required for a complete installation complying with Construction Schedule.

.2 Install 50 mm thick board wing insulation adjacent to foundations using shiplap insulation, extend out minimum 1.8 metres from foundation perimeter, and as follows:

.1 Excavate trench at perimeter of foundations of sufficient width and depth to install a 1.8 metre skirt of board insulation horizontally, with 2 percent slope to drain away from building.

.2 Place 100 mm compacted drainage layer of granular fill (refer to Division 31). Slope surface at 2 percent grade away from foundations.

.3 Place insulation fitted tightly to provide continuity of thermal barrier.

.4 Protect below grade insulation from damage during backfilling by applying protection board; set in adhesive according to insulation manufacturer's written instructions.

.5 Cover with 100% compacted gravel aggregate to Division 31 requirements, and cover aggregate with geotextile membrane to minimize soil migration into drainage layer.

.6 Backfill with minimum 100 mm of compacted topsoil for ballast and protection. Coordinate with Division 32 for topsoil requirements.

3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.4 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

.1 Repair damage to adjacent materials caused by Work of this Section.

.2 Protect installed board insulation from damage due to harmful weather exposures, physical abuse, and other causes.

.3 Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 10 – Rough Carpentry.

.2 Section 07 21 19 – Foamed Insulation.

.3 Section 07 46 23 – Wood Siding.

.4 Section 07 61 00 – Sheet Metal Roofing.

.5 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM C167-09, Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.

.2 ASTM C553-13, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.

.3 ASTM C665-12, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.4 ASTM C1320-10(2016), Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

.5 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.2 Canadian Gas Association (CGA)

.1 CAN/CSA B149.1-15, Natural Gas and Propane Installation Code, Includes Update No. 1 (2010).

.2 CAN/CGA B149.2-15, Propane Storage and Handling Code.

.3 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S102-11, Standard Method of Test For Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.3 CAN/ULC S604-04, Standard for Factory Built Type A Chimneys.

.4 CAN/ULC S702-14, Standard for Thermal Insulation Mineral Fibre for Buildings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for blanket insulation and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates:

.1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Test Reports:

.1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and 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:

.4 Store materials off ground and protect from weather as required; store in accordance with manufacturer's recommendations.

.5 Store and protect specified materials from damage and deterioration.

.6 Replace defective or damaged materials with new.

Part 2 Products

2.1 BLANKET INSULATION

.1 Fibrous Glass Acoustical Insulation for Fire and Smoke Rated Assemblies (sound batts): Unfaced preformed GreenGuard™ or formaldehyde-free binder fibrous insulation meeting the requirements of CAN/ULC S702; having maximum flame spread and smoke developed of 20/20 in accordance with CAN/ULC S102 and being non-combustible in accordance with CAN/ULC S114 and as follows:

.1 CAN/ULC S702 Type: 1.

.2 Width: to friction fit in stud or rafter spaces.

.3 Thickness: as required to fill cavity full depth.

.4 Nominal density: 40 kg/m^3.

.2 Fibrous Mineral Wool Insulation: Unfaced, preformed mineral slag fibrous insulation in accordance with CAN/ULC S702 and as follows:

.1 CAN/ULC S702 Type: 1

.2 Thermal Resistance: nominal RSI of 0.67/25 mm.

.3 Combustion Characteristics: non-combustible in accordance with CAN/ULC S114.

.4 Flamespread: less than 5 in accordance with CAN/ULC S102.

.5 Density: 32 kg/m^3.

.6 Width: to friction fit in stud or rafter spaces.

.7 Thickness: as required to fill cavity full depth.

2.2 ACCESSORIES

.1 Insulation clips:

.1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self-locking type.

.2 Nails: SAE Type 304 or 316 stainless steel, length to suit insulation plus 25 mm, to ASTM F1667.

.3 Staples: 12 mm minimum leg, SAE Type 304 or 316 stainless steel.

.4 Tape: as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's printed installation instructions, technical datasheets and details.

3.2 EXAMINATION

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

.2 Visually inspect substrate in presence of Departmental Representative.

.3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.3 PREPARATION

.1 Verify all in-wall and in-rafter construction is complete before beginning installation.

.2 Install insulation after building substrate materials are dry.

.3 Ensure substrate materials are properly installed and complete before beginning installation.

3.4 INSTALLATION

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces and to ASTM C1320.

.2 Install batts between framing members, structural components and other items snug and tight.

.3 Cut and trim batts neatly to fit spaces. Use batts free from ripped or damaged back and edges.

.4 Do not compress insulation to fit into spaces.

.5 Install batt insulation where indicated with continuous vapour retarder on the warm side of the insulation in accordance with ASTM C1320.

.6 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.7 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC S604 Type A chimneys and CAN/CGA B149.1 and CAN/CGA B149.2 Type B and L vents.

.8 Fill stud space of exterior framed walls with insulation full depth of stud only where no insulation/vapour retardant indicated on exterior face of stud walls.

.9 Hold insulation in position with clips, wires or as recommended by manufacturer when insulation is installed in horizontal locations.

.10 Do not enclose insulation until it has been reviewed by Departmental Representative.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 07 27 14 – Air and Vapour Barriers.

.3 Section 07 46 23 – Wood Siding.

.4 Section 07 61 00 – Sheet Metal Roofing.

.5 Section 08 11 13 – Metal Doors and Frames.

.6 Section 08 50 13 – Aluminum Windows.

.7 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

.1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA)

.2 Canadian Gas Association (CGA).

.1 CAN/CGA B149.1-10, Natural Gas and Propane Installation Code.

.2 CAN/CGA B149.2-10, Propane Storage and Handling Code.

.3 Green Seal Environmental Standards

.1 Standard GC-03-97, Anti-Corrosive Paints.

.2 Standard GS-11-10, Paints and Coatings.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.5 South Coast Air Quality Management District (SCAQMD), California State SCAQMD Rule 1113-06, Architectural Coatings.

.6 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

.2 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.3 CAN/ULC S604-M91, Standard for Factory Built Type A Chimneys.

.4 CAN/ULC S705.1-01-AM3, Amendment 3 to Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density,-Material –Specification, Includes Amendments 1,2.

.5 CAN/ULC S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for [polyurethane foam sprayed insulation] and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

.3 Test Reports:

.1 Submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.2 Submit test reports in accordance with CAN/ULC S101 for fire endurance and CAN/ULC S102 for surface burning characteristics.

.4 Manufacturer's Instructions:

.5 Submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and safe disposal procedures.

.6 Manufacturer's Reports:

.1 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

.1 Applicators (installers) to conform to CUFCA Quality Assurance Program.

.2 Qualifications:

.1 Installers: Use companies that are members and licensed CUFCA having trained and certified installers in accordance with CAN/ULC S705.2 and CUFCA requriements.

.2 Manufacturer: Obtain air and vapour seal materials from a single manufacturer regularly engaged in manufacturing the products specified in this Section.

.3 Cooperate and coordinate with the requirements of other units of work specified in other sections.

1.5 HEALTH AND SAFETY REQUIREMENTS: WORKER PROTECTION

.1 Protect workers as recommended by CAN/ULC S705.2 and manufacturer's recommendations:

.1 Workers must wear gloves, respirators/dust masks, long sleeved clothing, eye protection, protective clothing when applying foam insulation.

.2 Workers must not eat, drink, or smoke while applying foam insulation.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and 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 off ground and protected from the weather and temperature ranges that might compromise products, and in accordance with manufacturer's recommendations.

.2 Store and protect specified materials from damage or deterioration.

.3 Replace defective or damaged materials with new.

1.7 SITE CONDITIONS

.1 Ventilate area in accordance with Section 01 11 10 – General Requirements: Temporary Utilities.

.2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24-hour after application to maintain non-toxic, unpolluted, safe working conditions.

.3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.

.4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

.5 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

Part 2 Products

2.1 MATERIALS

.1 Insulation: One component rigid urethane foam to CAN/ULC S705.1 and with the following minimum physical properties and performance characteristics:

Density (ASTM D1622):	30.3 kg/m³
Compressive Strength (ASTM D1621):	57.5 kPa
Compressive Modulus (10% deflection):	848 kPa
Tensile Strength (ASTM D1623):	133.5 kPa
Flatwise Shear (ASTM C273):	58.5 kPa
Thermal Resistance:	1.41 RSI/25 mm thickness
Water Absorption (ASTM D2842):	3.0 kg/H20/m²
Water Vapour Transmission (ASTM E96):	2.327 perms

.2 Primers: in accordance with manufacturer's recommendations for surface conditions.

.3 Thermal Barrier: spray-applied, fire-retardant overcoat meeting applicable requirements of the National Building Code of Canada, 2010 for thermal barrier of foamed plastic.

Part 3 Execution

3.1 COMPLIANCE

.1 Apply insulation to clean surfaces in accordance with CAN/ULC S705.2, and manufacturer's printed installation instructions, data sheets, standard details and specifications.

.2 Apply primers as required per manufacturer’s foamed application instructions to suit conditions and substrates.

.3 Apply thermal barrier as required by National Building Code of Canada, 2010 and authorities having jurisdiction.

.4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC S604 type A chimneys and CAN/CGA B149.1 and CAN/CGA B149.2 type B and L vents.

3.2 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sprayed insulation application 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.

3.3 SURFACE PREPARATION

.1 Clean spaces that are to receive insulation, of dirt, dust, grease, loose material or other foreign matter that may inhibit adhesion.

.2 Provide sufficient ventilation during and until insulation has cured, to ensure safe working conditions. Introduce fresh air and exhaust air continuously during the 24-hour period after application.

.3 Protect adjacent surfaces from overspray and dusting.

.4 Prior to application, slightly moisten surfaces to which foamed insulation is being applied to accelerate curing.

.5 Temporarily brace frames as may be required to prevent possible bowing of frames due to over expansion of the foamed insulation.

3.4 APPLICATION – GENERAL

.1 Apply insulation to clean surfaces in accordance with CAN/ULC S705.2 and manufacturer's printed instructions.

.2 Use primer where recommended by manufacturer.

.3 Install thermal barrier as required by National Building Code of Canada and authority having jurisdiction.

3.5 HOLLOW METAL DOORFRAMES

.1 Fill exterior hollow steel doorframes 75% full with foamed insulation prior to installation of frames. Fill the remainder of the frame after installation, through the gap between the frame and the wall construction.

3.6 EXTERIOR GLAZED ALUMINUM WINDOWS

.1 Install foamed insulation around all exterior glazed aluminum framing systems and exterior sectional doors to maintain continuity of air seal and thermal barrier, after the air and vapour barrier membrane has been installed per Section 07 27 14 – Air and Vapour Barriers.

.2 Ensure that foam completely fills spaces, without voids or folding, and that foam is continuous at corners.

3.7 PROTRUSIONS THROUGH AIR BARRIER AND VAPOUR RETARDER

.1 Install foamed insulation around protrusions through the exterior building enclosure to achieve and maintain continuity of air seal and thermal insulation performance.

3.8 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.4 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 07 21 13 – Board Insulation.

.3 Section 31 00 99 – Common Work Results for Earthworks.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM E96/E96M-10, Standard Test Methods for Water Vapor Transmission of Materials.

.2 ASTM E154-08a, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

.3 ASTM F1249-06, Standard Test Method for Water Vapour Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

.4 ASTM E1643-10, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

.5 ASTM E1745-09, Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

.6 ASTM E2178-03, Standard Test Method for Air Permeance of Building Materials.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-51.34-M86 AMEND., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit the following in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for vapour retarders and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

.3 Certificates:

.1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 QUALITY ASSURANCE

.1 Comply with the requirements of Section 01 11 00 – General Requirements: Quality Control.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements and 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 Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

.4 Storage and Handling Requirements:

.1 Store materials off ground, in dry location, and in accordance with manufacturer's recommendations.

.2 Store and protect specified materials from damage and deterioration.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIAL

.1 Performance Criteria: under-slab vapour retarder membrane, when tested according to all requirements of ASTM E1745, Class A, minimum 0.38 mm thick (15 mils), and shall meet or exceed the following performance criteria:

.1 Maximum Water Vapour Permeance (to ASTM E154 Sections 7, 8, 11, 12, 13, by ASTM E96, Method B or to ASTM F1249):

.1 As received: ≤ 0.0063 perms.

.2 After Wetting and Drying: ≤ 0.0052 perms.

.3 Resistance to Plastic Flow and Temperature: ≤ 0.0057 perms.

.4 Effect Low Temperature and Flexibility: ≤ 0.0052 perms

.5 Resistance to Deterioration from Organisms and Substances in Contacting Soil: ≤ 0.0052 perms.

.2 Puncture Resistance (ASTM D1709): > 3,200 grams.

.3 Tensile Strength ASTM E154, Section 9: ≥ 72 Lb. Force/Inch

2.2 ACCESSORIES

.1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.

.2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer, and to Section 07 92 00 - Joint Sealants.

.3 Protection Board: asphalt-impregnated fibreboard: 13 mm thickness.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's printed installation instructions, standard details, and data sheets.

3.2 EXAMINATION

.1 Examine substrates and immediately inform Departmental Representative in writing of defects.

.2 Prior to commencement of work, ensure that substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.3 INSTALLATION: UNDER-SLAB SHEET VAPOUR BARRIER

.1 Prepare surfaces in accordance with the manufacturer's printed instructions. Ensure granular base and subbase is compacted as required, and specified by membrane manufacturer and structural drawings.

.2 Install Vapour Retarder.

.3 Continuous Vapour Retarder shall be installed around underground ducts in accordance with the Sheet Metal and Air Conditioning Contractors' National Association's (SMACNA) construction standards. Coordinate Work with other trades.

.4 Installation shall be in accordance with the manufacturer's printed instructions, data sheets, and the requirements of ASTM E1643.

.5 Unroll the Vapour Retarder with the longest dimension parallel with the direction of the pour.

.6 Lap the Vapour Retarder over footings and seal to foundation walls.

.7 Overlap joints 152 mm and seal with the manufacturer's seam tape.

.8 Seal all penetrations (including pipes) with the manufacturer's pipe boots; apply mastics and seals as required to ensure continuity of seal.

.9 No penetration of the Vapour Retarder will be allowed, except for permanent utilities, unless approved in writing by Departmental Representative. Seal all penetrations as recommended by the manufacturer.

.10 Repair damaged areas by cutting patches of Vapour Retarder, overlapping the damaged area 152 mm, and taping all four sides with tape.

.11 Install protection board over vapour retarder.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – Project General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – Project General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – Project General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION OF FINISHED WORK

.1 Protect finished work from damage.

.2 Complete concrete work within 28-days of installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 07 21 29 – Foamed Insulation.

.2 Section 07 46 23 – Wood Siding.

.3 Section 07 61 00 – Sheet Metal Roofing.

.4 Section 07 62 00 – Sheet Metal Flashing and Trim.

.5 Section 07 92 00 – Joint Sealants.

.6 Section 08 11 13 – Metal Doors and Frames.

.7 Section 08 50 13 – Aluminum Windows.

.8 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM D93-12, Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester.

.2 ASTM E96/E96M-10, Standard Test Methods for Water Vapor Transmission of Materials.

.3 ASTM D146/D146M-04 (2012) e1, Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing.

.4 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.

.5 ASTM D882-12, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

.6 ASTM D903-98(2010), Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.

.7 ASTM D1709-09, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.

.8 ASTM D1970/D1970M-11, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

.9 ASTM D2103-10, Standard Specification for Polyethylene Film and Sheeting.

.10 ASTM D2261-13, Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine).

.11 ASTM D2582-09, Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.

.12 ASTM D4533-11, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

.13 ASTM D4541-09e1, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

.14 ASTM D7234-12, Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

.15 ASTM E96/E96M-13, Standard Test Methods for Water Vapor Transmission of Materials.

.16 ASTM E283-04 (2012), Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

.17 ASTM E1643-11, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

.18 ASTM E2112 - 07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.

.19 ASTM E2178-11, Standard Test Method for Air Permeance of Building Materials.

.20 ASTM E2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 37-GP-56M AMEND., Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

.2 CAN/CGSB-51.34-M86 AMEND., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.3 DEFINITIONS

.1 Air Barrier: Air Barriers are systems of materials designed and constructed to control airflow between conditioned and unconditioned spaces.

.2 Air / Vapour Barrier: Systems of materials exhibiting both low air leakage (airtight) and low Vapour Permeance (vapour impermeable) levels, and functioning as a combined Air Barrier and Vapour Retarder.

.3 Enclosure: The enclosure is the boundary or barrier separating the interior of a building from the outside environment; it separates conditioned from unconditioned space.

.4 Vapour Permeance: The moisture transmission rate of a material is referred to as its ‘permeability’. This number is not dependent on the material’s thickness. Its ‘permeance’, however, is dependent on thickness much like the R-value in heat transmission. Dividing the ‘permeability’ of a material by its thickness gives the material’s ‘permeance’.

.5 Vapour Permeance Classes:

.1 Vapour impermeable: 5.72 ng/Pa·s·m^2 or less.

.2 Vapour semi-impermeable: 57.21 ng/Pa·s·m^2 or less, and greater than 5.72 ng/Pa·s·m^2.

.3 Vapour semi-permeable: 572.14 ng/Pa·s·m^2 or less, and greater than 57.21 ng/Pa·s·m^2.

.4 Vapour permeable: Greater than 572.14 ng/Pa·s·m^2.

.6 Vapour Retarder (vapour diffusion retarder): The element that is designed and installed in an assembly to retard the movement of water by vapour diffusion.

1.4 SYSTEM DESCRIPTION

.1 Minimum Air Barrier Performance:

.1 The building envelope shall be constructed with a continuous Air Barrier system to control air leakage into, or out of, the conditioned space. An Air Barrier system shall also be provided for interior partitions between the conditioned space and a space designed to maintain temperature or humidity levels that differ from those in the conditioned space by more than 50% of the difference between the conditioned space and the design ambient conditions.

.2 The installed Air Barrier system shall meet the following minimum requirements:

.1 Airtight: The installed Air Barrier system shall not exceed the following maximum air leakage rates:

.1 Air Barrier materials in accordance with ASTM 2178: 0.020 L/(m^2·s) @ 75Pa ΔP (0.072 m^3/m^2·h).

.2 Assemblies comprising the Enclosure in accordance with ASTM E283: 0.200 L/(m^2os) @ 75Pa ΔP (0.720 m3/m^2·h).

.3 Enclosures in accordance with ASTM E779, CAN/CGSB-149.10 or CAN/CGSB 149.15: 2.000 L/(m^2·s) @ 75 Pa ΔP (7.200 m^3/m^2·h).

.2 Continuity: The Air Barrier system shall be continuous across construction, control and expansion joints, across junctions between different building assemblies, and around penetrations through the building assembly.

.1 The Air Barrier system shall be continuous at the following connections:

.1 Roof / wall connections, wall / foundation connections, wall / window connections, wall / door connections, soffit connections, corner details, and connections between different exterior wall systems.

.2 Connect the roof waterproofing membrane system to the Air Barrier at the walls.

.3 Structural integrity: The Air Barrier system shall resist peak wind loads, stack pressure effects, or sustained pressurization loads without exhibiting signs of detachment, rupturing, or creep load failure.

.1 The Air Barrier shall be able to resist a minimum air pressure difference of ± 2.0 kPa without tearing, rupturing or breaking away from its fastening.

.4 Durability: The Air Barrier system must be able to perform its intended function, be compatible with adjoining materials, and resistant to the mechanisms of deterioration that can be reasonably expected given the nature, function and exposure of the materials, over the life of the building envelope.

.5 Compatibility: The physical characteristics, chemical properties, and application methods of the building materials that comprise the Air Barrier system shall be compatible.

.2 Minimum Vapour Retarder Performance:

.1 The Vapour Retarder shall retard the passage of moisture as it diffuses through the assembly of materials of the Enclosure and shall meet or exceed the requirements of CAN/CGSB-51.33, Type 1.

.2 At above-grade walls, provide a combined Air / Vapour Barrier system at the warm side of the insulation. Both insulation and Air / Vapour Barrier shall be installed in full contact with each other at the exterior of the structure.

.3 Combinations of vapour semi-impermeable or vapour impermeable membranes, films, sheets or wall coverings shall not be installed on both sides (interior and exterior facings) of an Enclosure, in order to facilitate drying in at least one direction.

.4 Vinyl wall coverings, polyethylene vapour barriers, foil-faced batt insulation or reflective radiant barrier foil insulation shall not be installed on the interior of Enclosures.

.5 The performance of the Air / Vapour Barrier shall meet or exceed the requirements of CAN/CGSB-51.33, Type 1, except that the water Vapour Permeance shall be 5.72 $ng/Pa \cdot s \cdot m^2$ or less, before and after aging.

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Select products to be compatible with adjoining membranes previously installed under related Sections

.2 Select products from a single manufacturer, or products that are compatible from different manufacturers.

.3 Coordination between all installers of each component of vapour and air retarder system is essential to ensure continuity of system and that junctions between the various components are effectively sealed.

.4 Verify with manufacturers and all tradesmen involved with installation procedures of building products incorporated into air barrier elements including, but not limited to, various membranes, coating and sealants as well as continuity with roofing membrane.

.2 Pre-installation Meeting:

.1 Convene one week before commencing Work of this Section.

.2 Arrange for manufacturer’s factory-trained agent to be on site at beginning of installation to provide training and supervision of personnel who will install membrane. Agent shall also provide frequent inspection visits thereafter to assure quality and competence of membrane installations.

.3 Sequencing:

.1 Sequence work in accordance with Construction Progress Schedule.

.2 Sequence work to permit installation of materials in conjunction with related materials and seals.

.3 Overlap (shingle) materials to direct water down and away from the structure.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:

.1 Submit manufacturer's printed product literature, specifications, and datasheets, and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Submit statement from manufacturer(s), indicating products supplied under this Section are compatible with one another and with products previously installed under the work of related Sections.

.2 Submit shop drawings of joint conditions and how transitions are being addressed.

.3 Submit samples in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:

.1 Provide duplicate 200 mm x 200 mm samples of membrane adhered to all project substrates, including adjoining membranes specified in other Sections.

.4 Quality Assurance Submittals: submit following in accordance with Section 01 11 10 – General Requirements: Quality Control.

.1 Existing Substrate Condition: report deviations, as described in PART 3 - EXAMINATION in writing to Departmental Representative.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.

.4 Manufacturer's Field Reports: submit manufacturer's written reports within 3-days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.7 QUALITY ASSURANCE

.1 Qualifications:

.1 Applicator: company specializing in performing work of this section with minimum 3-years documented experience with installation of air/vapour barrier systems.

.1 Completed installation must be approved by the material manufacturer.

.2 Applicator: company:

.1 Currently licensed by National Air Barrier Association certifying organization.

.2 Must maintain their license throughout the duration of the project.

.2 Mock-Up:

.1 Construct mock-up in accordance with Section 01 11 10 – General Requirements: Quality Control.

.2 Construct typical exterior wall panel, 3 m long by 4 m wide, incorporating window and frame and sill, insulation, building corner condition, and junction with roof system; illustrating materials interface and seals.

.3 Locate where directed.

.4 Mock-up may remain as part of finished work.

.5 Allow 24-hours for review of mock-up by Departmental Representative before proceeding with air/vapour barrier Work. Accepted mock-up will demonstrate minimum standard of quality required for this project.

.3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.

.1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.

.2 Once during progress of Work at 60% complete.

.3 Upon completion of Work, after cleaning is carried out.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and divert waste materials from landfill in accordance with Section 01 11 10 – General Requirements: Construction Waste Management.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.10 AMBIENT CONDITIONS

.1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.

.2 Ventilate enclosed spaces in accordance with Section 01 11 10 – General Requirements: Temporary Utilities.

.3 Maintain temperature and humidity recommended by materials manufacturer before, during and after installation.

1.11 SEQUENCING

.1 Sequence work in accordance with Section 01 11 10 – General Requirements: Construction Schedule.

.2 Sequence work to permit installation of materials in conjunction with related materials and seals.

1.12 WARRANTY

.1 For sealant and sheet materials the 12-month warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to 24 months.

Part 2 Products

2.1 AIR BARRIER: EXTERIOR APPLICATION

.1 Air Barrier (a.k.a., ‘Weather Barrier’): vapour-permeable (breathable), water-resistive air barrier, with the following minimum physical properties and performance characteristics:

- .1 Application temperature: to -7 degrees C.
- .2 Service temperature: +80 degrees C to -40 degrees C.
- .3 Air permeance, to ASTM E2178, maximum 0.02 l/m^2 @ 75 Pa: pass.
- .4 Water vapour transmission, to ASTM E96 Method A: ≤ 235 g/m^2 – 24 hrs
- .5 Water vapour permeance, to ASTM E96 Method A: ≤ 1915 ng/Pa•m^2•s.
- .6 Acceptance criteria for water-resistive barriers, to ICC-ES AC38: pass.
- .7 Average Dry Breaking Force, to ASTM D5034:
  - .1 MD: ≥ 245 N
  - .2 CD: ≥ 214 N.
- .8 Accelerated aging, to ICC-ES AC48, 25 cycles: pass.
- .9 Cycling and elongation, to ICC-ES AC48, 100 cycles at -29°C: pass
- .10 Thickness, to TAPPI T-410: 19 mils (.5 mm).
- .11 Class A for flame spread and smoke developed.
- .12 Low temperature flexibility, to ICC-ES AC38/3.3.4: pass.
- .13 Nail sealability, to ASTM D1970, modified: pass.

.2 Primer: provide primer as supplied by membrane manufacturer.

2.2 VAPOUR RETARDER: INTERIOR APPLICATION

.1 Vapour Retarder: polyimide film vapour retarder for use with unfaced, vapor-permeable glass fiber and mineral wool insulation in wall and ceiling cavities, meeting or exceeding the following minimum requirements:

- .1 Water Vapour Permeance, to ASTM E86:
  - .1 Dry cup method: 1.0 perms (57 ng/Pa•s•m^2).
  - .2 Wet cup method: 10.0 perms (1144 ng/Pa•s•m^2).
- .2 Class A for flame spread and smoke developed.

2.3 UNDER-SLAB VAPOUR RETARDER

.1 Under-slab vapour retarder: refer to Section 07 26 16 – Under-Slab Vapour Retarder.

2.4 FOAMED INSULATION

.1 Foamed Insulation (air seal material): to Section 07 21 29 – Foamed Insulation.

2.5 ROOF UNDERLAYMENT AND VAPOUR RETARDER

.1 Roof underlayment and vapour retarder membrane: refer to Section 07 61 00 – Sheet Metal Roofing.

2.6 ACCESSORIES

.1 Accessories: supply manufacturer's recommended seam tape, sealants, adhesives, prefabricated sill pan flashings, termination mastics, pre-punched termination bars, and other accessories as required for a complete installation, and as required to maintain continuity of air barrier and vapour retarder performance.

.2 Moulded box vapour retarder: factory-moulded polyethylene box, purpose-made for use with recessed electric switch and outlet device boxes.

.3 Fasteners: supply stainless steel screws, plastic clips and other fasteners as recommended by manufacturer required for complete installation of work.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturers’ printed installation instructions, typical details, and data sheets.

3.2 GENERAL

.1 Joint Sealants and Caulking: Perform Work in accordance with Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification requirements for materials and installation.

.2 Air Barriers: Perform Work in accordance with National Air Barrier Association - Professional Contractor Quality Assurance Program and requirements for materials and installation.

.3 Foamed Insulation: Perform Work in accordance with Canadian Urethane Foam Contractor's Association - Professional Contractor Quality Assurance Program and requirements for materials and installation.

3.3 COORDINATION

.1 Coordinate with other trades as required to ensure continuity of air barrier and vapour retarder performance at entire enclosure perimeter. Tie-in to adjacent systems as required, and seal transitions.

3.4 EXAMINATION

.1 Verify that surfaces and conditions are ready to accept work of this section.

.2 Ensure surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.

.3 Report unsatisfactory conditions to Departmental Representative in writing.

.4 Do not start work until deficiencies have been corrected.

.1 Beginning of Work implies acceptance of conditions.

3.5 PREPARATION

.1 Remove loose or foreign matter, which might impair adhesion of materials.

.2 Ensure substrates are clean of oil or excess dust; masonry joints struck flush, and open joints filled; and concrete surfaces free of large voids, spalled areas or sharp protrusions.

.3 Ensure substrates are free of surface moisture prior to application of membrane and primer.

.4 Ensure metal closures are free of sharp edges and burrs.

.5 Prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions.

3.6 EXTERIOR AIR BARRIER

.1 Surface shall be clean, dry, smooth and ready to accept air barrier application.

.2 Apply adhesive primer by lamb’s wool roller, brush or spry at the appropriate rate depending on porosity and texture of surface. Allow to dry as required. Do not primer more surface than can receive the weather barrier in one day.

.3 Install in a consecutive weatherboard method starting at the bottom or base of wall and working up. Provide a minimum of 50 mm side laps and 80 mm of end laps. Cut to manageable lengths, position membrane for alignment, remove protective poly-film, and firmly apply pressure with a roller to assure adhesion.

.4 Eliminate fishmouths, wrinkles or gaps, and roll entire membrane surface, including seams, with a counter top or J-roller with adequate pressure to ensure full contact and adhesion.

.5 Seal membrane terminations, heads of mechanical fasteners, around penetrations, ductwork, electrical and other apparatus extending through membrane. Seal around the perimeter edge of membrane terminations at window and door frames.

.6 Cover rough openings and transitions. Flash fenestrations (window and door openings) in accordance with window and door manufacturer’s printed installation instructions and data sheets, National Building Code of Canada requirements, and ASTM 2112 and AAMA guidelines. Use manufacturer’s prefabricated sill pan flashings at windows.

3.7 INTERIOR VAPOUR RETARDER

.1 Verify that services are installed and have been accepted by the Departmental Representative and authority having jurisdiction prior to installation of vapour barrier.

.2 Install sheet vapour barrier on warm side of exterior wall and ceiling assemblies prior to installation of gypsum board to form continuous retarder in accordance with manufacturer’s written instructions.

.3 Use sheets of largest practical size to minimize joints.

.4 Install materials in a manner that maintains continuity; repair punctures and tears with sealing tape before work is concealed.

.5 Openings:

.1 Cut sheet vapour barrier to form openings and lap and seal to window and door frames in accordance with good building envelope practice.

.6 Seal perimeter of sheet vapour retarder as follows:

.1 Apply continuous bead of sealant to substrate at perimeter of sheets.

.2 Lap sheet over sealant and press into sealant bead.

.3 Adhere sheets using sealant bead at each steel framing member and at top and bottom tracks.

.4 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.

.7 Seal lap joints of sheet vapour retarder as follows:

.1 Attach first sheet to substrate.

.2 Apply continuous bead of sealant over solid backing at joint.

.3 Lap adjoining sheet minimum 150 mm and press into sealant bead.

.4 Adhere sheets using sealant bead at each steel framing member and at top and bottom tracks.

.5 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.

.8 Seal electrical switch and outlet device boxes that penetrate vapour retarder as follows:

.1 Install moulded box vapour retarder:

.2 Apply sealant to seal edges of flange to main vapour retarder and seal wiring penetrations through box cover.

3.8 FOAMED INSULATION

.1 Install foamed insulation as required at penetrations and gaps to maintain continuity of air barrier seal.

3.9 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

.2 The Departmental Representative shall inspect installed membrane for continuity of air barrier prior to placement of insulation.

3.10 CLEANING

.1 Proceed in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.11 PROTECTION OF WORK

.1 Protect finished work from penetrations.

.2 Do not permit adjacent work to damage work of this section.

.3 Ensure finished work is protected from climatic conditions.

.4 Repair to manufacturer's written instructions.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 10 – Rough Carpentry.

.2 Section 07 27 14 – Air and Vapour Barriers.

.3 Section 07 62 00 – Sheet Metal Flashing and Trim.

.4 Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM D5116-10, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.

.2 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.2 Canadian Standards Association (CSA International)

.1 CSA O118.2-08 (R2013), Eastern White Cedar Shingles.

.2 CAN/CSA O141-05 (R2009), Softwood Lumber.

.3 Environmental Choice Program (ECP)

.1 CCD-045-95, Sealants and Caulking Compounds.

.4 Maritime Lumber Bureau (MLB)

.5 National Lumber Grades Authority (NLGA)

.1 NLGA Standard Grading Rules for Canadian Lumber 2003.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section, with Contractor, Agency, installer, manufacturer’s representative in accordance with Section 01 11 10 – General Requirements: Project Meetings to:

.1 Verify project requirements.

.2 Review structural load limitations.

.3 Coordination with other building trades.

.4 Review manufacturer's installation instructions.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wood siding and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 00 – General Requirements: Health and Safety Requirements. Indicate VOC's for caulking materials during application and curing.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.

.4 Submit samples in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.1 Unfinished samples: Submit duplicate of each type of siding and trim in specified width, 600 mm long, in dry condition.

.2 Finished samples for initial selection of colours and finishing processes: Submit duplicate of each type of siding and trim, finished, in specified width, 600 mm long, in dry condition.

.3 Submit duplicate samples of caulking for initial selection of colours.

.5 Manufacturer's Instructions: Provide to indicate special handling criteria and installation sequence.

.6 Submit closeout data in accordance with Section 01 11 10 – General Requirements: Closeout Submittals.

.1 Provide manufacturer’s printed recommendations for general maintenance, including cleaning instructions.

.2 Submit manufacturer’s warranties as specified.

1.5 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.6 MOCK-UPS

.1 Construct mock-ups in accordance with Section 01 11 10 – General Requirements: Quality Control.

.2 Construct typical exterior wall panel, 3 m long by 4 m wide, incorporating window openings with frame and sill installed, cladding, insulation, building corner condition, junction with roof system; illustrating materials interface and seals.

.3 Locate where directed.

.4 Mock-up may remain as part of Work.

.5 Allow 48 hours for review of mock-up by Departmental Representative before proceeding with work.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and 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 off ground, in dry location, and in accordance with manufacturer's recommendations i.

.2 Store and protect wood siding assembly materials from damage or deterioration.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 EASTERN WHITE CEDAR SIDING

.1 Eastern White Cedar: kiln-dried, solid wood siding, to CSA O118.2-08 (R2013), Eastern White Cedar Shingles.

.1 Pattern: tongue and groove board siding.

.2 Grade: #1 Grade, to Maritime Lumber Bureau standards.

.3 Tongue & Groove edges, jointed as indicated, S4S.

.4 Texture: rough sawn, circular blade pattern.

.5 Moisture Content: kiln dried (seasoned) to 10-12% moisture content; confirm moisture content, and provide testing results to Departmental Representative prior to installation.

.6 Board size (nominal): 1” x 4” (25.4 mm x 101.6 mm).

.7 Standard board length: 8’ (2.44 m).

.2 Trim, closures, cap pieces and other lumber as required for a complete installation:

.1 Eastern White Cedar, to CSA 0141, East White Cedar (N), kiln dried (seasoned) to 10-12% moisture content, #1 Grade, to Maritime Lumber Bureau standards. Confirm moisture content and provide testing results to Departmental Representative prior to application.

.2 Surface: surfaced one side and two edges (S1S2E).

.3 Texture: smooth.

2.2 FINISHES

.1 Apply 2-coats of 100% acrylic waterproof coating (full coverage of all surfaces).

.2 Coat cut ends, planed edges and bare wood: apply 3-coats of stain, supplied and recommended by stain manufacturer.

.3 Colour: as selected by Departmental Representative from manufacturer’s full range; refer to Drawings for additional information.

.4 If natural weathered appearance is selected, stain treatment shall be applied at mill, incorporating PPG/Olympic Weathering Stain, Bleaching Oil, and Enviro Bleach as required to achieve a weathered appearance, having a uniform look, stability and protection for the wood. Manufacturer’s Warranty: 25 years, against cracking, flaking and peeling shall apply.

2.3 ACCESSORIES

.1 Air and Vapour Barrier: to Section 07 27 13 – Air and Vapour Barriers.

.2 Strapping: kiln dried, pressure-treated Douglas Fir lumber: to Section 06 10 10 – Rough Carpentry. Sizes as required.

.3 Fasteners: to ASTM F1667, SAE No. 316 stainless steel, sized as required.

.1 Stainless steel fasteners, suitable for fastening strapping to solid wood backing.

.2 Siding installation: stainless steel splitless ring-shanked nails with flat head. Splitless nails shall be minimum 7/32'' (0.6 cm) head.

.4 Sealants: to Section 07 92 00 – Joint Sealants.

.5 Sheet Metal Flashing and Trim: to Section 07 62 00 – Sheet Metal Flashing and Trim.

Part 3 Execution

3.1 COMPLIANCE

.1 General: comply with Part 9 - Housing and Small Buildings of the 2010 National Building Code of Canada.

.2 Comply with manufacturers' printed installation instructions, technical datasheets, and standard and job-specific details for each product and assembly specified.

3.2 EXAMINATION

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

.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.

3.3 PREPARATION

.1 Sheet Metal Flashing and Trim: to Section 07 62 00.

.2 Air Barrier: to Section 07 27 13 – Air and Vapour Barriers.

.3 Before installing siding, make sure that flashings are installed to prevent moisture from entering wall and roof spaces. Flashings shall be installed in a manner that intercepts and directs the flow of water away from the building to designed drainage paths. Install horizontal flashing extending from the top of all wall penetrations (e.g., all windows and doors) and at any material or material directional change (e.g., skirtboards, water tables or the introduction of any alternative material). Flashings shall be installed to tilt downward to allow water to drain away from the wall. Siding or trim shall terminate evenly ¼ inch (6 mm) above the flashing ledge. Do not caulk where the flashing and trim or other materials meet. Note that caulking in lieu of flashing is not acceptable.

.4 Install sill flashing, starter and trim strips, skirtboards, inside corner flashing, edging, and flashing over openings.

.5 Install air barrier.

.6 Install blocking or furring, nail through sheathing to studs, penetrating solid wood at least 1-1/4 inches. Install to provide periodic gaps to permit drainage to exterior.

3.4 VERTICAL SIDING INSTALLATION

.1 Discard materials that are warped, twisted, bowed, crooked or otherwise defective.

.2 Fasten wood tongue and groove boards in straight, aligned lengths to blocking or furring at 400 mm on centre maximum, or as otherwise indicated on engineered, stamped and signed shop drawings, using two nails at each fixing location. Intermediate butt joints are not permitted.

.3 Field joints:

.1 Stagger butt joints not less than 800 mm and distribute evenly over wall faces.

.2 When butt jointing siding, cut ends at 45 degree angles to form an overlapping joint; slope to outside for vertical installation. Ensure joints meet on studs, blocking or furring, with nails penetrating solid wood at least 1-1/4 inches.

.4 Start at one corner, and use a level or plumb line to ensure that the first board is installed plumb. Trim grooved edge of first board for flush fit as required. Nail siding to horizontal blocking lines installed between studs or to furring strips.

.5 Blind-nail to solid wood backing; toe-nailed through base of each tongue, one siding nail per bearing; fasteners shall penetrate 1-1/4” (32 mm) into solid wood.

.6 Fasteners shall not be counter sunk into material; set air pressure accordingly if using air tools.

.7 Corner treatment:

.1 Inside corners: butt siding against 2” x 2” (50 mm x 50 mm) trim strip, fitted tight.

.2 Outside corners: mitred.

.8 Siding, trim and skirtboards shall be installed to leave 200 mm clearance above-grade.

3.5 MOULDING, FASCIA, AND TRIM INSTALLATION

.1 Installation standard: to Architectural Woodwork Standards (AWS), Premium Grade.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.3 Form joints to conceal shrinkage.

.4 Fastening:

.1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.

.2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.

.3 Blind-nail to solid wood backing; fasteners shall penetrate 1-1/4” (32 mm) into backing.

.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

3.6 CAULKING

.1 Seal gaps at windows, doors, corners, and other exterior joints that are exposed to potential water intrusion, to Section 07 92 00 – Joint Sealants, Type S-5: premium quality multi-component polyurethane sealant, colour to match expected weathered appearance of siding as closely as possible (submit samples to Departmental Representative for initial colour selections before ordering materials). Different colours will be required at white cedar and red cedar locations.

3.7 MAINTENANCE

.1 Explain proper maintenance procedures to Departmental Representative’s maintenance personnel at project closeout.

.2 Visually inspect siding, caulking, flashing annually for overall condition. Reapply failed caulking as necessary. Adjust flashing as required.

.3 The use of pressure washers not permitted.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 - General Requirements: Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 - General Requirements: Cleaning.

.4 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 - General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by wood siding installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications.

.2 Section 06 10 10 – Rough Carpentry.

.3 Section 07 21 16 – Blanket Insulation.

.4 Section 07 21 19 – Foamed Insulation.

.5 Section 07 27 14 – Air and Vapour Barriers.

.6 Section 07 62 00 – Sheet Metal Flashing and Trim.

.7 Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

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

.3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.

.4 ASTM D523-08, Standard Test Method for Specular Gloss.

.5 ASTM D822/D822M-13 Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.6 ASTM E2112 - 07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.32- M77, Sheathing, Membrane, Breather Type.

.3 Canadian Roofing Contractors Association (CRCA)

.1 CRCA Roofing Specifications Manual.

.4 Canadian Standards Association (CSA International)

.1 CSA A123.1-05/A123.5-05 (R2010), Asphalt Shingles Made From Organic Felt and Surfaced With Mineral Granules / Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules.

.2 CSA S136-12, North American Specification for the Design of Cold Formed Steel Structural Members.

.5 Deutsches Institut Fur Normung E.V. (DIN), English Editions

.1 DIN 4095 (1990): Planning, design and installation of drainage systems protecting structures against water in the ground, 1990.

.2 DIN 18195 (2011): Waterproofing of buildings – Parts 1 – 6 inclusive.

.6 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)

.1 CCMC-2002, Registry of Product Evaluations.

.7 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 Architectural Sheet Metal Manual, 7th Edition, 2012.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and technical datasheets for sheet metal roofing assembly, and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Proof of manufacturer's CCMC listing and listing number.

.3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.

.4 Samples:

.1 Submit duplicate 300 x 300 mm samples of each sheet metal material.

1.4 QUALITY ASSURANCE

.1 Installer Qualifications: Engage experienced installer with a minimum of 5-years experience who has completed systems similar in material, design, and extent to that indicated for Project and with record of successful performance. Installer shall be a member of the Canadian Roofing Contractors Association or affiliate organization.

.2 Obtain each type of metal roofing system through one source from a single manufacturer.

1.5 MOCK-UPS

.1 Submit mock-ups in accordance with Section 01 11 10 – General Requirements: Quality Control.

.2 Mock-up will be used:

.1 To evaluate workmanship, substrate preparation, operation of equipment and material application.

.3 Locate where directed.

.4 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sheet metal flashing work.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this Work. Approved mock-up may remain as part of finished Work.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and 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 off ground in dry location, and in accordance with manufacturer's recommendations.

.2 Store and protect sheet metal roofing assembly materials and products from damage or deterioration.

.3 Replace defective or damaged materials with new.

1.7 WARRANTY

.1 Provide CRCA Warranty Certificate for 15-years, and comply with CRCA Warranty policies and procedures.

.2 Manufacturer’s Finish Warranty: minimum 20-years from date of Substantial Performance.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 General: The complete roof cladding system shall meet the following performance/design criteria and maintain its intended appearance, remain wind and watertight, allow for expansion and contraction of metal components and transmit loads to the supporting structural back-up.

.2 The Work of this Section shall comply with the requirements, guidelines and recommendations of the CRCA Roofing Application Standards Manual.

.3 The design and erection of a complete metal roof system is the responsibility of this Section and shall be based on the performance criteria specified. The method assembly, reinforcing and anchorage is schematic and shows general intent only. Location and methods of providing same shall be this Section's responsibility, who shall design the assembly, reinforcing and anchorage to suit specific conditions in an acceptable manner complying with the requirements specified herein.

.4 Design and install panel system and all connections to withstand earthquake forces, snow loads and wind loads in accordance with the requirements of the National Building Code of Canada, 2010. Pull out resistance of fasteners shall be 1 kN or greater. Point load capacity per 100 mm diameter shall be 1.8 kN or greater.

.5 Provide flashing as shown and required to make the system wind and watertight, and still allow for thermal movement.

.6 All fastenings shall be concealed where possible. Where exposed in finished surfaces, screw heads shall be neat and symmetrical, made completely watertight and capable of allowing expansion and contraction of metal roof cladding. Exposed fasteners shall be colour-matched stainless steel to finished metal cladding and as scheduled.

.7 Thermal Movements: The metal wall and associated flashing systems shall be so designed and constructed as to provide for such expansion and contraction of component materials as will be caused by an ambient temperature range of -40°C to +60°C without causing harmful buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.

.8 Provide and/or make allowances for free noiseless vertical and horizontal thermal and wind loading movement, due to the contraction and expansion of any and all component parts.

.9 Assembly and erection procedures shall take into account the ambient temperature range and wind pressure at the time of installation.

.10 The system shall provide clear internal paths of drainage in order to drain any trapped moisture to the exterior, discharging moisture in a manner avoiding staining of architectural finishes, collecting in puddles, formation of unsafe icicles and dripping onto pedestrians.

.11 Fasten panel assembly to building structure in a manner, which transmits all loads to the main structure without exceeding the capacity of any fastener.

2.2 ROOF SHEATHING

.1 Roof sheathing boards: refer to structural Drawings and related specifications.

2.3 UNDERLAYMENT / VAPOUR RETARDER MEMBRANE

.1 Air and Vapour Retarder and Primer: adhered SBS-modified bituminous membrane for high temperature applications; rubberized asphalt will not flow up to temperatures as high as 116°C.

2.4 VENTILATION AND DRAINAGE MAT

.1 Ventilation and Drainage Mat: Geocomposite sandwich structure, open core with nonwoven filter or membrane; the three-dimensional core of looped polyamide monofilaments provides sound insulation properties, absorbing vibration from nearby sources of noise. Meets or exceeds DIN 4095 and DIN 18195.

.2 Minimum product property requirements:

.1 Geocomposite:

.1 Polymer (core/fleece): PA / PET-PA.

.2 Flow capacity at 20 kPa load:

.1 Where hydraulic gradient i=1: 3.2 l/(s.m.).

.2 Where hydraulic gradient i=0.1: 0.86 l/(s.m.).

.3 Where hydraulic gradient i=0.03: 0.40 l/(s.m.).

.3 Tensile strength: > 15 kN/m.

.4 Elongation at break: > 30%.

.5 Dynamic perforation (Cone drop): 10 mm.

.2 Fleece:

.1 Dynamic perforation (Cone drop): 42 mm.

.2 Opening size (O_{90})

.3 Water permeability (Vl_{H50}): 160 mm/s.

2.5 SHEET METAL MATERIALS

.1 Alloy time in construction schedule to custom order the products specified herein, which may be non-standard.

.2 Aluminum-zinc alloy (55% Al / 45% Zn) hot dipped coated steel sheet, with factory-applied clear acrylic coating: to ASTM A792/A792M, SS Grade 80, AZ60/AZM180, Aluminum-Zinc alloy coated, and as follows:

.1 Minimum Base Metal Thickness (i.e., prior to aluminum-zinc alloy coating): 0.7595 mm (22 gauge).

.2 Surface: regular spangle.

.3 Coating System: shall include aluminum-zinc alloy to specifications, plus a clear organic resign coating, factory-applied to both sides of substrate using reverse roll coaters.

.4 Profile: 38 mm high standing seam profile, with factory-formed stiffening flutes.

.5 General system description:

.1 No exposed fasteners.

.2 Concealed two-piece hold-down expansion clips.

.3 180 degree seaming I-Style.

2.6 ACCESSORIES

.1 Provide components required for complete metal roofing system assembly including trim, copings, fascia, corner units, vented ridge cap and closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items; match material and finish of metal roofing system.

.2 Z-girts and C-channels: to CSA S136; minimum 1.2141 mm (18-gauge) thick; ASTM A792/A792M SS Grade 80, AZ60/AZM180, Aluminum-Zinc alloy coated Z girts and C channels. Depth: as indicated on Drawings.

.3 Concealed hold-down roof clips: 2-piece 1.2141 mm (18-gauge) Aluminum-Zinc alloy hot dip galvanized sliding expansion clips designed for thermal movement; do not use fixed clips.

.4 Clamp-to-Seam Snow Fence:

.1 Snow Brackets: extruded 6061-T6 aluminum.

.2 Z-Brackets: extruded 6005-T5 Aluminum.

.3 Tubing: 6061-T6 aluminum with 1” outside diameter and .0125 wall thickness.

.4 Tubing Couplers: 6061-T6 Aluminum shaft with stainless washers and tightening bolts, nylon slip washers and rubber expansion washers.

.5 Tubing Caps: Type 302 stainless steel.

.6 Tubing Collars: 6061-T6 aluminum with stainless steel set screws.

.7 Ice Stops: 601-T6 aluminum with stainless fasteners.

.8 Finish: mill finish.

.5 Isolation coating: alkali-resistant bituminous paint.

.6 Plastic cement: to ASTM D4586 / D4586M.

.7 Slip-sheet: reinforced sisal paper or a heavy felt kraft paper.

.8 Sealant/caulking: neutral-cure silicone sealant, to ASTM C920 and ASTM C719 Class 50; ± 50% movement capability.

.9 Cold-applied rubber asphalt joint sealing compound.

.10 Fasteners: concealed, aluminum zinc alloy coated, suitable for structural deck material.

.11 Washers: of same material as sheet metal, 1 mm thick with rubber packing.

.12 Sheet metal flashing, curbs, and trim: prefinished flashing materials to match roofing materials, except 0.8 mm minimum base metal thickness.

.13 Penetration flashing: pre-manufactured silicone flashing able to withstand constant temperatures at the roofline of -50°C (-58°F) to 200°C (392°F) and up to 250°C (482°F) intermittently.

.14 Touch up paint: as recommended by sheet metal roofing manufacturer.

2.7 FABRICATION

.1 Fabricate all components of the system in the factory, ready for field installation.

.2 Form individual pieces in 2400 mm maximum lengths. Make allowances for expansion at joints.

.3 Hem exposed edges on underside 12 mm, mitre and seal.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Notch Z-girts and C-channels as required to accommodate air-seal liner ribs and fins, and to allow drainage and air circulation under sheet metal roofing panels.

.6 Apply minimum 0.2 mm dry film thickness coat of plastic cement to both faces of dissimilar metals in contact.

Part 3 Execution

3.1 COMPLIANCE

.1 Comply with Warranty requirements, and CRCA Roofing Application Standards Manual guidelines, requirements and recommendations.

.2 All installation work shall be carried out by trained erection crews in accordance with the manufacturer’s and these specifications.

3.2 COORDINATION

.1 Cooperate and coordinate with other trades as required to ensure continuity of waterproofing, thermal barrier, vapour retarder and air barrier systems.

3.3 EXAMINATION

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

.1 Visually inspect substrate 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.

3.4 STRUCTURAL DECK

.1 Roof sheathing: refer to structural Drawings and related specifications.

3.5 UNDERLAYMENT / VAPOUR BARRIER MEMBRANE

.1 Apply primer and install underlayment in accordance with manufacturer's printed installation procedures, guidelines and data sheets. Overlap joints minimum 100 mm, shingled to drain in direction of waterflow.

3.6 VENTILATION AND DRAINAGE MAT

.1 Install ventilation and drainage mat in accordance with manufacturer's printed installation procedure, guidelines and data sheet.

3.7 GIRTS AND CHANNELS

.1 Install Z-girts, fastened through underlayment, ventilation and drainage mat, and into structural elements beneath. Orient Z-girts to drain water from cavity and permit air circulation.

.2 Frame roofing system edges with C-channels and orient channel webs to face outwards.

3.8 FASCIA, TRIM, CLOSURES, AND FLASHING

.1 Form and profile fascia and trim including inside and outside corners, flashing, edgings, cap strips, drips, fillers, closure strips, and starter strips.

.2 Cut neat holes in metal roofing to accommodate roof penetrations and install penetration flashing for a watertight installation.

3.9 STANDING SEAM ROOFING

.1 Use concealed fastenings except where approved in writing by Departmental Representative.

.2 Sheet steel roof cladding shall be installed in the longest lengths possible and shall be adjusted to final position before being permanently fastened to structure.

.3 Install hold-down expansion clips spaced at 300 mm on centre. Secure clips with two fasteners each into Z-girts or structural deck below.

.4 Fold lower end of each panel 19 mm to underside, and upper end of each panel 50 mm onto topside. Slit fold 25 mm away from corner to form tab where panel turns up to make standing seam. Interlock lower and upper ends of panels.

.5 Apply sheet metal roofing beginning at eaves. Loose lock pans to valley flashing and edge strips at eaves and gable rakes.

.6 Double Fold Seams (180 degree I-Style Seaming): Install standing seams 38 mm high on flat surfaces. Form seams in direction of water-flow and make watertight. Bend up one side edge 40 mm and other 45 mm. Make first fold 6 mm wide single fold and second fold 13 mm wide, to form locked portion of standing seam with 5 plies in thickness. Fold lower ends of seams at eaves over at 45º angle. Terminate standing seams at vented ridge and hips by turning down in tapered fold.

.7 Install valley sheets not exceeding 3 m in length. Shingle lap joints 150 mm in direction of flow. Extend valley sheet minimum 150 mm under roofing sheets. Double fold valley and roofing sheets and secure with cleats spaced 450 mm o.c.

.8 Install metal roofing panels in one piece, for entire slope, except as indicated otherwise.

.9 Install vented ridge vents to manufacturer's installation instructions and details.

.10 Flash roof penetrations with material matching roof panels, and make watertight.

.11 Remove and replace damaged metal roofing. Do not touch-up damaged panels.

.12 Use concealed fasteners.

.13 Apply isolation coating to metal surfaces in contact with concrete or mortar.

3.10 CLAMP-TO-SEAM SNOW FENCE

.1 Install snow fence at sloped roof location to hold and prevent snow from falling from roof as indicated, or as recommended by the snow fence manufacturer.

.2 Follow architectural drawings or drawings supplied by manufacturer for location of snow brackets.

.3 Follow manufacturer's installation instructions and layout guide.

3.11 SEALANT

.1 Seal as necessary to form weather tight and watertight seal between flashing and adjoining surfaces and between flashing and other work. Sealing work consists of bedding between members where possible. Tool sealant to concave profile where exposed.

3.12 WARRANTY INSPECTIONS

.1 Inspection of the roofing system during application by an independent CRCA Warranty Ltd. accepted roofing inspector is mandatory.

.1 The roofing installation shall be inspected as required by an CRCA Warranty Ltd. Accepted Independent Inspector in accordance with the CRCA Warranty Ltd. Accepted Inspectors' Manual. Facilitate and permit inspections, and perform work to ensure warranty conditions are met.

.2 A second-year anniversary CRCA Warranty Ltd. assigned inspection and written report by an accepted independent roofing inspector shall be completed. Provide a copy of the report to the building Agency, Departmental Representative and Contractor.

3.13 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 - General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Remove temporary protective coverings and strippable films, if any, as metal roofing system is installed, unless otherwise indicated in manufacturer's written installation instructions.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 - General Requirements: Cleaning.

.1 Clean finished surfaces as recommended by metal roofing system manufacturer upon completion of installation; maintain in a clean condition during remainder of construction.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 - General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.14 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Replace metal roofing system components that become damaged or have deteriorated beyond successful repair by minor repair procedures.

.3 Repair damage to adjacent materials caused by sheet metal roofing installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 10 – Rough Carpentry.

.2 Section 07 27 14 – Air and Vapour Barriers.

.3 Section 07 46 23 – Wood Siding.

.4 Section 07 61 00 – Sheet Metal Roofing.

.5 Section 08 50 13 – Aluminum Windows.

1.2 REFERENCES

.1 The Aluminum Association Inc. (AA)

.1 Specifications for Aluminum Sheet Metal Work in Building Construction.

.2 DAF45-03, Designation System for Aluminum Finishes.

.2 ASTM International (ASTM)

.1 ASTM A606/A606M-09a, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.

.2 ASTM A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.4 ASTM B32-08, Standard Specification for Solder Metal.

.5 ASTM B907-13 Standard Specification for Zinc, Tin and Cadmium Base Alloys Used as Solders.

.6 ASTM D523-08, Standard Test Method for Specular Gloss.

.7 ASTM D822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.8 ASTM D4586-07, Standard Specification for Asphalt Roof Cement, Asbestos-Free.

.9 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

.3 Canadian Roofing Contractors Association (CRCA)

.1 Roofing Specifications Manual

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

.2 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.

.5 Canadian Standards Association (CSA International)

.1 CSA A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit shop drawings showing proposed method of shaping, forming, jointing, fastening, and application of flashing and sheet metal work.

.4 Verification Samples:

.1 Submit duplicate 300 x 300 mm samples of each type of sheet metal material, colour and finish proposed to be used for the project, and obtain written acceptance from Departmental Representative before ordering materials.

.2 Submit representative sample section of pre-painted metal flashing illustrating S-locking jointing method, minimum 600 mm long.

.5 Quality assurance submittals: submit following in accordance with Section 01 11 10 – General Requirements: Quality Control.

.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.2 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3, FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

.1 Coordination:

.1 Coordinate work of this Section with interfacing and adjoining Work for proper sequencing of each installation and to provide positive weather resistance, durability of the work, and protection of materials and finishes.

.2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with Contractor's representative and Departmental Representative in accordance with Section 01 11 10 – General Requirements: Construction Schedule to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building trades.

.4 Review manufacturer's installation instructions and warranty requirements.

.3 General: Fabricate and install sheet metal flashing and trim in accordance with SMACNA's Architectural Sheet Metal Manual, and to the CRCA Roofing Specifications Manual.

.4 Sheet Metal Flashing: Comply with the applicable recommendations and guidelines of the CRCA Canadian Roofing Reference Manual, CRCA Specification Manual, and applicable CRCA technical bulletins.

.5 Aluminum Flashing: Comply with the applicable recommendations and guidelines of the CRCA Canadian Roofing Reference Manual, CRCA Specification Manual, and applicable CRCA technical bulletins.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Stack pre-formed and pre-finished material in manner to prevent twisting bending and rubbing.

.2 Provide protection for galvanized surfaces.

.3 Prevent contact of dissimilar metals during storage and protect from acids, flux, and other corrosive materials and elements

.4 Protect prefinished surfaces from scratches and from rust staining.

Part 2 Products

2.1 METAL FLASHING

.1 Alloy time in construction schedule to custom order the products specified herein, which may be non-standard.

.2 (General Use) Aluminum-zinc alloy (55% Al / 45% Zn) hot dipped coated steel sheet, with factory-applied clear acrylic coating: to ASTM A792/A792M, SS Grade 80, AZ60/AZM180, Aluminum-Zinc alloy coated, and as follows:

.1 Minimum Base Metal Thickness (i.e., prior to aluminum zinc alloy coating): 0.45 mm.

.2 Surface: regular spangle.

.3 Coating System: shall include aluminum-zinc alloy to specifications, plus a clear organic resign coating, factory-applied to both sides of substrate using reverse roll coaters.

.3 (Aluminum Windows, Skylights, and at Foundation Perimeter) Formed anodized aluminum flashing: tension-levelled, aluminum sheet in accordance with ASTM B209 and ANSI H35.1 alloy designation 5005-H14 and as follows:

.1 Thickness: minimum 1.20 mm (18 gauge).

.2 Aluminum: anodic coating, meeting the requirements of the Aluminum Association DAF-45 and AAMA 611 for anodized architectural aluminum, in accordance with the Drawings, and as follows:

.1 Anodized: exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA-M12C22A41, Architectural Class I (0.7 mils minimum), colour: clear.

.2 Unexposed aluminum: Mill finish.

.4 Form flashing, coping and fascia to profiles indicated.

2.2 ACCESSORIES

.1 Isolation coating: alkali resistant bituminous paint.

.2 Roofing Cement: to ASTM D4586, asphalt based, asbestos free.

.3 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.

.4 Sealants: as indicated in Section 07 92 00 – Sealants.

.1 Mastic Sealant: CAN/CGSB 37.29 polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.

.2 Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 92 00.

.5 Fasteners: of same material as sheet metal, to ASTM F1667, as recommended by sheet metal manufacturer; non-corrosive. Finish of exposed parts to match material being fastened.

.6 Washers: same material as sheet metal, 1 mm thick with rubber packing.

.7 Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet metal.

.8 Metal Accessories: Provide non-corrosive sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work. Accessories shall match or be compatible with material being installed; size and thickness as required.

.9 Touch-up paint: as recommended by prefinished material manufacturer.

2.3 FABRICATION

.1 Roofing: Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details and as indicated.

.2 Zinc or aluminum-zinc galvanized sheet steel, as specified: Fabricate in accordance with SMACNA Architectural Sheet Metal Manual.

.3 Aluminum flashing (mill finished, pre-finished or anodized as specified) and other sheet aluminum work: Fabricate in accordance with AAI-Aluminum Sheet Metal Work in Building Construction. Back-paint aluminum flashing in contact with concrete or masonry, or dissimilar metal, with bituminous paint prior to installation.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

.6 Make flashing of prefinished metal for all cap flashing, for all flashing adjacent to roofing at roof edges and area dividers and where exposed to view from ground. Make flashing for other locations, of plain galvanized metal as follows:

.1 Use 0.46 mm metal core thickness except where otherwise indicated.

.2 Use 0.61 mm metal core thickness wherever a flat length exceeding 305 mm wide occurs.

.3 Use 0.84 mm metal core thickness for concealed fastening strips.

.7 All straight run joints shall be S-Lock in roof flashing.

.8 Make joints to allow for thermal movement, space S-Lock joints at 1500 mm maximum centers.

.9 Make flashing for building into masonry and concrete so that joints can be lapped 100 mm or more.

.10 Strengthen free edges of metal flashing by folding to form a 13 mm hem.

.11 Make flashing to curbs, walls and parapets a minimum of 200 mm high, where possible.

.12 Where curb-mounted roof penetrations are not required, provide flashing sleeves and collars for all pipes and conduit extending through the roof. Sleeves shall be soldered to a piece of sheet metal extending at least 150 mm onto the surrounding roof.

.13 Make joints for corners and intersections with standing seams except where exposed of pre-finished metal when seams shall be flat locked.

.14 All bends machine made; form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.15 All metal flashing shall be back painted with bituminous paint prior to installation.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

.1 Check mounting and counter-flashing of mechanical items and report any defect to the Departmental Representative.

.2 Verify that solid wood blocking or sheathing provided to back-up all flashing and that all nails, screws set and wood provides a smooth flat plane.

.3 Verify that all Work by other trades is in place, and properly and securely located, true and level in line.

3.3 INSTALLATION: METAL FLASHING

.1 Install sheet metal flashing and trim in accordance with applicable CRCA 'FL' series details, SMACNA's Architectural Sheet Metal Manual, and as indicated.

.2 Verify shapes and dimensions of surfaces being covered before fabricating sheet metal.

.3 Do not install metal flashings over flexible roof flashing until the flexible roof flashing has been inspected and approved by the Departmental Representative. This includes curbs for roof mounted items.

.4 Do not use exposed fastening unless indicated, or concealed fastening is not possible. Locations and methods shall be approved by Departmental Representative.

.5 Anchor units of work securely in place, providing for thermal expansion of metal units. Conceal fasteners where possible and set units true to line and level.

.6 Install work with laps, joints, and seams that are watertight and weatherproof.

.7 Install exposed sheet metal work that is without oil canning, buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weatherproof performance.

.8 Install surface mounted reglets true and level, and caulk top of reglet with sealant. Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.

.9 Install pans where shown around items projecting through roof membrane.

.10 Insert metal flashing into reglets or under cap flashing as indicated to form weather tight junction.

.11 Fasten metal base flashing to walls or upstands along top of flashing. Do not secure to cant strip. Form lapped corner joints. Extend rolled edge of base flashing approximately 25 mm on to roof from toe of cant, and rest on top of roof surface.

.12 Roof Edge Flashing: Secure metal flashing at roof edges at a maximum of 610 mm o.c.

.13 Expansion Provisions:

.1 Provide for the thermal expansion of exposed sheet metal Work.

.2 Space movement joints at maximum of 3050 mm, with no joints allowed within 610 mm of a corner or intersection.

.3 Form expansion joints of intermeshing hooked flanges, not less than 25 mm deep, filled with mastic sealant (concealed within joints) where lapped or bayonet type expansion provisions in the work cannot be used or are not sufficiently weatherproof and waterproof.

.14 Sealed Joints:

.1 Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant.

.2 Fill joint with sealant and form metal to conceal sealant completely.

.3 Use joint adhesive for non-moving joints specified.

.15 Lock Seams:

.1 Fabricate non-moving seams in sheet metal with flat lock seams.

.16 Separations:

.1 Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with bituminous paint or other permanent separation as recommended by the manufacturer.

.2 Underlayment: Install a slip-sheet of No. 15 perforated asphalt saturated felt and a course of polyethylene underlayment where installing sheet metal directly on cementitious or wood substrates. Secure in place and lap joints minimum 100 mm.

.3 Bed flanges of work in a thick coat of roofing cement where required for waterproof performance.

.17 Counter Flashing:

.1 Coordinate installation of counter flashing with installation of assemblies being protected by counter flashing.

.2 Secure in a waterproof manner.

.3 Lap counter flashing joints a minimum of 50 mm and bed with sealant.

.18 Flashing and metal closures: where flashing and metal closures overlap at any point in a system, ensure that flashing and closures are shingled over top lower sheet(s) and not behind, so that water is directed, and drains, to the exterior.

3.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 - General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Remove temporary protective coverings and strippable films, if any, as metal roofing system is installed, unless otherwise indicated in manufacturer's written installation instructions.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 - General Requirements: Cleaning.

.1 Clean finished surfaces as recommended by metal roofing system manufacturer upon completion of installation; maintain in a clean condition during remainder of construction.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 - General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Replace metal flashing components that become damaged or have deteriorated beyond successful repair by minor repair procedures.

.3 Repair damage to adjacent materials caused by sheet metal flashing installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 41 13 – Concrete Finishing.

.2 Section 06 20 00 – Finish Carpentry.

.3 Section 07 46 23 – Wood Siding.

.4 Section 07 61 00 – Sheet Metal Roofing.

.5 Section 07 62 00 – Sheet Metal Flashing and Trim.

.6 Section 08 11 13 – Metal Doors and Frames.

.7 Section 08 50 13 – Aluminum Windows.

.8 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM C834 -10, Standard Specification for Latex Sealants.

.2 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications.

.3 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants.

.4 ASTM C1193-13, Standard Guide for Use of Joint Sealants.

.5 ASTM D2240-05(2010), Standard Test Methods for Rubber Property, Durometer Hardness.

1.3 COORDINATION

.1 Coordinate work of this Section with interfacing and adjoining work for proper sequencing of each installation and to provide positive weather resistance, durability of the work, and protection of materials and finishes.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals shall comply with the requirements of Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer’s product data as follows:

.1 Printed product literature describing type, composition recommendations, and directions for surface preparation, material preparation, and material installation.

.2 Manufacturer's product literature to describe:

.1 Caulking compound.

.2 Primers.

.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

.3 Submit manufacturer’s installation instructions for each product used.

.1 Before performing work of this Section, submit the names of proposed materials.

.2 When required by Departmental Representative, submit test certificates from an approved Canadian materials testing laboratory indicating that sealants meet the requirements specified, and that the tests have been conducted in accordance with ASTM D2240.

.4 Submit samples as follows:

.1 Samples of back-up material, primer, joint fillers, and of each type and colour of sealant to be used. Cure samples under conditions anticipated at the site during application.

.5 Reports: submit written pre-installation meeting recommendations, field inspection, and test report results after each inspection.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

1.6 QUALITY ASSURANCE

.1 Comply with ASTM C1193 guidelines.

.2 Pre-Installation Meeting:

.1 Arrange with manufacturer's representative to inspect substrates and to review installation procedures 48-hours in advance of installation.

.1 Review conditions under which work will be done.

.2 Joint condition and profile.

.3 Weather conditions.

.2 Submit written report of meeting to Departmental Representative.

.3 Mock-up:

.1 Construct mock-up in accordance with Section 01 11 10 – General Requirements: Quality Control.

.2 Construct mock-up to show location, size, shape, colour, and depth of joints complete with bond breaker, joint backing, primer, and sealant.

.3 Arrange for the manufacturer's representative's review and acceptance. Allow 48 hours after acceptance before proceeding with the work.

.4 Inform Departmental Representative following construction of the mock-up. Allow 24 hours for review of mock-up by Departmental Representative before proceeding with sealant Work.

.5 Mock-up may remain as part of the Work if accepted by Departmental Representative. Remove and dispose of mock-ups not forming part of the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, store, and protect materials in accordance with manufacturer's recommendations and instructions.

.2 Deliver containers labelled and sealed, complete with written application and maintenance instructions.

.3 Store materials in a dry, heated enclosure.

1.8 PROJECT CONDITIONS

.1 Ambient Conditions:

.1 Do not proceed with installation of joint sealants under following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.

.2 When joint substrates are wet.

.2 Joint-Width Conditions:

.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

.2 Substrate must be clean, dry, and frost free.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.

.2 Ventilate inside work areas by use of approved portable supply and exhaust fans.

Part 2 Products

2.1 SEALANT MATERIALS

.1 Use materials as received from manufacturer without additives or adulteration. Use one manufacturer's product for each Type specified. Where sealant applications cross or contact each other, ensure compatibility, maintenance of physical properties and performance characteristics, and continuity of seal.

.2 Do not use sealants that emit strong odours, contain toxic chemicals, or, if used within air handling units, are not certified as mould-resistant.

.3 When low toxicity sealants are not possible, confine usage to areas that off-gas to exterior, are contained behind air barriers, or are applied several months prior to occupancy.

.4 All sealants shall be premium-quality, commercial-grade, construction-use and purpose-made for site conditions.

2.2 SEALANT MATERIAL TYPES

.1 Type S-1: Silicone Sealant; mould and mildew resistant.

.1 To ASTM C920; type S; grade NS; class 100/50; use NT, M, G, and A.

.2 Type S-2: Silicone Sealant; general construction and air-seal sealant.

.1 To ASTM C920: type S; grade NS; class 50; use NT, M, G, A, O.

.3 Type S-3: Silicone Sealant; structural glazing.

.1 To ASTM C920: type S; grade NS; class 25; use NT, A, G, O.

.4 Type S-4: Acoustical Sealant; interior, non-hardening.

.1 To ASTM C834 Type P, Grade -18°C.

.5 Type S-5: Multi-component polyurethane sealant; chemical curing, exterior wall sealant.

.1 To ASTM C920: type M; grade NS; class 50; use T, NT, M, A, O.

.6 Type S-6: One-component polyurethane sealant; non-sag, for general constructions.

.1 To ASTM C920: type S; grade NS; class 25; use NT, M, A, O.

.7 Type S-7: Horizontal joint sealant; two-component, self-levelling.

.1 To ASTM C920: type M; grade P; class 25; use T, M, O.

.8 Type S-8: One-part moisture curing, low modulus polyurethane sealant for sealing joints in level and slightly slope surfaces conforming to ASTM C920, type S, grade P, class 50, use T, M, A, O.

.9 Type S-9: Control joint sealant: two-component, epoxy-urethane, self-levelling, load bearing saw cut or preformed control joints.

.10 Type S-10: Exterior door thresholds, washroom facilities, and Wet Areas: two-component, gun-grade, slump-resistant elastomeric polyurethane sealant, specially formulated for sealing joints in water-immersion conditions, and highly resistant to biodegradation by both aerobic and anaerobic bacteria; to ASTM C920, Type M, Grade NS, Class 25, use T, NT, M, G, A, O; certified to CAN/ULC S115; Canadian Food Inspection Agency acceptance.

2.3 ACCESSORIES

.1 Preformed compressible and non-compressible back-up materials that are non-staining, compatible with joint substrate, sealants, primers, and other joint fillers, and are approved for applications indicated by sealant manufacturer based on site experience and laboratory testing.

.1 Rod Type Sealant Backings:

.1 ASTM C1330, Type C (closed cell material with a surface skin), Type O (open cell material) or Type B (bi-cellular material with a surface skin).

.2 Use any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated.

.3 Size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

.4 Non-adhering to sealant, to maintain two-sided adhesion across joint.

.2 High Density Foam.

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by manufacturer.

.3 Bond Breaker Tape.

.1 Polyethylene bond breaker tape which will not bond to sealant.

.2 Primer: Non-staining type as recommended by sealant manufacturer.

.3 Joint Cleaner: Non-corrosive solvent type recommended by sealant manufacturer for applicable substrate materials.

2.4 COLOURS

.1 Colours: To match final colour of adjacent materials as selected by Departmental Representative from manufacturer's full colour range. Provide samples as required for initial selection prior to ordering materials.

2.5 SEALANT SELECTION

.1 Where no specified type of sealant is shown or specified, choose one of the sealants specified in this Section appropriate for its location as recommended by the sealant manufacturer in accordance with its warranty provisions and datasheet.

.2 Make sealant selections consistent with manufacturer's printed installation instructions and data sheets.

.3 Use mould & mildew resistant silicone sealant Type S-1 for non-moving joints in washrooms and kitchens. Do not use on floors.

.4 Use silicone general construction sealant Type S-2 or Type S-5 and S-6 for all joints, interior and exterior, where no other specific sealant type specified.

.5 Use structural glazing silicone Type S-3 for sealing glass, interior and exterior.

.6 Use acoustical sealant Type S-4 and air seal sealant Type S-2 only where they will be fully concealed and only where no constant or consistent air pressure difference will exist across the joint.

.7 Use multi-component sealant type S-5 for wood and other porous substrates, such as concrete and masonry.

.8 Use multi-component sealant Type S-7 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.

.9 Use control joint sealant S-9 as filler for interior, horizontal saw cut or preformed control joints where joints are subject to load bearing conditions.

.10 Use wet area sealant S-10 for horizontal and vertical joints, and perimeter joints, at washroom facilities, exterior door threshold plates, and wet area applications. Use traffic grade (TG) at horizontal floor locations.

Part 3 Execution

3.1 PROTECTION

.1 Protect installed work of other trades from staining, damage, or contamination.

3.2 EXAMINATION

.1 Verify condition of previously installed work upon which this Section depends. Report defects to Departmental Representative. Commencement of work means acceptance of existing conditions.

.2 Ensure joints are suitable to accept and receive the sealants.

.3 Ensure surfaces are sound, dry, and free from dirt, water, frost, loose scale, corrosion, bitumen, paints, and other contaminants that may adversely affect the performance of the sealing materials.

.4 Do not apply sealant to masonry until mortar has cured.

.5 Before any sealing work is commenced, test the materials for indications of staining or poor adhesion.

.6 Ensure joints and spaces which are to receive sealants are less than 10 mm deep; not less than 6 mm wide; and not more than 19 mm wide.

3.3 SURFACE PREPARATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.4 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.5 MIXING

.1 Mix materials in accordance with sealant manufacturer's instructions.

3.6 APPLICATION

.1 Sealant:

.1 Apply sealant in accordance with manufacturer's written instructions.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

.3 Apply sealant in continuous beads.

.4 Apply sealant using gun with proper size nozzle.

.5 Use sufficient pressure to fill voids and joints solid.

.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.

.7 Tool exposed surfaces before skinning begins to give slightly concave shape.

.8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing:

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 .2 Do not cover up sealants until proper curing has taken place.

3.7 FIELD QUALITY CONTROL

.1 At the discretion of the Departmental Representative, field test joint sealant adhesion to substrates in the presence of Departmental Representative as follows:

.1 Extent of Testing: test completed and cured sealant joints as follows:

.1 Perform 10 tests for the first 300 m of joint length for each kind of sealant and joint substrate.

.2 Perform 1 test for each 300 m of joint thereafter or 1 test per each floor per elevation.

.2 Test Method: test joint sealants according to method A, Field-Applied Sealant Joint Hand Pull Tab, Appendix X1, ASTM C1193 or Method A, Tail Procedure, ASTM C1521.

.1 For joints with dissimilar substrates, verify adhesion to each substrate separately. Extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

.3 Inspect tested joints and report on finding for the following requirements:

.1 Joint cavities filled and free of voids.

.2 Sealant dimensions and configurations comply with sealant manufacturer's data sheet and printed installation requirements.

.3 No adhesive or cohesive failure noted during pull tests per ASTM criteria. Include data on pull distance used to test each kind of product and joint substrate.

.4 Record tests results in a field-adhesion test log. Include dates when sealants were installed, name of worker responsible in each instance, test dates, test locations, whether joints were primed or not, adhesion results and percent elongations, sealant fill, sealant configuration and dimensions.

.5 Repair sealant test locations by applying new sealants following approved preparation and application procedures.

.2 Evaluation of Field Adhesion Test results:

.1 Sealants passing ASTM pull-tests and compliant with specifications will be considered satisfactory.

.2 Remove sealants that fail adhesion tests or do not meet specifications, and apply in accordance with approved preparation and application requirements.

.3 Retest re-applied sealants until test results are satisfactory and sealant application is compliant.

3.8 SCHEDULE

.1 Exterior: provide sealant at the following exterior locations, unless sealant is specified to be included in the work of other sections:

.1 Control joints and expansion joints;

.2 Window and door frames and adjacent materials;

.3 Penetrations.

.2 Interior: provide sealant at the following interior locations, unless joints are covered by trim or unless sealant is specified to be included in the work of other sections:

.1 Control joints and expansion joints in non-fire-rated masonry and gypsum board walls;

.2 Window and door frames and adjacent materials;

.3 Penetrations in non-fire-rated walls;

.4 Floor-to-wall joints in washroom buildings (washroom facilities);

.5 Top of non-fire-rated gypsum board walls;

.6 Interior side of exterior windows;

.7 Interior sealing shall include both sides of walls and frames where finished installation will be visible.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 - General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Immediately clean adjacent surfaces that have been soiled and leave work in a neat, clean condition. Remove excess materials and droppings using recommended cleaners and solvents.

.3 Remove excess and droppings, using recommended cleaners as work progresses.

.4 Remove masking tape after initial set of sealant.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 - General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 - General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.10 PROTECTION

.1 Cut out damaged sealant, repeat preparation, prime joints and install new material as specified, and acceptable to the manufacturer.

.2 Provide approved, non-staining means of protection for the completed joint sealant installations where required to protect the work from mechanical, thermal, chemical and other damage by construction operations and traffic.

.3 Maintain protection securely in place until Substantial Performance.

.4 Repair damage to adjacent materials caused by joint sealants installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 07 21 29 – Foamed Insulation

.2 Section 08 71 00 – Door Hardware

.3 Section 09 91 00 – Painting

1.2 REFERENCES

.1 American National Standards Organization (ANSI) / Steel Door Institute (SDI)

.1 ANSI/SDI A250.3-2007 (R2011), Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames.

.2 ANSI/SDI A250.8-2003 (R2008), Recommended Specifications for Standard Steel Doors and Frames.

.3 ANSI/SDI A250.10-1998 (R2011), Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A780/A780M-09, Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings.

.3 ASTM A879/A879M-12, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface

.4 ASTM A924 / A924M-13, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.5 ASTM B29-03(2009), Standard Specification for Refined Lead.

.6 ASTM B749-03(2009), Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.

.7 ASTM C553-11, Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications

.8 ASTM C578-12b, Specification for Rigid, Cellular Polystyrene Thermal Insulation

.9 ASTM C591-12b, Specification for Un-Faced Pre-formed Rigid Cellular Polyisocyanurate Thermal Insulation

.10 ASTM C592-12, Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)

.11 ASTM C1289-13e1, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

.12 ASTM D1622-08, Standard Test Method for Apparent Density of Rigid Cellular Plastics.

.13 ASTM D4726-09, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors.

.14 ASTM D6386-10, Standard Practice for Preparation of Zinc (Hot Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.

.15 ASTM D7396-08, Standard Guide for Preparation of New, Continuous Zinc-Coated (Galvanized) Steel Surfaces for Painting.

.3 Canadian Standards Association (CSA International)

.1 CAN4-S106-M80, Standard Method for Fire Tests of Window and Glass Block Assemblies

.2 CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.3 CSA W47.1-09, Certification of companies for fusion welding of steel, Includes Update No. 3 (2011), Update No. 5 (2012).

.4 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).

.4 Canadian Steel Door Manufacturers' Association (CSDMA)

.1 CSDMA, Guide Specification for Installation and Storage of Hollow Metal Doors and Frames, 2012.

.2 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2006.

.3 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 2009.

.5 National Fire Protection Association (NFPA)

.1 NFPA (Fire) 80, Standard for Fire Doors and Other Opening Protectives, 2013 Edition.

.2 NFPA (Fire) 252, Fire Tests of Door Assemblies, 2012 Edition.

.6 The Society for Protective Coatings (SSPC)

.1 SSPC-PS 12.01, One Coat Zinc-Rich Painting System.

.2 SSPC-PS Guide 12.00, Guide to Zinc-Rich Coating Systems.

.7 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC S104-10, Standard Method for Fire Tests of Door Assemblies.

.2 CAN/ULC S105-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.

.3 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.4 CAN/ULC-S702-09-AM1, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1 (January 2012).

.5 CAN/ULC-S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Perform work in accordance with CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, except as otherwise specified herein.

.2 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.

.3 Maximum deflection for exterior steel entrance doors under wind load of 1.2 kPa not to exceed 1/175th of span.

.4 Steel fire rated doors and frames: Label and list fire rated doors and frames by an organization accredited by the Standards Council of Canada in conformance with CAN/ULC S104 and CAN/ULC S105 for ratings specified or indicated. Fire labels must be factory applied by the manufacturer.

.5 Be responsible for securing approval from Authorities Having Jurisdiction for materials, fabrication and installation of fire rated oversized door and frame assemblies.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheets for each type of door and frame specified.

.3 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures:

.1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware and fire rating and finishes.

.2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing, fire rating, finishes.

.3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

.4 Submit test and engineering data, and installation instructions.

1.5 QUALITY ASSURANCE

.1 Manufacturer/Fabricator: member in good standing of the Canadian Steel Door and Frame Manufacturer's Association.

.2 Installer: Use installers who are experienced with the installation of hollow metal doors and frames of similar complexity and extent to that required for the Project.

.3 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled:

.1 List by nationally recognized agency having factory inspection service and construct as detailed in Follow-up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.2 Fabricate all rated doors and frames to labelling authority standard.

.4 Manufacture door and frame assemblies to ANSI/SDI A250.8.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements, and as follows:

.1 Receive and store materials as recommended by materials manufacturer.

.2 Adequately protect surfaces from damage during moving, handling and storage.

Part 2 Products

2.1 MATERIALS

.1 Steel:

.1 Doors and frames: coated steel sheets to ASTM A924/M924; coating designation to ASTM A653/A653M: Commercial Steel (CS), Type B, ZF180 galvannealed; stretcher levelled.

.2 Nominal Base Metal Thickness Requirements:

.1 Frames: refer to frame fabrication requirements specified in this section.

.2 Doors: refer to door fabrication requirements specified in this section.

.3 Hardware Reinforcement for Doors and Frames: Carbon steel, welded in place, prime painted, to the following minimum nominal thicknesses:

Hardware Reinforcement	Door (mm)	Frame (mm)
Pivot Hinge:	4.20	4.20
Mortise Hinge:	3.51	3.51
Mortise or Bored Lock or Deadbolt:	1.98	1.98
Flush or Surface Bolt Front:	1.98	1.98
Surface or Concealed Closer:	2.74	2.74
Strike Reinforcements:	1.98	1.98
Hold Open Arm:	1.98	1.98
Electronic Hardware Reinforcements:	1.98	1.98
Pull Plates and Bars:	1.30	1.30
Mortar Box:	--	0.84
Surface Exit Devices:	1.98	1.98
Door Surface Hardware Reinforcements:	1.30	1.30
Frame surface hardware reinforcements:	2.74	2.74

.3 Door Core Materials

.1 Honeycomb: Structural small cell 25 mm maximum. kraft paper honeycomb:

.1 Weight: 36.3 kg/ream minimum.

.2 Density: 16.5 kg/m^3 minimum.

.3 Sanded to required thickness.

.2 Polystyrene: Rigid extruded, closed cell insulation, fire retardant treated meeting the requirements of ULC S701, Type 4, minimum thermal resistance RSI 0.8/25 mm thickness.

.3 Temperature Rise Rated (TRR): core composition shall provide the fire-protection rating and limit the temperature rise on the unexposed side of door at 250°C for 30 or 60 minutes as determined by National Building Code of Canada, 2010. Core shall be tested as part of a complete door assembly in accordance with CAN/ULC S104 covering the Standard Method of Tests of Door Assemblies and shall be listed by a nationally recognized testing agency having a factory inspection service.

2.2 ADHESIVES

.1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

.2 Polystyrene cores: heat resistant, epoxy resin based, low viscosity, contact cement.

.3 Interlocking Edge Seam Adhesive: fire-resistant, resin-reinforced polychloroprene, high-viscosity, sealant/adhesive.

2.3 ACCESSORIES

.1 Door silencers (bumpers): Black neoprene, to ANSI/BHMA A156.16 Type 6-180; three silencers on strike jambs of single door frames; two silencers on heads of double door frames; screw fastener applied. Stick on bumpers are not acceptable.

.2 Exterior top and bottom caps: steel.

.3 Interior top caps: rigid polyvinylchloride extrusion, to ASTM D4726.

.4 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners, and fastened to frame sections with counter-sunk oval head sheet metal screws.

.5 Make provisions for glazing as indicated and provide necessary glazing stops.

.1 Provide removable glazing beads.

.2 Design exterior glazing stops to be tamperproof.

.6 Metallic paste filler: to manufacturer's standard.

.7 Fasteners: type 304 stainless steel screws with countersunk flat head.

.8 Labels for fire doors and door frame: brass plate, riveted to door and door frame.

.9 Sealant: Section 07 92 00 – Joint Sealants.

.10 Glazing: Section 08 80 50 – Glazing.

2.4 FABRICATION GENERAL

.1 Welded construction: assemble units by welding in accordance with CSA W59 to produce a finished unit square, true, and free of distortion. Welding shall be continuous unless specified otherwise. Welding shall be undertaken only by a fabricator fully approved by the Canadian Welding Bureau to the requirements of CSA W47.1.

.2 Permit access by an approved inspection and testing company for the purpose of inspecting at random, doors being fabricated for this project.

.3 Make provisions in doors and frames to suit requirements of trade or section providing electrically operated hardware or security devices. Provide removable plates or knock outs for electrical contacts. Provide junction boxes on security door frames as required for door strikes, mag locks and door contacts. Ensure frames arrive on site prepared for wiring.

.4 Fabricate galvanized steel channels to reinforce frames as required for size, and for fire protection rating requirements. Extend reinforcements from floor to structure above. Design top connection to accommodate structural deflection. Conceal reinforcements in frames.

2.5 FRAME FABRICATION: GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Accurately form frames to profiles indicated. Construct frames straight and free from twist or warp.

.3 Exterior frames: 1.98 mm minimum welded construction. 50 mm face standard frame profile, throat and frame width to suit wall construction.

.4 Interior frames: 1.6 mm minimum for single doors; 1.98 mm for frames with opening width in excess of 1220 mm; welded type construction; 50 mm face standard frame profile, throat and frame width to suit wall construction.

.5 Blank, drill, reinforce and tap frames to receive mortised, templated hardware, security and electrical devices, using templates provided by finish hardware supplier. Reinforce frames for installation of closers. Install stiffener plates or two angle spreaders where required to prevent bending of frame and to maintain alignment when setting. Weld reinforcement in place.

.6 Protect mortised cutouts with steel guard boxes where required (masonry/concrete construction).

.7 Provide three resilient bumpers per single door at the strike jamb. Provide two resilient bumpers per door leaf at the head of double doors.

.8 Conceal fastenings except where exposed fastenings are indicated.

.9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.10 Provide fire labelled frames for those openings requiring fire protection ratings, as indicated in as scheduled on Drawings.

2.6 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Where frames terminate at finished floor, supply floor plates for anchorage to slab. Check depth of extension of finished floor to structural slab and provide jamb extension anchorage as required. Provide 50 mm minimum adjustment

.3 Locate wall anchors immediately above or below each hinge reinforcement on the hinge jamb, and directly opposite on the strike jamb. Provide three anchors per jamb for frames up to 2300 mm. Add one anchor per jamb for each additional 760 mm or fraction thereof in frame height.

.4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

2.7 FRAMES: WELDED TYPE

.1 Welding in accordance with CSA W59.

.2 Cut frame mitres accurately and weld on inside of frame profile. Fill frame corners, exposed surface depressions and butted joints with air drying paste filler. Sand to a smooth uniform finish. Touch up damaged galvanized finish with zinc rich primer.

.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.

.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

.7 Insulate exterior frame components with polyurethane insulation as indicated in Section 07 21 19.

2.8 DOOR FABRICATION: GENERAL

.1 Doors: swing type, flush, with provision for openings as indicated.

.2 Fabricate doors with longitudinal edges locked seamed with adhesive and spot-welded for larger doors. Seams: not visible, grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish. Bevel both stiles of single doors 1 in 16.

.3 Provide fixed transoms, side panels and base panels where indicated or scheduled, of same materials, gauge, thickness, construction and finish as door. Reinforce transoms and panels to prevent oil canning. Install transoms and panels with concealed fastenings, and reinforce to accommodate hardware as required. Seal joint between transom or panel airtight. Provide accurately formed ship lap joint between door and transom panel where no transom rail occurs.

.4 Mortise, reinforce, drill, and tap doors to receive templated hardware, security, and electrical devices.

.5 Reinforce doors where required, for surface mounted hardware. Provide flush steel top and bottom caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.

.6 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.7 Cut-outs: Where openings are required, provide integrally formed cut-outs with steel framing, and closely fitted steel glass and grille stops, as required. Mitre corners of stops. Drill and countersink fasteners symmetrically at 150 mm o.c. Supply and install coated steel stops, with same coating type and thickness as doors. Screw stops in place.

.8 Supply and install steel vent grilles in doors where indicated.

.9 Fabricate doors with a clearance of 3 mm to the frame and 6 mm to completed floor finish or threshold, except at openings in non-fire rated separations where undercuts are indicated.

.10 Provide flush top and bottom steel edge on exterior doors and doors to stair shafts.

.11 Provide touch-up primer at areas where zinc coating has been removed or damaged during fabrication.

.12 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN/ULC S104 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.13 Manufacturer's nameplates on doors are not permitted.

2.9 FABRICATION: EXTERIOR DOORS

.1 Face sheets: Minimum 1.6 mm base steel sheet thickness.

.2 Stiffened, insulated and sound deadened with polystyrene core laminated under pressure to each face sheet.

.3 Longitudinal edges mechanically interlocked, adhesive assisted with edge seams continuous welded, filled, and sanded flush with no visible seam.

2.10 FABRICATION: INTERIOR DOORS

.1 Face sheets: Minimum 1.2 mm base steel sheet thickness.

.2 Stiffened and sound deadened with honeycomb core laminated under pressure to each face sheet.

.3 Longitudinal edges mechanically interlocked, adhesive assisted with edge seams continuous welded, sanded flush with no visible seam.

2.11 FABRICATION: FIRE RATED DOORS

.1 Face sheets: Minimum 1.6 mm base steel sheet thickness.

.2 Stiffened and sound deadened with honeycomb core laminated under pressure to each face sheet.

.3 Longitudinal edges mechanically interlocked, adhesive assisted with edge seams continuous welded, sanded flush with no visible seam.

.4 Equip pairs of fire labelled doors with minimum 2.7 mm (0.105") steel surface mounted flat bar astragal, shipped loose for application on site.

2.12 LAMINATED CORE CONSTRUCTION

.1 Form face sheets for exterior doors from 1.6 mm sheet steel with polystyrene core laminated under pressure to face sheets.

.2 Form face sheets for interior doors from 1.6 mm sheet steel with honeycomb core laminated under pressure to face sheets.

2.13 EXTERIOR FRAMES

.1 Insulate exterior frame components with polyurethane foamed insulation in accordance with Section 07 21 19.

2.14 PRIMER

.1 Touch-up primer: Commercial rust inhibitive primer, shop prime coat doors and frames before delivery; grey or red coloured primer; in accordance with Section 09 91 00 – Painting. Clear primer not acceptable; provide primer for field touch-up.

2.15 PAINT

.1 Field paint steel doors and frames in accordance with Section 09 91 00 - Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

.1 Verify condition and dimensions of previously installed work upon which this Section depends. Report defects to Departmental Representative. Commencement of work means acceptance of existing conditions

3.3 INSTALLATION GENERAL

.1 Install fire rated doors and frames in accordance with requirements of NFPA 80.

.2 Install doors and frames to, CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

3.4 FRAME INSTALLATION

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Install hollow metal window frames at interior locations as indicated.

.6 Install door silencers.

.7 Caulk perimeter of frames between frame and adjacent material.

.8 Maintain continuity of air barrier and vapour retarder.

3.5 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 05 - Door Hardware.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.

.1 Hinge side: 1.0 mm.

.2 Latchside and head: 1.5 mm.

.3 Finished floor, top of carpet, non-combustible sill, or thresholds: 6 mm.

.3 Adjust operable parts for correct function.

3.6 FINISH REPAIRS

.1 Touch-up areas where galvanized coating has been removed or damaged with primer.

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.7 GLAZING

.1 Install glazing for doors and frames in accordance with Section 08 80 50 – Glazing.

3.8 ADJUSTING

.1 Adjust doors for smooth and balanced door movement.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 - General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 - General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 - General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.10 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Replace components that become damaged or have deteriorated beyond successful repair by minor repair procedures.

.3 Repair damage to adjacent materials caused by sheet metal roofing installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 05 50 00 – Metal Fabrications.

.3 Section 09 91 00 – Painting.

.4 Section 22 42 10 – Composting Toilets.

1.2 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Verification: Obtain specific locations and sizes for required access doors and frames from trades requiring access to concealed equipment and indicate on submittal schedule.

.2 Coordinate with other trades as required and furnish items to build in to the construction in accordance with the construction schedule.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.1 Product Data: Manufacturer's technical data for each type of access door and panel assembly, including setting drawings, templates, fire-resistive characteristics, finish requirements, and details of anchorage devices.

.1 Include complete schedule, types, locations, construction details, finishes, latching or locking provisions, and other pertinent data.

.2 Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions.

.3 Shop Drawings:

.1 Door and panel units: Show types, elevations, thickness of metals, full size profiles of door members.

.2 Hardware: Show materials, finishes, locations of fasteners, types of fasteners, locations, and types of operating hardware, and details of installation.

.3 General: Show connections of units and hardware to other Work. Include schedules showing location of each type and size of door and panel units.

.4 Submit catalogue details for each type of door illustrating profiles, dimensions, and methods of assembly.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 01 11 10 – General Requirements: Closeout Submittals.

1.5 QUALITY ASSURANCE

.1 Single Source Responsibility: Obtain access door and panel units, and frames for entire Project from one source and a single manufacturer.

.2 Size Variations: Obtain Architect's acceptance and approval of manufacturer's standard size units that may vary slightly from sizes indicated on Drawings.

.3 Coordination: Provide inserts and anchoring devices that will be built into other Work for installation of access door assemblies. Coordinate delivery with other Work to avoid delay.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements.

.2 Apply temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.

.3 Leave protective covering in place until final cleaning of building.

Part 2 Products

2.1 FLOOR ACCESS DOORS

.1 Materials:

.1 Steel Diamond Tread Plate: to CAN/CSA G40.20/G40.21, Grade 300W.

.2 Steel Angle: to CAN/CSA G40.20/G40.21, Grade 300W.

.3 Fasteners: Bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws, and machine bolts.

.1 Unfinished fasteners: In areas not exposed to public, use unfinished bolts conforming to ASTM A307, Grade A, with hexagon heads and nuts. Supply bolts of lengths required to suit the thickness of the material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.

.2 Finished fasteners: In areas exposed to public use, bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts to be hot dip galvanized in accordance with ASTM A153/A153M or CAN/CSA-G164.

.2 Flush Steel Doors and Frames:

.1 Opening Size: coordinate with Section 22 42 10 – Composting Toilets, and size door assembly in accordance with composting toilet manufacturer’s requirements, and as required to permit access to equipment for servicing purposes as approved by Departmental Representative. Confirm measurements with related trades and Departmental Representative before ordering.

.1 Ensure that equipment is within view and accessible for operating, inspecting, adjusting, servicing without use of special tools.

.2 Door: 3/16" (5 mm) reinforced steel diamond plate.

.3 Frame: 3/16" (5 mm) steel 2" x 3" (50 mm x 745 mm) steel angle frame with holes for bolt in applications

.4 Latch: steel slam latch with inside lever handle and outside removable "L" handle.

.5 Hinge: 3 inch by 3-inch (75 mm x 75 mm) steel, heavy-duty butt hinge with steel pin fastened to door with steel carriage bolts. Provide hinges with slotted bolt holes for on-site adjustment.

.6 Springs: steel compression lift springs designed to counterbalance door weight and resist downward pressure when closing door.

.7 Hold-Open Arm: 3/8 inch steel arm that automatically locks when door is opened to 90 degrees. Provide release handle that releases door and allows for closure.

.8 Mortise cylinder lock, protected by brass cover plate for keyed access interior and exterior. Manufacturer's standard cylinder and core.

.9 Gasket Odour Resistance: certified for a maximum air infiltration of 1 cubic foot per minute per linear foot of perimeter.

.10 Gasket Debris; 1/8" commercial grade EPDM rubber.

2.2 FABRICATION

.1 Manufacture each access panel and door assembly as an integral unit ready for installation.

.2 Framing to include integral anti-flexing technology, with ¼ inch (6 mm) mounting holes, to reduce the twist of frame during installation.

.3 Easy Install Tabs integral to framing for multiple installation methods.

.4 Furnish number of latches required to hold door in flush, smooth plane when closed.

2.3 FINISHING

.1 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface by brush-off blast cleaning to SSPC SP 7.

.2 Apply one coat of primer in shop to steel surfaces except:

.1 Surfaces to be encased in concrete.

.2 Surfaces and edges to be field welded.

.3 Faying surfaces of friction-type connections.

.3 Apply paint under cover on dry surfaces when surface and air temperatures are above 5˚ C.

.4 Maintain dry condition and 5˚C minimum temperature until paint is thoroughly dry.

.5 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

.6 Finish paint exposed surfaces to Section 09 91 00 – Painting, grey colour to match concrete finished appearance as closely as possible.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that rough openings for door and frame are correctly sized and located.

3.2 ACCESS DOOR LOCATION

.1 Access door locations: ensure that equipment is within view and accessible for operating, inspecting, adjusting, servicing without use of special tools.

3.3 PREPARATION

.1 Advise installers of work relating to access panel installation including rough opening dimensions, locations of supports, and anchoring methods. Coordinate delivery with other work to avoid delay.

.2 Advise and coordinate with other trades as required of details relating to floor hatch installation, including rough opening dimensions, locations of supports, and anchoring methods.

.3 Provide items to be cast in concrete or otherwise built in to other trades as required.

3.4 INSTALLATION

.1 Install access door and frame units per manufacturer's printed installation instructions, details, and technical datasheets.

.2 Install frames plumb and level in opening, in proper alignment with adjacent planes for flush installation. Secure rigidly in place.

.3 Position units to provide convenient access to concealed equipment requiring maintenance and servicing access.

.4 Install floor doors so hinges are located to maximize ease and safety of entry and exit.

3.5 ADJUSTING

.1 Adjust panels and doors after installation for smooth operation.

.2 Remove and replace panels or frames that are warped, bowed, or damaged.

3.6 CLEANING

.1 Progress and Final Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 At completion and continuously as Work proceeds, remove all surplus materials, debris and scrap. Leave Work area clean at end of each day.

.2 At completion of Work, remove all protective surface covering film and wrappings. Clean all glass, panels and frames using mild soap or other cleaning agent approved by manufacturer.

.3 Remove all excess glazing or joint sealing materials from exposed surfaces. Clean and polish glass.

.2 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by window installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 10 – Rough Carpentry.

.2 Section 07 21 19 – Foamed Insulation.

.3 Section 07 27 14 – Air and Vapour Barriers.

.4 Section 07 46 23 – Wood Siding.

.5 Section 07 92 00 – Joint Sealants.

.6 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

.1 Aluminum Association (AA)

- .1 Aluminum Design Manual, 2010 Edition.
- .2 Welding Aluminum: Theory and Practice, 2002.
- .3 Properties of Aluminum Alloys: Fatigue Data and the Effects of Temperature, Product Form, and Processing, 2008.

.2 American Architectural Manufacturer's Association (AAMA)

- .1 AAMA 501-05, Methods of Test for Exterior Walls.
- .2 AAMA 611-12, Voluntary Standards for Architectural Anodized Aluminum.
- .3 AAMA 701/702-11, Guide to selecting pile weatherstrip and weatherseals used in windows and doors. Standards define requirements to restrict air and water infiltration.
- .4 AAMA 1503-09, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- .5 AAMA AFPA-91, Anodic Finishes/Painted Aluminum.
- .6 AAMA CW-RS-1-12, The Rain Screen Principle and Pressure Equalized Wall Design.
- .7 AAMA RPC-00, Rain Penetration Control: Applying Current Knowledge.

.3 American Society for Testing and Materials (ASTM)

- .1 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
- .2 ASTM A480/A480M-14a, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
- .3 ASTM B209/209M-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .4 ASTM B221/B221M-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .5 ASTM B429/B429M-10e1, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
- .6 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants.

.7 ASTM E1748-95(2009), Standard Test Method for Evaluating the Engagement Between Windows and Insect Screens as an Integral System.

.8 ASTM E2112 - 07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.

.2 CAN/CGSB-12.8-97 AMEND, Insulating Glass Units.

.5 Canadian Standards Association (CSA) International

.1 CSA A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2014).

.2 CSA A440.2-14/A440.3-14, Fenestration energy performance/User guide to CSA A440.2-14, Includes Update No. 1 (2015).

.3 CAN/CSA A440.4-07 (R2012), Window, Door, and Skylight Installation.

.4 CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels, Inludes Update No.1 (2014).

.5 CAN/CSA Z91-02 (R2013), Health and Safety Code for Suspended Equipment Operations.

.6 Glazing Association of North America (GANA)

.1 GANA Glazing Manual (50th Anniversary Edition).

.2 GANA Guide to Architectural Glass (2010).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for windows and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit shop drawings signed and sealed by the Manufacturer’s Engineer clearly indicating:

.1 Components, materials, finishes, and locations of anchorage.

.2 Section details showing all window perimeter conditions.

.3 Mullion details and frame corner connections.

.4 Sill flashing terminations, in isometric view, including coordination with wall cladding materials.

.5 Frame anchorage details.

.6 Details showing sealing techniques within and around perimeter of framing and operable sash.

.7 Connection to building sheet membrane air and vapour retarder.

.8 Required sizes and tolerance of openings.

.4 Samples:

.1 Submit one representative model of each type window.

.2 Include frame, sash, sill, glazing and weatherproofing method, insect screens, surface finish and hardware. Show location of manufacturer's nameplates.

.3 Include 150 mm long samples of head, jamb, and sill to indicate profile.

.5 Provide operation and maintenance data for windows for incorporation into manual specified in Section 01 11 10 – General Requirements: Closeout Submittals.

.6 Test and Evaluation Reports:

.1 Submit test reports from approved independent testing laboratories, certifying compliance with specifications.

.2 All test reports that reference the NAFS CSA A440 must include, on the first page, a summary of the results including, at minimum:

.1 The product manufacturer.

.2 The type of product.

.3 The model number/series number.

.4 The primary product designation.

.5 The secondary product designation.

.1 Positive design pressure.

.2 Negative design pressure.

.3 Water penetration resistance test pressure.

.4 Canadian air infiltration and exfiltration levels.

.6 The test completion date.

.3 The report will also contain the following information:

.1 Test dates.

.2 Report preparation dates.

.3 Test information retention period.

.4 Location of testing facilities.

.5 Full description of test samples, including:

.1 Anodized finish.

.2 Condensation resistance.

.3 Safety drop - vertical sliding windows only.

.4 Block operation - sliding windows only.

.5 Sash strength and stiffness - operable outswing casement.

.6 Sash pull-off - vinyl windows.

.7 Forced entry resistance.

.8 Mullian deflection - combination and composite windows.

.6 Complete description of amendments, as applicable.

.7 Conclusion.

.8 Drawings signed by the testing laboratory, if provided.

1.4 QUALITY ASSURANCE

.1 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.2 Restricted Supply: All windows by same manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements, and 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 off ground in dry location, and in accordance with manufacturer's recommendations.

.2 Store and protect windows from damage.

.3 Replace defective or damaged materials with new.

1.6 JOB CONDITIONS

.1 Protect aluminum finishes and glazing during erection against disfiguration, contamination or damage by abuse of harmful materials. Install protective cover where exposure to damage is critical.

.2 After glass is installed, mark each light with large cross or other symbol to make glass obvious and noticeable to other trades. Use substance which will not stain, mark or "Shadow" glass either by itself or by reaction with sunlight, moisture or the environment. Do not use masking tape.

.3 Coordinate installation of windows and skylights with Work specified in other Sections to ensure proper placement and installation of air barrier and vapour retarder, insulation, and flashing in order that air/vapour/thermal barrier of building is intact and moisture will be diverted to the exterior.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Outswing casement windows with insect screens; 25 mm double glazed insulated glass unit with 0.10 low emissivity coating on surface 3, argon gas filled interspace and a thermally broken aluminum glazing spacer, with the following minimum features:

.1 Glass-reinforced nylon thermal break: ≥ 14 mm thick.

.2 Aluminum tubular extrusions.

.3 Glass installed and replaced from interior.

.4 Exterior pre-shim butyl glazing tapes.

.5 Interior EPDM rubber glazing gaskets.

.6 Lock-in glass stop.

.7 Frame depth: 57 mm.

.2 Windows shall meet or exceed requirements of CSA A440, and the following minimum Canadian performance requirements:

.1 Operating window air tightness: less than 0.55 (m^3/h)/m at 75 Pa.

.2 Operating window water tightness: no water leakage at 500 Pa.

.3 Operating windows shall meet performance criteria for ease of operation, sash strength and stiffness in accordance with CSA A440.

.4 The thermal transmittance (U-Factor) of the window when tested in accordance with CAN/CSA A440.2 shall be ≥ 2.4 W/m^2 • °C.

.5 Condensation resistance: I_f = 57 or better.

.3 Provide datasheets and test results demonstrating compliance with these minimum requirements.

2.2 MATERIALS

.1 Materials: to CSA A440, supplemented as follows:

.1 Sash: aluminum.

.2 Main frame: aluminum.

.3 Glazing:

.1 Insulating Glass Units: 25 mm double glazed insulated glass unit with 0.10 low emissivity coating on surface 3, argon gas filled interspace and a thermally broken aluminum glazing spacer.

.1 Individual glass panes shall be 6 mm thick clear tempered glass, to CAN/CGSB-12.1-M90, with low-e coating on 3rd surface.

.1 Tempered glass: Type 2, Class B, Category II – 540 J impact resistance, polished edge treatment.

.2 Insulating glass units, to CAN/CGSB-12.8.

.3 Inert gas fill: ≥95% argon filled.

.2 Glazing System: Glazing method shall be a wet/dry type in accordance with manufacturer's standards. Exterior glazing shall be silicone back bedding sealant. Interior glazing shall be snap-in type glazing beads with an interior gasket in accordance with ASTM C864.

.4 Screens: to ASTM E1748, on the entire area of the windows.

.1 Insect screen frames shall be extruded aluminum finished to match window frame and rigidly joined at the corners. Screen shall be 18 x 16 fibreglass mesh. Splines shall be extruded elastomer removable to permit re-screening.

.2 Fasteners: tamper proof.

.3 Mount screen frames for interior replacement.

.5 Aluminum: Aluminum Association (AA) alloy 6063-T5 or 6063-T6 for aluminum extrusions and AA 1100, anodizing quality, for aluminum sheet, minimum 3 mm thickness.

.6 Fasteners: To ASTM A480, stainless steel, type 304 selected to prevent galvanic action with the components fastened, of suitable size to sustain imposed loads.

.7 Gaskets: Neoprene or EPDM with dimensional tolerances and durometer hardness and of suitable size and shape to meet the requirements of the specifications and their specific application.

.8 Supporting angles, plates, bars, rods, and other steel accessories: Mild steel CAN/CSA-G40.20/G40.21, shop painted with zinc chromate primer, thickness as required to sustain imposed loads and in no case less than 5 mm thick.

.9 Sealant: Including primer, joint filler, as specified in Section 07 92 00.

.10 Isolation coating: alkali resistant bituminous paint.

.11 Thermal separator: Polyvinylchloride, 50 Shore A durometer hardness +5.

.12 Glazing Tape: Refer to Section 08 80 50.

.13 Metal air seal/vapour barrier (by window supplier) to be bonded to window frame and extend behind mounting frame. Seal all corners to maintain air seal vapour retarder. Install flexible flashing with continuous metal retaining strip to lap to interior wall assembly.

.14 Provide all accessories, fastenings and parts recommended by manufacturer for a complete installation in accordance with printed installation instructions, data sheets, and specifications.

2.3 FABRICATION

.1 Fabricate in accordance with CSA A440, supplemented as follows:

.1 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less and plus or minus 3 mm for units with a diagonal measurement over 1800 mm.

.2 Face dimensions detailed are maximum permissible sizes.

.3 Brace frames to maintain squareness and rigidity during shipment and installation.

.4 Finish steel clips and reinforcement with 380 g/m^2 zinc coating to CAN/CSA G164.

2.4 ALUMINUM FINISHES

.1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.

.1 Clear Anodized: Exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA-M12C22A41, clear anodized.

.2 Unexposed aluminum: Mill finish.

.2 Isolation Coating

.1 Isolate aluminum from following components, by means of isolation coating:

.1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.

.2 Concrete, mortar and masonry.

.3 Wood.

2.5 HARDWARE

.1 Hardware: stainless steel or white bronze sash locks and aluminum handles to provide security and permit easy operation of units.

.2 Locks: provide operating sash with spring loading locking device, to provide automatic locking in closed position.

.3 Provide special keyed opening device for windows normally locked.

.4 Where windows latching devices are located in excess of 1900 mm above floor level:

.1 Equip casement units with roto operators with locking handle.

.5 Equip operable windows with hardware as follows:

.1 Casement Hinges: low friction slide and pivot design, with Teflon filed slide shoe on roll formed stainless steel track and flat bottom.

.6 Provide ADA handles for roto operators.

.7 Force to operate locking devices shall not exceed 20 N.

2.6 AIR BARRIER AND VAPOUR RETARDER

.1 Equip window frames with factory installed air barrier and vapour retarder material for sealing to building air barrier and vapour retarder as follows:

.1 Material: identical to, or compatible with, building air barrier and vapour retarder materials to provide required air tightness and vapour diffusion control throughout exterior envelope assembly.

.2 Material width: adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder from interior.

Part 3 Execution

3.1 COMPLIANCE

.1 Comply with manufacturer’s printed installation instructions, datasheets, details, and specifications.

3.2 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product 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.

3.3 PREPARATION

.1 Obtain all dimensions from the job site.

.2 Provide data, dimensions and components, anchors and assemblies to be installed by others in proper time for installation.

3.4 INSTALLATION

.1 Window installation:

- .1 Install to CAN/CSA A440.4 and CSA A440.
- .2 Arrange components to prevent abrupt variation in colour.
- .3 Install foamed insulation at perimeter of window as required.

.2 Sill installation:

- .1 Install metal sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces. Use one piece lengths at each location.
- .2 Cut sills to fit window opening.
- .3 Secure sills in place with anchoring devices located at ends joints of continuous sills and evenly spaced 600 mm on centre in between.
- .4 Fasten expansion joint cover plates and drip deflectors with self-tapping stainless steel screws.
- .5 Maintain 6 to 9 mm space between butt ends of continuous sills. For sills over 1200 mm in length, maintain 3 to 6 mm space at each end.

.3 Caulking:

- .1 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in bedding compound. Caulk between sill upstand and window-frame. Caulk butt joints in continuous sills.
- .2 Apply sealant in accordance with Section 07 92 00 - Joint Sealants. Conceal sealant within window units except where exposed use is permitted by Departmental Representative.

.4 Glazing:

- .1 Perform work in accordance with GANA Glazing Manual, IGMA, and GANA Laminated Glazing Reference Manual for glazing installation methods.
- .2 Bite of glass edge on stop: 6 mm minimum.

3.5 CLEANING

.1 Progress and Final Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

- .1 At completion and continuously as Work proceeds, remove all surplus materials, debris and scrap. Leave Work area clean at end of each day.
- .2 At completion of Work, remove all protective surface covering film and wrappings. Clean all glass, panels and frames using mild soap or other cleaning agent approved by manufacturer.

.3 Remove all excess glazing or joint sealing materials from exposed surfaces. Clean and polish glass.

.2 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by window installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 08 11 13 – Metal Doors and Frames

1.2 REFERENCES

.1 Standard hardware location dimensions in accordance with the Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers Association.

.2 ANSI/BHMA A156.2–2011, Bored and Preassembled Locks and Latches.

.3 ANSI/BHMA A156.1–2013, Butts and Hinges.

.4 ANSI/BHMA A156.3–2014, Exit Devices

.5 ANSI/BHMA A156.4–2013, Door Controls (Closers).

.6 ANSI/BHMA A156.5-2014, Auxiliary Locks and Associated Products

.7 ANSI/BHMA A156.6-2010, Architectural Door Trim.

.8 ANSI/BHMA A156.7-2014, Template Hinge Dimensions

.9 ANSI/BHMA A156.8-2010, Door Controls – Overhead Holders

.10 ANSI/BHMA A156.13-2012, Mortise Locks and Latches

.11 ANSI/BHMA A156.15-2011, Closer/Holder Release Device.

.12 ANSI/BHMA A156.16-2013, Auxiliary Hardware.

.13 ANSI/BHMA A156.18-2012, Materials and Finishes

.14 ANSI/BHMA A156.21-2014, Thresholds.

.15 ANSI/BHMA A156.22-2012, Door Gasketing and Edge Seal Systems.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

.1 Hardware for doors in fire separations and exit doors to be certified by ULI / ULC, a Canadian Certification Organization accredited by Standards Council of Canada.

1.4 SAMPLES

.1 When requested, submit samples of hardware items in accordance with Section 01 11 11 – General Requirements: Submittal Procedures.

.2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.

.3 After approval, samples will be returned for incorporation in the Work.

1.5 HARDWARE SCHEDULE

.1 Submit finish hardware schedule using the standard DHI format for finish hardware schedules in accordance with Section 01 11 11 – General Requirements: Submittal Procedures.

.2 Clearly indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

1.6 MAINTENANCE DATA

.1 Provide operation and maintenance data for door closers, locksets, door holders and fire exit devices for incorporation into manual specified in Section 01 11 11 – General Requirements: Closeout Procedures.

.2 Brief maintenance staff regarding proper care, cleaning and general maintenance of door hardware items.

1.7 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Section 01 11 11 – General Requirements: Closeout Procedures.

.2 Supply two sets of wrenches for door closers, locksets and fire exit hardware.

1.8 DELIVERY AND STORAGE

.1 Store finishing hardware in locked, clean and dry area.

.2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

Part 2 Products

2.1 HARDWARE ITEMS

.1 Use one manufacturer's products only for all similar product groups.

.2 Basis-of-Design – refer to Section 01 11 11 –General Requirements: Product Options and Substitutions: the product numbers listed in the finish hardware schedule are the Basis-of-Design and shall be used as the standard of acceptance for all items.

.3 Other manufacturer's products will be considered provided they meet or exceed the performance, grade, quality, function, weight, design and finish of the specified product, and requests for approval are approved by the Departmental Representative in writing through issued addenda 7 days prior to tender closing.

2.2 DOOR HARDWARE

.1 Butts and hinges:

.1 Butts and continuous hinges: designated by letter and numeral identifiers, followed by size and finish, as listed in Hardware Schedule.

.2 Butt hinges on exterior doors and locked doors opening out shall have non removable pins (NRP) and doors equipped with door closers or in high traffic areas shall have ball bearing (BB) hinges.

.3 Specified product – Butts/continuous hinges: Ives

.2 Door Closers and Accessories:

.1 Door controls (closers): to meet or exceed ANSI A156.4 Grade 1 requirements; to be heavy duty cast aluminum bodies with adjustable spring power and have separate valves for latching, closing and backcheck control. All closer arms to be forged steel, with power adjustment arm bracket.

.2 All closers are to be non-sized to suit door and opening, and to have full covers with finish 689. Brackets, shoes, and plates are to be included for proper mounting of closers. All closers shall have minimum 25 - year warranty.

.3 Specified product: LCN

.3 Auxiliary locks:

.1 To meet ANSI A156.5 requirements, to be Grade 1, heavy-duty, and finished in 626.

.2 Bored deadlocks to have 1” throw high-strength steel alloy deadbolt with hardened steel roller, free spinning cylinder collar, metal security shield, and hardened steel ball bearings with mounting bolts.

.3 Cylinders: rim or mortise type, finished to 626, for installation in deadbolts provided with exterior doors as listed in Hardware Schedule.

.4 Specified product: Schlage

.4 Architectural door trim:

.1 To meet ANSI A156.6 requirements, type 304 stainless steel, finished 630.

.2 Door protection plates: kick plate type 304 stainless steel, 1.27 mm thick stainless steel, finished to 630.

.3 Push Plates: type 304 stainless steel, 1.27 mm thick stainless steel, finished to 630.

.4 Specified product: Ives Hardware

.5 Auxiliary hardware; door stops:

.1 to meet CAN/CGSB-69.32-(M90)/ANSI/BMHA A156.16-1989, designated by letter and numeral identifiers, as listed in Hardware

Schedule, finished to 626.

.1 Floor stops, dome type, cast brass, finished 626.

.2 Specified products: Ives Hardware

.6 Door sweeps:

.1 Heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene seal, surface mounted, adjustable, clear anodized finish.

.2 Specified product: DraftSeal

.7 Thresholds:

.1 150 mm wide x full width of door opening, extruded aluminum, serrated surface, with stop strip, clear anodized finish.

.2 Specified product: DraftSeal

.8 Weatherstripping:

.1 Head and jamb seal:

.1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.

.2 Adhesive backed santoprene material.

.2 Door bottom sweep:

.1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.

.3 Specified product: DraftSeal

2.3 FASTENINGS

.1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.2 Exposed fastening devices to match finish of hardware.

.3 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.4 Use fasteners compatible with material through which they pass.

2.4 KEYING

.1 All deadlocks are to have Best SFIC 7-pin cylinders to suit, and be keyed to existing Best building master key system. Door locks and cylinders to be keyed differently, keyed alike, keyed alike in groups, master keyed or grandmaster keyed as directed. Prepare detailed keying schedule in conjunction with Agency's representative.

.2 Provide three (3) change keys for every lock in this Contract.

.3 Provide three (3) master keys for each MK or GMK group.

Part 3 Execution

3.1 INSTALLATION INSTRUCTIONS

.1 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.2 Furnish manufacturer's instructions for proper installation of all hardware components.

.3 Install hardware to standard hardware location dimensions in accordance with Canadian Imperial Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

.4 Where door stop contacts door pulls, mount stop to strike bottom of pull.

3.2 SCHEDULE

Hardware Set # H-1 - Single Doors No. D1, D2; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Classroom Deadlock Schlage B663BDC x CMK - 626
1 SFIC Permanent Cylinder Core Best 1C7A2 - 626
1 Indicator Deadbolt Schlage B571 x Occupied x 61-509 - 626
1 Door Pull Ives 8302-10 x 250mm c. to c. - 101mm x 406mm x T/B - 630
1 Push Plate Ives 8400- 150mm x 406mm - 630
1 Door Closer LCN 4050 Hw/PA-REG x M/S - 689
1 Kickplate Ives 8400 10 x 34 - 630
1 Floor Door Stop Ives FS439 - 626
1 Threshold DraftSeal DS5000 x 915mm - AL
1 Set Door Seal DraftSeal DS44D x 5185 ft. - BN
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-2 - Single Door No. D3; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Classroom Deadlock Schlage B663BDC x CMK - 626
1 SFIC Permanent Cylinder Core Best 1C7A2 - 626
1 Door Pull Ives 8302-10 x 250mm c. to c. - 101mm x 406mm x T/B - 630
1 Push Plate Ives 8400- 150mm x 406mm - 630
1 Door Closer LCN 4050 Hw/PA-REG x M/S - 689
1 Kickplate Ives 8400 10 x 34 - 630
1 Floor Door Stop Ives FS439 - 626
1 Threshold DraftSeal DS178N x 915mm - AL
1 Set Door Seal DraftSeal DS44D x 5185 ft. - BN
1 Door Sweep DraftSeal DS138C x 915mm - AL

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications.

.2 Section 06 10 10 – Rough Carpentry.

.3 Section 07 92 00 – Joint Sealants.

.4 Section 09 91 00 – Painting.

1.2 REFERENCES

.1 Aluminum Association (AA)

.1 AA DAF-45, Designation System for Aluminum Finishes.

.2 ASTM International (ASTM)

.1 ASTM C475/C475M-12, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.2 ASTM C514-04(2009)e1, Specification for Nails for the Application of Gypsum Board.

.3 ASTM C557-03(2009)e1, Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

.4 ASTM C840-11, Specification for Application and Finishing of Gypsum Board.

.5 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications.

.6 ASTM C954-11, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

.7 ASTM C1002-07, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.8 ASTM C1047-10a, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.9 ASTM C1278/C1278M-07a(2011), Standard Specification for Fiber-Reinforced Gypsum Panel.

.10 ASTM C1280-12a, Specification for Application of Gypsum Sheathing Board.

.11 ASTM C1177/C1177-08, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

.12 ASTM C1178/C1178M-11, Specification for Glass Mat Water-Resistant Gypsum Backing Board.

.13 ASTM C1280 13a, Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.

.14 ASTM C1658/C1658M-12, Standard Specification for Glass Mat Gypsum Panels.

.15 ASTM C1396/C1396M-11, Standard Specification for Gypsum Board.

.3 Association of the Wall and Ceilings Industries International (AWCI)

.4 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC S102-10, Surface Burning Characteristics of Building Materials and Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:

.1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store gypsum board assembly materials level off ground in dry location, and in accordance with manufacturer's recommendations.

.2 Store and protect gypsum board assemblies from damage.

.3 Protect from weather, elements and damage from construction operations.

.4 Handle gypsum boards to prevent damage to edges, ends or surfaces.

.5 Protect prefinished aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

.6 Replace defective or damaged materials with new.

1.5 AMBIENT CONDITIONS

.1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.

.2 Apply board and joint treatment to dry, frost free surfaces.

.3 Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

Part 2 Products

2.1 GYPSUM MATERIALS

.1 Glass mat gypsum sheathing (exterior grade sheathing):
to ASTM C1177/C1177M and as follows:

.1 Type: regular.

.2 Size: 1200 mm x maximum practical length.

.3 Thickness: as indicated on Drawings.

.4 Edges: square.

.2 Water-resistant (moisture-resistant) glass mat faced board: manufactured to meet to ASTM C1658, ASTM C1396 Section 7 and ASTM C1177, and as follows:

.1 Type: regular.

.2 Size: 1200 mm x maximum practical length.

.3 Thickness: as indicated on Drawings.

.4 Coated fibreglass mat face with moisture-resistant core.

2.2 FRAMING MATERIALS

.1 Refer to Section 06 10 00 – Rough Carpentry.

2.3 PARTITION WALL INSULATION MATERIALS

.1 Fibrous Acoustical Insulation For Fire and Smoke Rated Assemblies: Un-faced preformed GreenGuard™ or formaldehyde free binder fibrous insulation meeting the requirements of ULC S702; having maximum flame spread and smoke developed of 20/20 in accordance with CAN/ULC S102 and being non-combustible in accordance with CAN/ULC S114 and as follows:

.1 Type: 1.

.2 Width: to friction fit in stud spaces.

.3 STC Ratings: as indicated on Drawings.

.4 Thickness: to fill a minimum of 90% of the cavity thickness.

.5 Nominal density: 40 kg/m^3.

.2 Fibrous Glass Acoustical Insulation For Non-rated Assemblies: Un-faced, preformed GreenGuard™ or formaldehyde free binder fibrous insulation meeting the requirements of ASTM C423, ASTM E90, ASTM E413 and ULC S702 and as follows:

.1 Type: 1.

.2 Width: to friction fit in stud spaces.

.3 STC Ratings: as indicated on Drawings.

.4 Thickness: to fill a minimum of 90% of the cavity thickness.

2.4 CEILING/WALL ACCESS DOORS

.1 Architectural, flush mounting access panels for gypsum board installation, thickness, and fire rating to match wall assembly, manufacturer's standard sizes selected to suit access requirements, complete with extruded aluminum frame, concealed hinge and a removable door panel, airtight gasket and screwdriver slot latch mechanism.

2.5 ALUMINUM TRIM, REVEALS AND MOULDING

.1 Coordinate with other trades and specification sections as required.

.2 Dimensions and shape: as indicated.

.3 Finish: as indicated; if not indicated, clear anodized (0.7 mils minimum).

2.6 ACCESSORIES

.1 Nails: to ASTM C514.

.2 Thin Set Interior Wall: Dry set mortar meeting or exceeding the requirements of ANSI A118.1 formulated for thin set applications of ceramic biscuit tile, factory sanded mortar consisting of Portland cement, sand and additives requiring only potable water to be added for installation complete with ANSI A118.4 bond enhancing latex additives.

.3 Steel drill screws: to ASTM C1002.

.4 Stud adhesive: to CAN/CGSB-71.25.

.5 Laminating compound: as recommended by manufacturer, asbestos-free.

.6 Casing beads, corner beads, control joints, and edge trim: to ASTM C1047, metal, zinc-coated by hot-dip process, 0.5 mm base thickness, perforated flanges, one-piece length per location.

.1 Gypsum board corner bead vertical corners shall be 3/4" round. Provide transition caps at the base and head, by Trim-Tex or similar.

.7 Strippable Edge Trim: Extruded PVC with pre-masked L-shaped tape on trim with tear away protective serrated strip for removal after compound and paint is applied, for use at areas where gypsum butts aluminum frames and where gypsum butts concrete or concrete block.

.8 Sealants: in accordance with Section 07 92 00 – Joint Sealants.

.9 Acoustic sealant: non-hardening, non-skinning, permanently flexible and in accordance with Section 07 92 00 – Joint Sealants.

.10 Insulating Strip / Acoustic Strip: rubberized, moisture-resistant, 3 mm thick closed cell neoprene strip, or 8 mm thick open cellular rubber reinforced with solid rubber particles bonded to cellulose, minimum 28 mm (1-1/2 inch) wide, with self-sticking permanent adhesive on one face, lengths as required.

.11 Joint Treatment Materials: Provide joint compound and accessory materials in accordance with ASTM C475 and as follows:

.1 Joint Tape:

.1 Interior Gypsum Board: Paper.

.2 Sheathing board and Cement board: Fibreglass mesh tape.

.2 Joint Compound for Interior Gypsum Board: Vinyl based, non-asbestos, low dusting type compatible with other compounds applied on previous or for successive coats, and as follows:

.1 Pre-filling: Setting type taping compound.

.2 Embedding and First Coat: Drying type compound.

.3 Fill Coat: Drying type compound.

.4 Finish Coat: Drying type, sandable topping compound.

.5 Skim Coat: Drying type, sandable topping compound.

2.7 FINISHES

.1 Paint: in accordance with Section 09 91 00 – Painting.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assembly 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 ERECTION

.1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.

.2 Do application of gypsum sheathing in accordance with ASTM C1280.

.3 Support light fixtures by providing additional ceiling support within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.4 Install work level to tolerance of 1:1200.

.5 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.6 Install furring channels parallel to, and at exact locations of, stud partition header track.

.7 Furr gypsum board faced vertical bulkheads within and at termination of ceilings.

.8 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.9 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.

.10 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.11 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

.12 Erect drywall resilient furring transversely across studs and joists spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.

.13 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

.14 Install trim, shadow mould and reveals as indicated.

3.3 APPLICATION

.1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.

.2 Apply single or double layer gypsum board to metal furring or framing using screw fasteners for first layer, screw fasteners for second layer. Maximum spacing of screws 300 mm on centre.

- .1 Single-Layer Application:
  - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
  - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
- .2 Double-Layer Application:
  - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
  - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
  - .3 Apply base layers at right angles to supports unless otherwise indicated.
  - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.

.3 Apply mould-resistant gypsum board adjacent to sinks, wet areas, and where indicated. Apply mould-resistant sealant to edges, ends, cut-outs that expose gypsum core and to fastener heads.

.4 Apply non-cementitious backer board at wall tile locations. Apply mould-resistant sealant to edges, ends, cut-outs that expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

.5 Apply acoustical sealants, to ASTM C919, and as follows:

- .1 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.

.6 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.

.7 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.

.8 Install gypsum board with face side out.

.9 Do not install damaged or damp boards.

.10 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

.4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.

.5 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers.

.6 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.

.7 Provide continuous polyethylene dust barrier behind and across control joints.

.8 Locate control joints where indicated, and at changes in substrate construction at approximate 10 m spacing on long corridor runs at approximate 15 m spacing on ceilings.

.9 Install control joints straight and true.

.10 Construct expansion joints at building expansion and construction joints. Provide continuous dust barrier.

.11 Install expansion joint straight and true.

.12 Install cornice cap where gypsum board partitions do not extend to ceiling.

.13 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.

.14 Splice corners and intersections together and secure to each member with 3 screws.

.15 Install access doors to electrical and mechanical fixtures specified in respective sections.

.1 Rigidly secure frames to furring or framing systems.

.16 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.17 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:

.1 Levels of finish:

.1 Level 0: No taping, finishing or accessories required for areas of temporary construction.

.2 Level 1: Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable and for plenum areas above ceilings, in attics or in concealed spaces.

.3 Level 2: Embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable and when gypsum is used as a substrate for tile.

.4 Level 3: Embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges and where areas are to receive a heavy coating of textured material.

.5 Level 4: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges and where light textures or wall coverings are to be applied.

.18 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.19 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

.20 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.21 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

.22 Mix joint compound slightly thinner than for joint taping.

.23 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.

.24 Allow skim coat to dry completely.

.25 Remove ridges by light sanding or wiping with damp cloth.

.26 Provide protection as required to ensure gypsum drywall work will remain without damage or deterioration at time of substantial completion.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by gypsum board assemblies installation.

3.7 BOARD SCHEDULE

.1 Use Fire Rated Type ‘X’ or Type ‘C’ board at fire rated wall and ceiling assemblies as required to meet National Building Code of Canada, 2010; refer to Drawings for rated assembly locations and required ratings.

.2 Install board as indicated, and as follows:

.1 Glass mat gypsum sheathing (exterior grade sheathing): exterior application at exterior walls.

.2 Water-resistant (moisture-resistant) glass mat faced board: all other board locations.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications.

.2 Section 08 11 13 – Metal Doors and Frames.

.3 Section 09 21 16 – Gypsum Board Assemblies.

.4 Other technical sections as indicated; coordinate with Drawings.

1.2 REFERENCES

.1 American Society of Testing and Materials (ASTM)

.1 ASTM D16-12, Standard Terminology for Paint, Related Coatings, Materials, and Applications.

.2 ASTM E84-14, Standard Test Method for Surface Burning Characteristics of Building Materials.

.2 Green Seal

.1 Green Seal Standards GS-11, Paint.

.2 Green Seal Standard GC-03, Anti-Corrosive Paints.

.3 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.4 Environmental Protection Agency (EPA)

.1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).

.5 Master Painters Institute (MPI)

.1 MPI Architectural Painting Specifications Manual.

.6 National Fire Code of Canada – 2010.

.7 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1113-04, Architectural Coatings.

.8 Society for Protective Coatings (SSPC)

.1 SSPC Painting Manual, 2011 Edition.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meeting:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Construction Progress Schedule.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building trades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Scheduling

.1 Submit work schedule for various stages of painting to Departmental Representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Departmental Representative for changes in work schedule.

.3 Schedule painting operations to prevent disruption of and by other trades.

.3 Health and Safety:

.1 Do construction occupational health and safety in accordance with Health and Safety Requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:

.1 Submit product data and instructions for each paint and coating product to be used.

.2 Submit product data for the use and application of paint thinner.

.2 Submit samples in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:

.1 Submit full range colour sample chips to indicate where colour availability is restricted.

.2 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:

.1 3 mm plate steel for finishes over metal surfaces.

.2 13 mm birch plywood for finishes over wood surfaces.

.3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

.4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.

.5 10 mm plywood for finishes over wood surfaces.

.3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.

.3 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 11 10 – General Requirements: Closeout Submittals include following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour numbers.

.4 MPI Environmentally Friendly classification system rating.

.4 Manufacturer's Instructions:

.1 Submit manufacturer's installation and application instructions.

.5 Submit quality assurance submittals in accordance with Section 01 11 10 – General Requirements: Quality Control.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.5 QUALITY ASSURANCE

.1 Contractor: minimum of five years proven satisfactory experience. Provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.

.2 Journeymen: qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.

.3 Apprentices: working under direct supervision of qualified trades person in accordance with trade regulations.

1.6 MOCK-UPS

.1 Construct mock-ups in accordance with Section 01 11 10 – General Requirements: Quality Control.

.1 Provide 3 m x 3 m mock-up. Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing selected colours, gloss/sheen, textures.

.2 Mock-up will be used to judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.

.3 Locate where directed.

.4 Allow 24 hours for review of mock-up before proceeding with work.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

.1 Pack, ship, handle and unload materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and manufacturer's written instructions.

.2 Acceptance at Site:

.1 Identify products and materials with labels indicating:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Storage and Protection:

.1 Provide and maintain dry, temperature controlled, secure storage.

.2 Store materials and supplies away from heat generating devices.

.3 Store materials and equipment in well-ventilated area with temperature range 7 degrees C to 30 degrees C.

.5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.

.7 Remove paint materials from storage only in quantities required for same day use.

.8 Fire Safety Requirements:

.1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.

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

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.8 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces.

.2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.

.3 Provide continuous ventilation for seven days after completion of application of paint.

.4 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.

.5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

.6 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless pre-approved written approval by Departmental Representative and product manufacturer, perform no painting when:

.1 Ambient air and substrate temperatures are below 10 degrees C.

.2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is above 85% or when the dew point is more than 3 degrees C variance between the air/surface temperatures. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.

.2 Perform painting work when maximum moisture content of the substrate is below:

.1 12% for concrete and masonry (clay and concrete brick/block).

.2 15% for wood.

.3 12% for plaster and gypsum board.

.4 Allow new concrete and masonry to cure minimum of 28 days.

.3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".

.4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.

.3 Apply paint when previous coat of paint is dry or adequately cured.

.4 Additional interior application requirements:

.1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

.2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

.5 Additional exterior application requirements:

.1 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.

.2 Do not apply paint when:

.1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.

.2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.

.3 Surface to be painted is wet, damp or frosted.

.3 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.

.4 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.

.5 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

Part 2 Products

2.1 MATERIALS

.1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.2 Provide paint materials for paint systems from single manufacturer.

.3 Use only MPI listed L-rated materials.

.4 Conform to latest MPI requirements for all painting work, including preparation and priming.

.5 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI - Architectural Painting Specification Manual "Approved Product" listing.

.6 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.

2.2 COLOURS

.1 Refer to Drawings: Paint Finish Schedule(s).

.2 Colours to be selected by Departmental Representative from manufacturer’s full range; associated painted trim to match adjacent wall.

.3 Minimum number of coats shall be three: primer and two topcoats, minimum, plus additional as required to achieve opaque, uniform colour.

.4 Second coat in three-coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Unless otherwise specified or pre-approved, all paint shall be ready-mixed and pre-tinted. Re-mix all paint in contained prior to and during application to ensure break-up of lumps, completed dispersion of settled pigment, and colour and gloss uniformity.

.2 Mix paste, powder, or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.

.4 Thin paint for spraying in accordance with paint manufacturer's instructions.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

Description / Gloss Level	Gloss @ 60 degrees	Sheen @ 85 degrees
G1 - Matte Finish (flat)	Max. 5	Max. 10
G2 - Velvet-Like Finish	Max.10	10 to 35
G3 - Eggshell Finish	10 to 25	10 to 35
G4 - Satin-Like Finish	20 to 35	min. 35
G5 - Traditional Semi-Gloss Finish	35 to 70	
G6 - Traditional Gloss	70 to 85	
G7 - High Gloss Finish	More than 85	

.2 Gloss level ratings of painted surfaces as indicated or otherwise specified.

2.5 EXTERIOR PAINTING

.1 Unless otherwise specified, all exterior painting work shall be in accordance with MPI Premium Grade finish requirements; minimum 3 coats typically, and minimum of 4 coats where deep or bright colors are used.

.2 Structural Steel and Metal Fabrications:

.1 EXT 5.1T - Polyurethane, pigmented finish (over H.B. self-priming epoxy).

.3 Galvanized Metal:

.1 EXT 5.3D - Polyurethane, pigmented finish (over vinyl wash and epoxy primer).

2.6 INTERIOR PAINTING

.1 Unless otherwise specified, all interior painting work shall be in accordance with MPI Premium Grade finish requirements; minimum 3 coats typically, and minimum of 4 coats where deep or bright colors are used.

.2 All structural, electrical and mechanical elements at exposed areas shall be primed and finish painted to MPI Premium Grade requirements.

.3 All metal doors, frames, balustrades and railings shall be primed and finish painted to MPI Premium Grade requirements.

.4 Structural Steel and Metal Fabrications:

.1 INT 5.1F - Polyurethane, pigmented finish (over epoxy primer).

.5 Galvanized metal:

.1 INT 5.3M - High performance architectural latex semi-gloss finish.

.6 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock" type material, and textured finishes (refer to Drawings for locations):

.1 INT 9.2B - High performance architectural latex; eggshell finish for walls and matte finish for ceilings. Colour: match Benjamin Moore Designer Classics, CC-20.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 GENERAL

.1 Perform preparation and operations for interior and exterior painting in accordance with MPI - Architectural Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work. Proceeding with work means acceptance of conditions.

.2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:

.1 Stucco, plaster, and gypsum board: 12%.
.2 Concrete: 12%.
.3 Wood: 15%.
.4 Clay and Concrete Block/Brick: 12%.

3.4 PREPARATION

.1 Protection:

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect passing pedestrians, other workers, and general public in and about the building.

.2 Surface Preparation:

.1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.

.2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.

.3 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual requirements and coating manufacturer's recommendations. Refer to MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.

.2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.

.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.4 Allow surfaces to drain completely and allow to dry thoroughly.

.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.

.6 Use trigger operated spray nozzles for water hoses.

.7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

.4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.

.5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.

.1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.

.2 Apply wood filler to nail holes and cracks.

.3 Tint filler to match stains for stained woodwork.

.6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by vacuum cleaning.

.8 Touch up of shop primers with primer as specified.

.9 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.5 APPLICATION

.1 Method of application shall be as approved by Departmental Representative. Apply paint by brush, roller, air sprayer or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in uniform layer using brush and/or roller type suitable for application.

.2 Work paint into cracks, crevices, and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers, or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers, or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.

.5 Remove runs, sags, brush marks from finished work, and repaint.

.3 Spray application:

.1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.

.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

.3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.

.4 Brush out immediately all runs and sags.

.5 Use brushes and rollers to work paint into cracks, crevices, and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

.5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum period as recommended by manufacturer.

.7 Sand and dust between each coat to provide an anchor for next coat and to remove defects in previous coat (runs, sags, etc.) visible from a distance up to 1000 mm (39").

.8 To avoid air entrapment in applied coats, apply materials in accordance with manufacturer's spread rates and application requirements.

.9 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.10 Finish inside of cupboards and cabinets as specified for outside surfaces.

.11 Finish closets and alcoves as specified for adjoining rooms.

.12 Finish top, bottom, edges, and cut-outs of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Unless otherwise noted, repainting shall also include exposed to view / previously painted mechanical and electrical equipment and components (panels, conduits, piping, hangers, ductwork, etc.).

.2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour, and sheen finish to match existing unless otherwise noted or scheduled.

.3 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.

.4 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.

.5 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.6 Do not paint over nameplates.

.7 Keep sprinkler heads free of paint.

.8 Paint inside of ductwork where visible behind grilles, registers, and diffusers with primer and one coat of matt black paint.

.9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.10 Paint natural gas piping yellow.

.11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.12 Do not paint interior transformers and substation equipment.

3.7 FIELD QUALITY CONTROL

.1 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Agency

.2 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.3 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

.4 Painted interior surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to the Departmental Representative:

.1 brush / roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.

.2 evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.

.3 damage due to touching before paint is sufficiently dry or any other contributory cause.

.4 damage due to application on moist surfaces or caused by inadequate protection from the weather.

.5 damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).

.5 Painted interior surfaces shall be considered unacceptable if any of the following are evident under final lighting source conditions:

.1 visible defects are evident on vertical surfaces when viewed at 90 degrees to the surface from a distance of 1000 mm (39”).

.2 visible defects are evident on horizontal surfaces when viewed at 45 degrees to the surface from a distance of 1000 mm (39”).

.3 visible defects are evident on ceiling surfaces when viewed at 45 degrees to the surface.

.4 when the final coat on any surface exhibits a lack of uniformity of sheen across full surface area.

.6 Painted surfaces rejected by the Departmental Representative shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

.2 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications

.2 Section 06 10 10 – Rough Carpentry

.3 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM A153/A153M-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.2 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM A666-10, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

.4 ASTM A924/A924M-13, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.5 ASTM A1008/A1008M-13, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

.6 ASTM B16/B16M – 10, Standard Specifications for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.

.7 ASTM B19 – 10, Standard Specification for Cartridge Brass Sheet, Strip, Place, Bar, and Disks.

.8 ASTM B456-11, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

.2 Canadian Standards Association (CSA)

.1 CSA B651-12, Accessible Design for the Built Environment.

.2 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet.

.3 Shop Drawings:

.1 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

.4 Submit closeout data in accordance with Section 01 11 10 – General Requirements: Closeout Submittals:

.1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 11 10 – General Requirements: Closeout Submittals.

.2 Include list of sources for disposable supplies, replacement parts and service recommendations.

1.4 EXTRA MATERIALS

.1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 11 10 – General Requirements: Closeout Submittals.

.2 Deliver special tools to Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Sheet steel: to ASTM A653/A653M cold rolled, commercial quality, 0.912 mm minimum nominal thickness, with ZF001 designation zinc coating.

.2 Stainless steel sheet metal: to ASTM A666, Type 304, finish as indicated in component list in 1.519 mm minimum nominal thickness.

.3 Stainless steel tubing: Type 304, commercial grade, seamless welded, 1.2 mm wall thickness.

.4 Fasteners: concealed screws and bolts hot dip galvanized after fabrication, tamper and theft resistant exposed fasteners to match material of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 SOLE SOURCE

.1 Furnish components from a single manufacturer for this project; this manufacturer shall be identified as the ‘prime manufacturer’.

.2 If a component is not available from the ‘prime manufacturer’, furnish that component from a single manufacturer.

2.3 COMPONENTS

.1 Toilet tissue dispenser (jumbo roll type): holds twin jumbo rolls, surface-mounted, stainless steel construction, equipped with tumbler lock, accommodates two 55 mm diameter rolls, satin finish.

.2 Automatic surface-mounted alcohol-based hand rub dispenser: type 304 stainless steel, 1.0 mm thick, concealed mounting, 800 ml capacity. Requires 4 “AA” cell batteries, hand motion activated by placing hand under spout for approximately one second.

.3 Surface-mounted 18-8 type 304, 0.8 mm thick stainless steel paper towel dispenser and waste receptacle with all-welded construction, satin finish. Unit capable of dispensing 600 C-fold or 800 multifold paper towels without adjustment or use of adapters; waste container – removable leak-proof, rigid moulded plastic, 14.4 litre (3.8 gallon) capacity.

.4 Grab bars: 18-8 type 304 stainless steel, lengths as indicated or required, straight 38 mm dia x 1.2 mm thick of stainless steel with satin finish, concealed mounting flanges, screw attachment, flanges welded to tubular bar, provided with steel back plates and all accessories. Knurl bar at area of hand grips. Grab bar material and anchorage to withstand downward pull of 2.2 kN. Refer to Drawings for respective lengths, 610 mm if not otherwise indicated.

.5 Grab Bar: Left or right, 90º angle, 32 mm diameter, 760 x 760 mm (30” x 30”) stainless steel, peened grip; satin finish at end bar and flange; 75 mm diameter concealed mounting plate, with flange secured by set screws; 38 mm from wall finish. WA-7 shall be 760 mm x 760 mm; WA-7A shall be 900 mm x 760 mm.

.6 Vandal-resistant, surface-mounted clothes hook, secured from front, 2 mm thick, type 304 stainless steel, auto-release hook tested to hold 20 lbs and release 35 - 40 lbs or greater.

.7 Utility Room:

.1 Surface mounted utility shelf with mop/broom holders and rag hooks. Utility Shelf: dimensions as indicated, or if not indicated, as follows: 24" (865 mm) long x 5" (205 mm) wide, 18-gauge (1.2 mm), type 304 stainless steel alloy 18-8 satin finish. Three mop holders, four rag hooks.

.8 Baby Changing Table: surface mounted wall unit of high impact fungi and bacteria resistant polyethylene, concealed full-length steel on steel hinge assembly, sanitary liner dispenser, safety belt, safety instructions in both official languages.

.1 Acceptable materials:

.1 KB100-00 Horizontal Change Station, Koala Kare.

.2 Wall Mounted Changing Station, Safe Strap.

2.4 FABRICATION

.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

.2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.

.3 Brake form sheet metal work with 1.5 mm radius bends.

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building finishes to prevent electrolysis.

.6 Hot-dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.

.7 Shop assemble components and package complete with anchors and fittings.

.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.

.9 Provide steel anchor plates and components for installation on studding and building framing.

2.5 FINISHES

.1 Stainless steel: type 304, 18-8, satin finish.

.2 Chrome and nickel plating: to ASTM B456, satin finish.

.3 Baked enamel: condition metal by applying one coat of metal conditioner to CGSB 31-GP-107Ma, apply one coat Type 2 primer to CAN/CGSB-1.81 and bake, apply two coats Type 2 enamel to CAN/CGSB-1.88 and bake to hard, durable finish. Sand between final coats. Colour selected from standard range by Departmental Representative.

.4 Manufacturer's or brand names on face of units not acceptable.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrates and surfaces to receive toilet and bathroom accessories previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to toilet and bathroom accessories installation.

.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 from Departmental Representative.

3.2 INSTALLATION

.1 Install and secure accessories rigidly in place as follows:

.1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.

.2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.

.3 Solid masonry, marble, stone, or concrete: use bolt with lead expansion sleeve set into drilled hole.

.4 Toilet/shower compartments: use male/female through bolts.

.2 Install grab bars on built-in anchors provided by bar manufacturer.

.3 Use tamper-proof screws/bolts for fasteners.

.4 Install mirrors in accordance with manufacturer’s printed instructions.

.5 Fill units with necessary supplies shortly before final acceptance of building.

3.3 ADJUSTING

.1 Adjust toilet and bathroom accessories components and systems for correct function and operation in accordance with manufacturer's written instructions.

.2 Lubricate moving parts to operate smoothly and fit accurately.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by washroom accessory installation.

3.6 SCHEDULE

.1 Locate accessories where indicated on Drawings, and to CSA B651. Exact locations determined by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 10 – Rough Carpentry.

.2 Section 07 46 23 – Wood Siding.

.3 Section 07 92 00 – Joint Sealants.

.4 Electrical Drawings and Specifications.

1.2 REFERENCES

.1 CSA International

.1 CSA B651-12, Accessible Design for the Built Environment.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA ICS 6-1993 (R2001, R2006, R2011), Industrial Control and Systems: Enclosures.

.3 Underwriters Laboratories (UL)

.1 UL 991, Standard for Tests for Safety-Related Controls Employing Solid-State Devices (2014).

1.3 SYSTEM DESCRIPTION

.1 Ticket dispensers for admission to Terra Nova National Park (north and south entrances), requiring entry of licence plate number during ticket acquisition process, and for placement of purchased ticket on automobile interior dashboard.

.2 Dispensers shall be able to efficiently process the approximately 18,000 or more visitors to the park each year.

1.4 PRE-INSTALLATION MEETINGS

.1 Convene pre-installation meeting, in accordance with section 01 11 11 – General Requirements: Project Meetings, 1-week prior to beginning work of this specification section and on-site installation, with Contractor, Departmental Representative, and installer to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building trades.

.4 Review manufacturer's installation instructions and warranty requirements

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide required information in accordance with section 01 11 11 – General Requirements: Submittal Procedures.

.2 Submit manufacturer’s printed installation instructions, technical datasheets, standard details, and specifications for products specified.

.3 Submit shop drawings indicating the following:

.1 Plans, elevations, sections, details, and attachments to other work

.2 Detailed equipment assemblies with dimensions, required clearances, method of field assembly, components, and location and size of each field connection

.3 Wiring diagrams for power, signal, and control wiring.

.4 Provide operations and maintenance information in accordance with section 01 11 11 – General Requirements: Closeout Submittals.

.5 Submit operation and maintenance data for ticket dispensers including emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Manufacturer must have been in continuous operation for a minimum of 5-years. Manufacturer shall have current version of each primary component currently operating successfully in 5 or more admission facilities of same size, magnitude, environmental conditions and exposure as required for this Contract. Primary admission products listed are based on no particular manufacturer's product and represent the minimum features and quality required.

.2 Installer Qualifications: Installation shall be performed by factory-authorized installer specifically trained in installation of admission ticket dispensers of the type specified in this section.

.1 Provide documentation of maintenance and repair service availability for emergency conditions.

.2 Provide quarterly maintenance for one year following Substantial Performance of the Project.

.3 Obtain admission ticket dispensers through one source from a single manufacturer.

.4 Electrical components, devices, and accessories shall be listed and labelled in accordance with CSA and Canadian Electrical Code by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 COORDINATION

.1 Coordinate installation of anchorages for admission ticket dispensers, and as follows:

.2 Provide setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

.3 Deliver items for building-in to site in time for installation.

.4 Coordinate layout and installation of ticket dispensers with connections to power supplies.

1.8 WARRANTY

.1 Provide manufacturer's standard warranty, which shall commence at date of Certificate of Substantial Performance.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Barrier-free ticket dispenser for all-in-one parking / park entrance fee ticket purchase for placement on vehicle dash.

2.2 EQUIPMENT SPECIFICATIONS

.1 Barrier-Free Requirement:

- .1 Installed equipment shall meet the requirements of CSA B651, Accessible Design for the Built Environment, and shall be comfortably usable from both standing and sitting positions.

.2 Environmental Conditions:

- .1 Equipment shall be designed, manufactured and installed to function as designed and intended under the following minimum site conditions:
  - .1 Fully exposed to local weather conditions in all seasons of the year.
  - .2 Minimum operating temperature range: -29 degrees Celsius to +50 degrees Celsius.
  - .3 Minimum humidity range: up to 95% RH (non-condensing).

.3 Cabinet Materials:

- .1 Welded reinforced Grade 304-2B stainless steel, 3 mm thick, for cabinet and doors.
- .2 Aluminium front, with scratch-resistant, impact-resistant, UV-resistant clear polycarbonate display covers for LCD screens, rate/instruction plate, LED panel and site branding display.
- .3 Colour: as selected by Departmental Representative from manufacturer's standard range.

.4 Power Supply Configuration:

- .1 AC Single Phase, 120 VAC, 60 Hz.
- .2 Uninterruptible power supply can bridge up to 25 min.

.5 Operating System and Hardware:

- .1 Industrial PC, Windows Embedded Standard 7 operating system, SQL database.
- .2 Latest technology 32 Bit ARM® RISC-based processor.
- .3 Memory 32 MB of SDRAM and 32 MB of Flash memory.

.6 Communications:

- .1 Both wide area or local area pay-by-space network options are supported, allowing payment for any space, at any machine, at any time.
- .2 Ethernet port that can support hardwire (Cat5) cable or add-on WiFi devices for local network connection.

.7 Payment Systems:

- .1 Coins.
- .2 Credit cards, utilizing secure, on-line real-time PCI-compliant processes.
- .3 Bills.

.8 Ticket Printing:

- .1 Thermal printer offers alphanumeric printing in various fonts and languages; multi-language capability shall allow users to select the language of their choice to carry out transactions, which shall, at minimum, include English and Français.
- .2 Ticket size: Standard - Short 75 mm x 57 mm or Long 100 mm x 57 mm as selected by Departmental Representative.
- .3 Ticket capacity: 4,000 3-inch tickets per roll.

.9 Display:

- .1 High contrast, color, sunlight readable, 640-pixel x 480-pixel graphics LCD.
- .2 Viewing area 114 mm x 89 mm.
- .3 Self-adjusting contrast to temperature.
- .4 LED back light.

.10 Coin Acceptor:

- .1 Programmable: Accepts up to 16 different coins.
- .2 Programmed coin acceptance can be turned on/off with a switch.
- .3 High coin storage capacity of self-refilling change bins (4 x approximately 1000 coins).
- .4 Self-locking coin cashbox made from Grade 304-2B stainless steel.

.11 Card reader:

- .1 Single slot, dual mode card reader captures magnetic stripe (ISO/IEC 7810 and ISO/IEC 7811) credit card data, and provides an ISO/IEC 7816 interface for smart card acceptance.

.12 Keypads and Buttons:

- .1 Tactile feedback keypad and buttons.
- .2 Vandal resistant and rated for resistance to impact, shock and vibration to MIL standards.
- .3 Sealed against ingress of water and dust to IP67, and designed for exposed outdoor and extreme environmental conditions.
- .4 LED accept and cancel buttons that light up.

.13 Printer:

- .1 Heavy-duty printer head with minimal moving parts ensuring quality, reliability and endurance.
- .2 Print life of over 20 million character lines.
- .3 Designed for high-resolution printing.

.4 Guillotine type cutter with full or partial paper cutting options (software selectable).

.5 Accessible for ease of maintenance.

.14 Cashbox:

.1 Two (2) supplied with each machine, each with a convenient carry handle.

.2 Rugged, secure, high-capacity 4.2 litres, stainless steel container.

.3 Self-locking lid on removal, and includes a high security lock/key (unique key codes available at option of Departmental Representative).

.4 Printed audit record produced when cashbox is removed from machine (software selectable).

.15 Bill Acceptor:

.1 Built-in, integrated bill acceptor.

.2 Bill cassette with 1000 bill capacity secured in cash vault.

.3 Programmed bill acceptance can easily be turned on/off on-site.

.4 Reads bills inserted in any of 4 directions.

Part 3 Execution

3.1 COMPLIANCE

.1 Comply with NBC and directions of authorities having jurisdiction.

.2 Comply with manufacturer's printed installation instructions, technical datasheets, specifications, and details.

3.2 EXAMINATION

.1 Examine substrates, areas, and conditions for compliance with requirements for installation tolerances, critical dimensions, and other conditions affecting performance.

.2 Examine roughing in for electrical systems to verify actual locations of connections before ticket dispenser installation.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

.1 Coordinate with other trades as required for items to be set in concrete or built-in to assemblies, and templates for laying out.

3.4 INSTALLATION

.1 The specified equipment shall be installed by a qualified ticket dispenser equipment installer who shall be responsible for mounting all equipment and hook-up of low voltage, computer communications and wiring. Equipment installer shall install all components necessary for a completely operational system as described herein.

.2 Install in accordance with manufacturer's printed installation instructions.

.3 Anchor cabinets to concrete base and adjacent assemblies with anchor bolts or expansion anchors.

.4 Connect wiring, and ground equipment, in accordance with electrical Drawings and Specifications.

3.5 FIELD QUALITY CONTROL

.1 Engage a factory-authorized service representative to inspect, test, and adjust equipment installation, including connections, to assist in field testing, and to provide written results of inspection

.2 Perform the following field tests and inspections, and prepare test reports:

.1 Confirm proper unit operation after electrical circuitry has been energized.

.2 Test controls and safeties and adjust to suit field conditions.

.3 Report any damaged and malfunctioning controls and equipment.

.3 Remove and replace ticket dispensers where test results indicate that it does not comply with specified requirements.

3.6 COMMISSIONING

.1 Adjust ticket dispensers to operate smoothly, easily, and properly.

.2 After completing installation of exposed, factory finished ticket dispensers, inspect exposed finishes and repair damaged finishes.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.4 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.5 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.8 PROTECTION

.1 Protect installed products until completion of project.

.2 Touch-up, repair or replace damaged products before Substantial Performance.

3.9 DEMONSTRATION AND TRAINING

.1 Demonstration and Training:

.1 Engage a factory-authorized service representative to train Departmental Representative in the adjustment, operation, and maintenance of installed ticket dispensers.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

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

.2 Section 07 27 14 – Air and Vapour Barriers.

.3 Section 08 31 00 – Access Doors and Frames.

.4 Section 31 00 99 – Common Work Results for Earthworks.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ASME A112.19.2-2013 / CSA B45.1-13, Ceramic Plumbing Fixtures, Includes Update No. 1 (2013).

.2 ASTM International Ltd.

.1 ASTM D638-14, Standard Test Method for Tensile Properties of Plastics.

.2 ASTM D1693-15, Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.

.3 ASTM D4883-08, Standard Test Method for Density of Polyethylene by the Ultrasound Technique.

.3 National Sanitation Foundation (NSF)

.1 NSF 61-2014a, Drinking Water System Components - Health Effects.

.4 Canadian Standards Association (CSA)

.1 CAN/CSA B45 SERIES-02 (R2013), Plumbing Fixtures (Consists of B45.0-02, B45.1-02, B45.2-02, B45.3-02, B45.4-02, B45.5-02, B45.6-02, B45.7-02, B45.8-02 and B45.9-02), Includes Updates No. 1, No. 2, No. 3, and No. 4 (2007).

.2 CSA B125-01, Plumbing Fittings.

.3 CSA B651-12, Accessible Design for the Built Environment.

.5 Authority Having Jurisdiction

.1 Conform to the requirements of the Authority Having Jurisdiction.

.6 Approvals

.1 Obtain approval from the Authority Having Jurisdiction before beginning installation.

.2 Pay all costs associated with such approvals and checking.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, standard details, specifications and technical datasheets.

.3 Shop Drawings:

.1 Indicate fixtures and trim:

.1 Dimensions, construction details, roughing-in dimensions.

.2 Connections to drain and vent stack.

.3 Securement of fixture and piping to structure.

.4 Closeout Submittals:

.1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 11 10 – Project General Requirements: Closeout Procedures.

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

1.4 EXTRA MATERIALS

.1 Provide special tools required for accessing, assembly/disassembly or removal of toilet components in accordance with requirements specified in Section 01 11 10 – General Requirements: Closeout Submittals.

.2 Deliver special tools to Departmental Representative.

1.5 QUALITY ASSURANCE

.1 Products shall be certified by the National Sanitation Foundation under Standard 41 (day-use, park).

1.6 WARRANTY

.1 Provide manufacturer's standard warranty.

Part 2 Products

2.1 MANUFACTURED UNITS

.1 Fixtures: manufactured in accordance with CSA B45 series.

.2 Trim, fittings: manufactured in accordance with CSA B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: Architectural drawings to govern.

.5 Fixtures to be product of one manufacturer and of same type.

.6 Trim to be product of one manufacturer and of same type.

2.2 CAPACITY

.1 Commercial Waterless Composting System:

.1 Solids storage capacity: 81 cubic feet; 604 gallons.

.2 Liquid storage capacity: 40 cubic feet; 300 gallons.

.3 Daily capacity at average temp. >65°F: 60 visits.

.4 Annual capacity at average temp. >65°F: 22,000 visits.

2.3 COMPOSTING TOILET DESCRIPTION

.1 Prefabricated Waterless Toilets:

.1 Constructed of impact resistant fiberglass with sanitary white finish. Seat and lid shall be made of plastic; the liner rotationally molded polyethylene. The toilet shall be located directly over the composter, which shall be situated in a space below. The toilet shall be connected with a 14" diameter straight chute.

.2 Toilet Height: ADA Compliant: 18".

.3 Toilet Width: 18.5".

.4 Toilet Length: 23.75".

.5 Design shall conform to the requirements for universal access of the Americans with Disabilities Act.

.6 Colour: bone white.

.2 Composter Base:

.1 Composter Base shall be composed of rotationally molded high-density linear polyethylene resin conforming to the following minimum specifications:

.1 Density (to ASTM D4883): 0.942 g/cm^3.

.2 Tensile Strength at Yield (to ASTM D638): 2.950 psi.

.3 Dart Impact (-40°C, 250 mils thickness): 108ft-lbs.

.4 Environmental Stress Crack Resistance, 100% lgepal (to ASTM D1693): 550 hrs.

.2 Length: 118"; Width: 67.75"; Height: 48".

2.4 VENTILATION

.1 The ventilation system shall be designed to oxygenate the compost pile and to keep the toilet room odour free. Air shall be drawn down the toilet opening and then vented to the exterior at roof level, carrying away odour, carbon dioxide and water vapour. Each system shall come with its own AC or DC fan (as selected by Departmental Representative), which will carry out the function of a conventional bathroom exhaust fan. The AC fan is 115 volts, 20 watts; the DC fan is 12 volts and uses .8 amps per hour. There must be no other exhaust fan or other competing air flow.

2.5 ACCESSORIES AND FIXTURE PIPING

.1 Provide accessories as required for a complete installation, including securement to structure.

.2 Vent pipe: 2” PVC Thinwall (supply as required, connected to exterior roof vent exhaust). Coordinate with other trades as required.

.3 Drain: ¾” O.D.; Brass P trap with cleanout on fixtures not having integral trap; Chrome plated in exposed places.

.4 Provide brackets, fasteners and anchors as required for a complete installation.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrates and surfaces to receive toilet components are acceptable for product installation in accordance with manufacturer's instructions prior to toilet and bathroom accessories installation.

.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 from Departmental Representative.

3.2 INSTALLATION

.1 Comply with manufacturer’s printed installation instructions, data sheet, standard details, and specifications.

.2 All installation work to be in accordance with the National Building Code of Canada, 2010, and directions of the authority having jurisdiction.

.3 Coordinate connection to power, connection of vent pipe to toilet and vent stack covers at roof, connection of emergency overflow drain system.

.4 Verify settings and adjust for proper operation. Verify proper functioning of controls.

.5 Train Owner’s personnel in manufacturer’s recommended operation and maintenance of unit.

.6 Protect finished installations until turn over to Owner.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by washroom accessory installation.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This Section covers items common to Sections of Division 26.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.2 CAN/CSA-22.3 No. 1, Overhead Systems.

.3 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

1.3 CARE, OPERATION AND START-UP

.1 Instruct Owner's Representative and operating personnel in the operation, care and maintenance of systems, system equipment and components.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.4 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.4 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 SUBMITTALS

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.5 Quality Control: in accordance with Section 01 45 00 - Quality Control.

- .1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for approval before delivery to site.
- .2 Submit test results of installed electrical systems and instrumentation.
- .3 Submit, upon completion of Work, load balance report as described in sentence 3.4.6.
- .4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Owner's Representative.

.6 Manufacturer's Field Reports: submit to Owner's Representative within seven (7) working days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in paragraph 3.6- FIELD QUALITY CONTROL.

.7 Single Line Electrical Diagrams

- .1 Provide single line electrical diagrams in glazed frames as follows:
  - .1 Electrical distribution system: locate in main electrical room.
  - .2 Electrical power generation and distribution systems: locate in power plant rooms.
- .2 Provide fire alarm riser diagram, plan and zoning of building in glazed frame at fire alarm control panel and annunciator.
- .3 Drawings: 600 x 600 mm minimum size.

.8 The electrical contractor shall supply an arc-flash study of the building's entire distribution system, to be performed by the successful electrical equipment supplier. The contractor shall furnish the supplier with distances, wire lengths and transformer shop drawings as required. Supply also stick-on labels for all equipment, identifying the arc-flash hazard rating of each distribution board and panel board. Such labelling shall meet CSA Z462. Supply one full set of Personal Protective Equipment required for each identified hazard rating in the arc-flash study. The arc-flash study shall be submitted with the electrical distribution

equipment shop drawings. The electrical distribution equipment shop drawings will not be reviewed until the arc-flash study is received.

1.6 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Division and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

.3 Owner's Representative will provide drawings and specifications required by Electrical Inspection Division and Supply Authority at no cost.

.4 Notify Owner's Representative of changes required by Electrical Inspection Division prior to making changes.

.5 Furnish Certificates of Acceptance from Electrical Inspection Division or authorities having jurisdiction on completion of work to Owner's Representative.

1.7 CO-ORDINATION

.1 Co-ordinate work with work of other divisions to avoid conflict.

.2 Locate distribution systems, equipment, and materials to provide minimum interference and maximum usable space.

.3 Locate all existing underground services and make all parties aware of their existence and location.

.4 Where interference occurs, Owner's Representative must approve relocation of equipment and materials regardless of installation order.

.5 Notwithstanding the review of shop drawings, this division may be required to relocate electrical equipment which interferes with the equipment of other trades, due to lack of co-ordination by this Division. The cost of this relocation shall be the responsibility of this Division. The Owner's Representative shall decide the extent of relocation required.

1.8 CUTTING AND PATCHING

.1 Inform all other divisions in time, concerning required openings. Where this requirement is not met, bear the cost of all cutting. Openings of 200 mm or smaller shall be the responsibility of Division 26. Openings larger than 200 mm shall be the responsibility of Division 1. Obtain written approval of Structural engineer before drilling any beams or floors.

1.9 PROTECTION

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark all live parts “LIVE 120 VOLTS”, or with appropriate voltage in English.

.3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

1.10 RECORD DRAWINGS

.1 Obtain and pay for three sets of white prints. As the job progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times and present for scrutiny at each job meeting.

.2 Show on the record drawings the installed inverts of all services entering and leaving the building and the property. Dimension underground services at key points of every run in relation to the structure and building.

.3 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.

.4 Submit record drawings within 30 days prior to start of commissioning.

1.11 INSPECTION OF WORK

.1 The Owner will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications but will not execute quality control. The Contractor shall be responsible for the execution of his work in conformity with the construction documents and with the requirements of the inspection authority.

1.12 SCHEDULING OF WORK

.1 Work shall be scheduled in phases as per other divisions of the architectural specifications.

.2 Become familiar with the phasing requirements for the work and comply with these conditions.

.3 No additional monies will be paid for contractor’s requirement to comply with work phasing conditions.

1.13 FIRE RATING OF PENETRATIONS

.1 Maintain fire ratings around conduits passing through floors, ceilings and fire rated walls.

.2 Use 3M brand or equal fire barrier products at each penetration.

.3 Acceptable products for fire barrier products shall be 3M #CP25 fire barrier caulk, #303 putty, #FS 195 wrap and #CS195 sheet.

.4 Acceptable manufacturers: Nelson, Fire Stop Systems, 3M or approved equal. Material of same manufacturer to be used throughout project..

Part 2 Products

2.1 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings, where applicable.

.2 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 25 and shown on mechanical drawings. Division 25 – EMCS Controls Contractor is responsible for all conduit, wiring and connections below 50V which are related to control systems in Division 25 and shall comply with the requirements of Division 26 for standard of quality..

2.2 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Division.

.3 Factory assemble control panels and component assemblies.

2.3 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1.

.2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.

2.4 WARNING SIGNS

.1 As specified and to meet requirements of Electrical Inspection Department and Owner’s Representative.

.2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

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

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, black white face, black white core, mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

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

.2 Labels:

.1 Embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Owner's Representative prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate and label.

.5 Identification to be English (and French where applicable).

.6 Nameplates for terminal cabinets and junction boxes to indicate system name and voltage characteristics.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Terminal cabinets and pull boxes: indicate system name and voltage.

.9 Transformers: indicate capacity, primary and secondary voltages and transformer number.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1, Canadian Electrical Code.

.4 Use colour coded wires in communication cables, matched throughout system.

2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

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

Part 3 Execution

3.1 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.2 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 27 26 – Wiring Devices.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

3.4 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical at following heights unless indicated otherwise.

- .1 Local switches: 1200 mm.
- .2 Wall receptacles:
  - .1 General: 300 mm.
  - .2 Above top of continuous baseboard heater: 200mm.
  - .3 Above top of counters or counter splash backs: 175 mm.
  - .4 In mechanical rooms: 1400 mm.
- .3 Panelboards: as required by Code or as indicated.
- .4 Telephone and interphone outlets: 300 mm.
- .5 Wall mounted telephone and interphone outlets: 1400 mm.
- .6 Fire alarm stations: 1200 mm.
- .7 Fire alarm bells: 2400 mm.
- .8 Television outlets: 300 mm.
- .9 Wall mounted speakers: 2400 mm.
- .10 Clocks: 2400 mm.
- .11 Door bell pushbuttons: 1200 mm.
- .12 Exit lights: 2400 mm.
- .13 Emergency lighting heads: 2400 mm.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.6 FIELD QUALITY CONTROL

.1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks – the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

.2 The work of this division to be carried out by a contractor who holds a valid Code 1 Electrical Contractor License as issued by the Province.

.3 Perform tests in Accordance with this section as noted.

.4 Load Balance:

- .1 Measure phase current to panelboard with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

.5 Conduct and pay for following tests:

- .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
- .2 Circuits originating from branch distribution panels.
- .3 Lighting and its control.
- .4 Motors, heaters and associated control equipment including sequenced operations of systems where applicable.
- .5 Systems: fire alarm system, communications.

.6 Furnish manufacturer’s certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer’s instructions.

.7 Insulation resistance testing.

- .1 Megger and record circuits, feeders and equipment up to 350 V with a 500 V instrument.
- .2 Megger and record 350 – 600 V circuits, feeders and equipment with a 1000 V instrument.
- .3 Check resistance to ground before energizing and record value.

.8 Carry out tests in presence of Owner’s Representative.

.9 Provide instruments, meters, equipment and personnel required to conduct tests during and conclusion of project.

.10 Submit test results for Owner's Representative's review and include in Commissioning Manuals.

3.7 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.

.2 CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for stranded copper conductors.

.2 Clamp for copper bar.

.3 Stud clamp bolts.

.4 Bolts for copper bar.

.5 Sized for conductors and bars as indicated.

.4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

.2 Install fixture type connectors and tighten. Replace insulating cap.

.3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

.2 Refer to drawings for wiring type required under different applications.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No. 131, Type TECK 90 Cable.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE as indicated. Provide RWU90 XLPE rated cable for underground wiring. Related to new service entrance feeders and site lighting circuits. RWU90 XLPE not required under interior floor slabs.

.3 Copper conductors: size as indicated, with thermoplastic insulation type TWH rated at 600 V, typically used for insulated ground wires.

2.2 TECK Cable

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Cross-linked polyethylene XLPE, rating – 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking aluminum, compliant to applicable Building Code classification for this project.

.6 Overall covering: thermoplastic polyvinyl chloride material.

.7 Fastenings:

.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables at 1500 mm centers.

.3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors:

.1 Watertight and/or type approved for TECK cable, as indicated.

2.3 CONTROL CABLES

.1 Type LVT: 2 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket.Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type TW -40° C polyethylene insulation with shielding of tape coated with paramagnetic material wire braid over each conductor and overall covering of PVC jacket.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests using method appropriate to site conditions and to approval of Owner’s Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 No splices permitted in panel board feeders in new construction. Splices in re-work or renovation projects only with pre-approval by Owner’s Representative.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34- Conduits, Fastenings and Fittings.

.2 In underground ducts in accordance with Section 26 05 43.01- Installation of Cables in Ducts.

.3 In surface and lighting fixture raceways in accordance with Section 26 50 00- Lighting.

.4 Overhead service conductors in accordance with Section 26 24 01 - Service Equipment.

3.4 INSTALLATION OF TECK CABLE 0 -1000 V

.1 Install cables.

.1 Group cables wherever possible on channels.

.2 Install cable concealed, securely supported by straps and hangers.

3.5 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit as indicated.

.2 Ground control cable shield.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

.2 Grounding conductors for all distribution grounding to be insulated copper, uninsulated where in contact with earth. Copper conductors shall, at a minimum, be used in the following areas: service entrance switch ground of neutral, telephone and data system grounds and circuits rated less than 60 amps.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA)

.1 CAN/CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities, where applicable.

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as indicated to electrically conductive underground water pipe.

.2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated.

.3 Rod electrodes: copper clad steel 19 mm dia by 3 m long.

.4 Plate electrodes: copper, surface area 0.2 m^2, 1.6 mm thick.

.5 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.6 Insulated grounding conductors: green, type TW.

.7 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.8 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors, as required by local authority having jurisdiction.

.4 Thermit welded type conductor connectors, as indicated.

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run insulated copper ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Install separate ground conductor to outdoor lighting standards.

.10 Connect building structural steel and metal siding to ground by welding copper to steel.

.11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.12 Bond single conductor, metallic armoured cables to cabinet at supply end and load end.

.13 Ground secondary service pedestals.

3.2 ELECTRODES

.1 Make ground connections to continuously conductive underground water pipe on street side of water meter.

.2 Install water meter shunt.

.3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.

.4 Install rod, plate electrodes and make grounding connections.

.5 Bond separate, multiple electrodes together.

.6 Use size 2/0, 3/0 or 4/0 AWG copper conductors for connections to electrodes as required by code.

.7 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.3 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of primary 600 V system, secondary 208 V system.

3.4 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.5 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room.

.2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size as required by code.

3.6 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone / data as follows:

.1 Telephones: make telephone grounding system in accordance with telephone company's requirements.

3.7 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Owner's Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 General (not applicable)

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted suspended or set in poured concrete walls and ceilings as required.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.
- .4 Strap AC-90 cable at box location plus every 900 mm.

.7 Suspended support systems.

- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing, wood blocking, plastic strap or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Owner's Representative.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 REALTED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical.

1.2 SUBMITTALS

.1 Submit shop drawings and product data for cabinets.

.2 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Provide drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada.

Part 2 Products

2.1 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.3 CABINETS

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

.2 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing 19 mm fir plywood backboard for surface flush mounting.

Part 3 Execution

3.1 SPLITTER INSTALLATION

.1 Install splitters and mount plumb, true and square to the building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.3 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Install size 2 identification labels indicating system name voltage and phase.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical.

.2 Section 26 05 29 – Hangers and Supports for Electrical Systems.

.3 Section 26 05 34 – Conduits, Conduit Fastenings and Fittings.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

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

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.3 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.4 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster walls.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 FLOOR BOXES

.1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass faceplate. Device mounting plate to accommodate short or long ear duplex receptacles. Minimum depth: 28 mm for receptacles; 73 mm for communication equipment.

.2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 12 mm and 19 mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.7 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

.1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables. For use in wood stud construction only.

2.8 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

.5 Double split rings for AC-90 terminations.

2.9 SERVICE FITTINGS

.1 ’High tension’ receptacle fitting made of 2 piece die-cast aluminum with brushed aluminum housing finish for 1 duplex receptacles. Bottom plate with two knockouts for centered or offset installation.

.2 Pedestal type 'low tension' fitting made of 2 piece die cast aluminum with brushed aluminum housing finish to accommodate two amphenol jack connectors.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware, a National Standard of Canada.

.2 CSA C22.2 No. 45, Rigid Metal Conduit.

.3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.4 CSA C22.2 No. 83, Electrical Metallic Tubing.

.5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.

.6 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), a National Standard of Canada.

1.2 SUBMITTALS

.1 Product data: submit manufacturer's printed product literature, specifications and datasheets.

.1 Submit cable manufacturing data.

.2 Quality assurance submittals:

.1 Test reports: submit certified test reports.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.

.2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.4 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.5 Flexible metal conduit: to CSA C22.2 No. 56, aluminum liquid-tight flexible metal.

.6 FRE conduit: to CSA C22.2.

.7 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3,

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1.5 m oc.

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

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90º, 45 º or 22.5 º bends are required for 25 mm and larger conduits.

.3 Ensure conduit bends other than factory “ells” are made with an approved bender. Making offsets and other bends by cutting and rejoining 90 degree bends are not permitted.

.4 Connectors and couplings for EMT. Steel set-screw type, size as required.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install all conduit, conduit fittings and accessories in accordance with the latest edition of the Canadian Electrical Code in a manner that does not alter, change or violate any part of the installed system components or the CSA/UL certification of these components.

.2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.3 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.4 Surface mount conduits except in finished areas or as indicated.

.5 Use rigid hot dipped galvanized steel threaded conduit for exposed work below 2.4 m above finished floor.

.6 Use epoxy coated conduit underground in corrosive areas and where exposed to exterior elements. (ie: pole mounted service entrance conduits)

.7 Use electrical metallic tubing (EMT) except in cast concrete and above 2.4 m not subject to mechanical injury, as well as concealed work in masonry construction.

.8 Use rigid PVC conduit underground and buried in or under concrete slab on grade.

.9 Use FRE conduit for encasement in concrete duct bank for service entrance feeders.

.10 Use flexible metal conduit for connection to motors in dry areas connection to recessed incandescent fixtures without a prewired outlet box connection to surface or recessed fluorescent fixtures work in movable metal partitions.

.11 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.12 Use explosion proof flexible connection for connection to explosion proof motors.

.13 Install conduit sealing fittings in hazardous areas. Fill with compound.

.14 Minimum conduit size for lighting and power circuits: 19 mm.

.15 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.16 Mechanically bend steel conduit over 19 mm dia.

.17 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.18 Install fish cord in empty conduits.

.19 Run 2 - 25 mm spare conduits up to ceiling space and 2 - 25 mm spare conduits down to ceiling space from each flush panel. Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete type box.

.20 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.21 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel. Install in centre one third of slab. Use rigid PVC conduit.

.2 Protect conduits from damage where they stub out of concrete. Use rigid steel conduit for stub-up and adapt to in floor rigid PVC conduit.

.3 Install sleeves where conduits pass through slab or wall.

.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.

.5 Do not place conduits is slabs in which slab thickness is less than 4 times conduit diameter.

.6 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits 25 mm and larger below slab and encased in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.8 CLEANING

.1 On Completion and verification of performance of installation, remove surplus materials, excess materials rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS.

.1 Section 26 05 00 - Common Work Results - Electrical.

.2 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 REFERENCES

.1 Canadian Standards Association, (CSA)

.2 Insulated Cable Engineers Association, Inc. (ICEA)

Part 2 Products

2.1 MARKERS

.1 100mm warning tape, as per duct detail.

Part 3 Execution

3.1 CABLE INSTALLATION IN DUCTS

.1 Install cables as indicated in ducts.

.1 Do not pull spliced cables inside ducts.

.2 Install multiple cables in duct simultaneously.

.3 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.4 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

.5 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.6 After installation of cables, seal duct ends with duct sealing compound.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre-acceptance tests.

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour and conductors not under test.

.3 High Potential (Hipot) Testing.

.1 Conduct hipot testing at 100 % of original factory test voltage in accordance with manufacturer's recommendations.

.4 Leakage Current Testing.

.1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.

.2 Hold maximum voltage for specified time period by manufacturer.

.3 Record leakage current at each step.

.7 Provide Owner's Representative with list of test results showing location at which each test was made, circuit tested and result of each test. Include results in Commissioning Manual.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials, components, cabinets, instruments and installation for metering and switchboard Instruments.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 26 05 00 - Common Work Results - Electrical.

1.3 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI C39.1, Requirements, Electrical Analog Indicating Instruments.

.2 Canadian Standards Association, (CSA)

.1 CAN3-C17, Alternating - Current Electricity Metering.

1.4 PRODUCT DATA

.1 Indicate meter, and instrument, outline dimensions, panel drilling dimensions and include cutout template.

Part 2 Products

2.1 METER

.1 Combination energy and demand meter: to CAN3-C17- AC Electricity Metering.

.2 Accuracy: ±2 %.

.3 ’S’ socket, ’A’ base, bottom connected, rectangular, flush switchboard case, indoor. Ratings: as indicated.

.5 Register: self contained, pulse contacts for transmitting signal.

.6 Provision for remote sensing.

2.2 METER SOCKET

.1 Meter socket to suit meter with automatic current transformer shorting devices when meter removed.

Part 3 Execution

3.1 METERING INSTALLATION

.1 Install meters and instruments in location free from vibration and shock.

.2 Make connections in accordance with diagrams.

.3 If applicable, ensure power factor corrective equipment connected on load side of meter.

.4 Connect meter and instrument transformer cabinets to ground.

.5 Locate meters within 9 m of instrument transformers. Use 32 mm conduit for interconnections. Use separate conduit for each set of current transformer connections, exclusive for metering.

3.2 FIELD QUALITY CONTROL

.1 Conduct tests in accordance with Section 26 05 00- Common Work Results – Electrical.

.2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.

.3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies.

.4 Perform tests to obtain correct calibration.

.5 Do not dismantle meters and instruments.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

Part 2 Products

2.1 PHOTOELECTRIC LIGHTING CONTROL

.1 Wall mounting.

.2 Capable of switching 1800 W of lighting at 120 V.

.3 Voltage variation: plus or minus 10%.

.4 Temperature range: minus 40 C to plus 40° C.

.5 Switching on lights at 1-5 lx.

.6 Switching off lights at 6-15 lx.

.7 Rated for 5000 operations.

.8 Options:

- .1 Lightning arrester.
- .2 Fail-safe circuit completed when relay de-energized.
- .3 Twist-lock type receptacle.
- .4 Terminal strip.
- .5 Sensitivity adjustment.

.9 Switching time delay of 30 s.

.10 Wall mounting bracket.

.11 Colour coded leads: size 10 AWG, 460 mm long.

2.2 CONTACTOR

.1 Cabinet mounting.

.2 Capable of switching multiple lamp circuits with total lighting load of 6000 W.

.3 Waterproof enclosure.

.4 Manual override.

Part 3 Execution

3.1 INSTALLATION

.1 Install photoelectric controls in accordance with manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Actuate control unit in presence of Owner's Representative to demonstrate lighting circuits are controlled as designated.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

1.2 SYSTEM DESCRIPTION

.1 Low voltage control system designed to provide remote switching of lighting loads by use of:

- .1 Low voltage relays.
- .2 Control transformers
- .3 Manual switch control.

1.3 SUBMITTALS

.1 Product Data:

- .1 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria, and limitations.
  - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).

.2 Shop Drawings:

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada.

.3 Closeout Submittals:

- .1 Submit maintenance data in accordance with Section 01 78 00 - Closeout Submittals.

.4 Test reports:

- .1 Submit certified test reports indicating compliance with specifications for specified performance characteristics and physical properties.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions.
- .4 Manufacturer's Field Reports: manufacturer's field reports specified.

1.4 QUALITY ASSURANCE

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

Part 2 Products

2.1 MATERIALS

.1 Control system: by one manufacturer and assembled from compatible components.

2.2 REMOTE CONTROL SWITCHES

.1 Single pole, double throw, momentary contact, heavy duty, rated 3 A, 25 V, centre pivot rocker action with pilot lights where indicated.

2.3 LOW VOLTAGE RELAYS

.1 Electrically operated by momentary impulse, mechanically latched until activated.

.2 Two coil solenoid type with one coil to close relay contacts and one coil to open relay contacts.

.3 Operating voltage: 24 V, AC.

.4 Load contacts: 20 A, 120 or 347 V, AC as indicated.

.5 Auxiliary contacts for pilot light.

.6 Coloured pre-stripped leads.

2.4 CONTROL TRANSFORMER

.1 Low voltage power Class 2, input 120 or 347 V, AC, 60 Hz, output 35 VA at 24 V.

2.5 RECTIFIER

.1 Selenium type: 24 V, AC, 60 Hz input, 0.36 A continuous duty output.

.2 Silicon type: 24 V, AC, 60 Hz input, 7.5 A continuous duty output.

2.6 MANUAL CONTROL

.1 Individual remote control switches as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install equipment in accordance with manufacturer's recommendations and as indicated.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical and Section 01 91 13 – General Commissioning (Cx) Requirements.

.2 Actuate control units in presence of Owner's Representative to demonstrate lighting circuits are controlled as designated.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Service equipment and installation.

1.2 RELATED SECTIONS

.1 Section 26 05 28 - Grounding - Secondary.

.2 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.3 Section 26 24 16.01 - Panelboards Breaker Type.

.4 Section 26 28 16.02 - Moulded Case Circuit Breakers.

.5 Section 26 28 20 - Ground Fault Circuit Interrupters - Class "A".

Part 2 Products

2.1 EQUIPMENT

.1 Enclosed circuit breaker: in accordance with Section 26 28 16.02 - Moulded Case Circuit Breakers, rating as indicated.

.2 Panelboard breaker type: in accordance with Section 26 24 16.01 - Panelboards Breaker Type

.3 Cabinet type ’A’ for utility revenue metering Junction box Pull box Splitter box: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets, size as indicated.

.4 Ground fault equipment: in accordance with Section 26 28 20 - Ground Fault Circuit Interrupters - Class "A".

Part 3 Execution

3.1 INSTALLATION

.1 Install service equipment.

.2 Connect to incoming service.

.3 Connect to outgoing load circuits.

.4 Install ground fault equipment.

.5 Make grounding connections in accordance with Section 26 05 28 - Grounding – Secondary.

.6 Make provision for power supply authority's metering.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

.2 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.

1.4 SUBMITTALS

.1 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250 and 600 V panelboards: bus and breakers rated for 10,000 and 18,000 A (symmetrical) minimum interrupting capacity respectively or as indicated on electrical drawings.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Two keys for each panelboard and key panelboards alike.

.6 Tin plated aluminum bus with neutral of same ampere rating as mains.

.7 Mains: suitable for bolt-on breakers.

.8 Trim with concealed front bolts and hinges.

.9 Trim and door finish: baked grey enamel.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Departmental Representative.

.5 Lock-on devices for receptacles, fire alarm clock outlet, emergency, door supervisory, intercom, stairway, exit and night light circuits as indicated.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

Part 3 Execution

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 – Common Work Results - Electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

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

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 91 13 – General Commissioning (Cx) Requirements.

.3 Section 26 05 00 – Common Work Results - Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.

.2 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).

.3 CSA-C22.2 No.55, Special Use Switches.

.4 CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

Part 2 Products

2.1 SWITCHES

.1 15 A, 120 V, single pole, double pole, three-way, four-way switches as indicated to: CSA-C22.2 No.55 and CSA-C22.2 No.111.

.2 Manually-operated general purpose ac switches with following features:

.1 Terminal holes approved for No. 10 AWG wire.

.2 Silver alloy contacts.

.3 Urea or melamine moulding for parts subject to carbon tracking.

.4 Suitable for back and side wiring.

.5 White toggle.

.6 Specification grade.

.3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.4 Switches of one manufacturer throughout project.

.5 Acceptable products:

.1 Hubbel HBL 1201 W,
.2 Leviton 1201-2W,
.3 Pass and Seymour.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:

.1 Ivory thermoplastic moulded housing.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Break-off links for use as split receptacles.
.4 Eight back wired entrances, four side wiring screws.
.5 Triple wipe contacts and rivetted grounding contacts.
.6 Specification grade.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:

.1 Ivory thermoplastic moulded housing.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

.5 Acceptable products:

.1 Hubbel 5262-W,
.2 Leviton 5262-W,
.3 Pass and Seymour 5262-W.

2.3 SPECIAL WIRING DEVICES

.1 Special wiring devices:

.1 Pilot lights as indicated, with neon type 0.04 W, 125 V lamp and red plastic jewel lense, flush type.

2.4 COVER PLATES

.1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 Stainless steel cover plates as indicated, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

.5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.7 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

.8 All wiring device cover plates to be labeled using clear adhesive strips with black type identifying panel and circuit number for each device.

Part 3 Execution

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height in accordance with Section 26 05 00 – Common Work Results - Electrical.

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.3 Cover plates:

.1 Protect cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results – Electrical.

1.2 SUBMITTALS

.1 Include time-current characteristic curves for breakers with ampacity of 600 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.

.2 Common-trip breakers: with single handle for multi-pole applications.

.3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.4 Circuit breakers with interchangeable trips as indicated.

.5 Circuit breakers to have minimum of 10,000 A symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Equipment and installation for ground fault circuit interrupters (GFCI).

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-C22.2 No.144, Ground Fault Circuit Interrupters.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA PG 2.2, Application Guide for Ground Fault Protection Devices for Equipment.

1.4 SUBMITTALS

.1 Submit product data and shop drawings.

.2 Submit test report for field testing of ground fault equipment to Owner's Representative and a certificate that system as installed meets criteria specified herein.

Part 2 Products

2.1 MATERIALS

.1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA-C22.2 No.144.

.2 Components comprising ground fault protective system to be of same manufacturer.

2.2 BREAKER TYPE GROUND FAULT INTERRUPTER

.1 Single or two pole ground fault circuit interrupter for 15-20 A, 120 V, 1 phase circuit c/w test and reset facilities.

2.3 GROUND FAULT PROTECTOR UNIT

.1 Self-contained with 15 A, 120 V circuit interrupter and duplex receptacle complete with:

.1 Solid state ground sensing device.

.2 Facility for testing and reset.

.3 CSA Enclosure 1, flush mounted with stainless steel face plate.

Part 3 Execution

3.1 INSTALLATION

.1 Do not ground neutral on load side of ground fault relay.

.2 Pass phase conductors including neutral through zero sequence transformers.

.3 Connect supply and load wiring to equipment in accordance with manufacturer’s recommendations.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Arrange and pay for field testing of ground fault equipment by ground fault equipment manufacturer before commissioning service.

.3 Demonstrate simulated ground fault tests.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for contactors for system voltages up to 600 V

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

.2 Section 26 29 03 - Control Devices.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No.14, Industrial Control Equipment.

Part 2 Products

2.1 CONTACTORS

.1 Contactors: to CSA C22.2 No.14.

.2 Electrically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.

.3 Fused switch combination contactor as indicated.

.4 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.

.5 Mount in CSA Enclosure 1 unless otherwise indicated.

.6 Include following options in cover:

.1 Red indicating lamp.

.2 Hand-Off-Auto selector switch.

.7 Control transformer: in accordance with Section 26 29 03 - Control Devices, in contactor enclosure.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Size 4 nameplate indicating name of load controlled as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install contactors and connect auxiliary control devices.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for industrial control devices including pushbutton stations, control and relay panels.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 – Common Work Results - Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No.14, Industrial Control Equipment.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA ICS 1, Industrial Control and Systems: General Requirements.

1.4 SUBMITTALS

.1 Include schematic, wiring, interconnection diagrams.

1.5 QUALITY ASSURANCE

.1 Submit to Owner's Representative one copy of test results.

Part 2 Products

2.1 AC CONTROL RELAYS

.1 Control Relays: to CSA C22.2 No.14 and NEMA ICS 1.

.2 Convertible contact type: contacts field convertible from NO to NC, electrically held, with solid state timer as indicated. Coil rating: as indicated. Contact rating: as indicated.

.3 Sealed contact type: electrically held. Coil rating: as indicated. Contact rating: as indicated.

.4 Universal pole type: electrically held convertible from NO to NC by changing wiring connections. Coil rating: as indicated. Contact rating: as indicated.

.5 Fixed contact plug-in type: general purpose low coil current. Coil rating: as indicated. Contact rating: as indicated.

.6 Socket bases and DIN mounting rails for plug-in type relays.

2.2 RELAY ACCESSORIES

.1 Standard contact cartridges: normally-open - convertible to normally-closed in field.

2.3 OPERATOR CONTROL STATIONS

.1 Enclosure: CSA Type1, surface mounting:

2.4 PUSHBUTTONS

.1 Illuminated, Standard duty. Operator recessed mushroom type, as indicated, with 1-NO and 1-NC auxiliary contacts rated as indicated. Labels as indicated. Stop pushbuttons coloured red, provision for padlocking in depressed position and labelled "emergency stop".

2.5 SELECTOR SWITCHES

.1 Maintained 2 or 3 position labelled as indicated standard duty, operators wing lever, contact arrangement as indicated, rated as indicated.

2.6 INDICATING LIGHTS

.1 Standard duty, full voltage, transformer LED type, push-to-test, lens colour: as indicated, supply voltage as indicated, labels as indicated.

2.7 CONTROL AND RELAY PANELS

.1 CSA Type 1 sheet steel enclosure (sprinkler proof where required) with hinged padlockable access door, accommodating relays, timers, labels, as indicated, factory installed and wired to identified terminals.

2.8 CONTROL CIRCUIT TRANSFORMERS

.1 Single phase, dry type.

.2 Primary: 208, 240 or 600 V, 60 Hz ac.

.3 Secondary: 120 V, or 24V ac.

.4 Rating: 50, 150, 250, 350 or 500 VA, as indicated.

.5 Secondary fuse: size as required.

.6 Close voltage regulation as required by magnet coils and solenoid valves.

2.9 THERMOSTAT (LINE VOLTAGE)

.1 Wall mounted, for baseboard heater control.

.2 Full load rating: Amps as indicated.

.3 Temperature setting range: 5 degrees C to 30 degrees C.

.4 Thermometer Range: 5 degrees C to 30 degrees C.

.5 Markings in 5 degrees increments.

.6 Differential temperature fixed at 20 degrees C.

Part 3 Execution

3.1 INSTALLATION

.1 Install pushbutton stations, control and relay panels, control devices and interconnect as required on control wiring diagrams as per drawings.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at a time and check out operation of section.

.3 Upon completion of sectional test, undertake group testing.

.4 Check out complete system for operational sequencing.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI C82.1, Electric Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.

.2 ANSI C82.4, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps.

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41, Surge Voltages in Low-Voltage AC Power Circuits.

.3 American Society for Testing and Materials (ASTM)

.1 ASTM F1137, Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 United States of America, Federal Communications Commission (FCC)

.1 FCC (CFR47) EM and RF Interference Suppression.

1.2 SUBMITTALS

.1 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Owner's Representative.

.2 Photometric data to include: VCP Table and spacing criterion and luminaire coefficient of utilization (CU) tables.

.3 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.4 Quality assurance submittals: provide the following

.1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures and relamping schedule.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with contract documents.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Divert unused metal materials from landfill to metal recycling facility.

.4 Disposal and recycling of fluorescent lamps as per local regulations.

.5 Disposal of old PCB filled ballasts.

1.4 ACCEPTABLE PRODUCTS

.1 Luminaires described in the Lighting Fixture Schedule and/or Legend identify quality, performance criteria and other parameters, as indicated for this project. Named fixtures are acceptable with modifications and accessories, as indicated.

.2 Fixtures from other manufacturers may be acceptable provided:

.1 Appearance and lighting performance are similar.

.2 Quality is equal or better.

.3 Lamp and ballast criteria remain the same.

.4 The fixture is provided with modifications and accessories to provide a complete product in keeping with the intent of the project.

.5 Approval in writing is obtained from the Owner's Representative to the supplier/manufacturer 5 days prior to tender closing date.

Part 2 Products

2.1 LAMPS

.1 Incandescent lamps to be - clear, A19, 100 Watt with 1000 hour lamp life, rough-service rated; or as indicated.

.2 Tungsten halogen lamps to be - clear, T-3, 300 Watt, RSC base, 2000 hour lamp life, 5000 lumens; or as indicated.

.3 Fluorescent lamps to be - T8, 32 Watt, medium bi-pin, rapid or instant start to suit application, 4100 K, 30,000 hour lamp life, 2950 initial lumens, CRI 80; or as indicated.

.4 Metal halide lamps to be - clear, BT37, 400 Watt, mogul base, horizontal burn, 4100 K, 15,000 hour lamp life, 36,000 initial lumens, CRI65, open or enclosed type to suit the luminaire; or as indicated.

.5 Low pressure sodium lamps to be - clear, T21, 135 Watt, BY22d base, horizontal burn,16,000 hour lamp life, 22,000 initial lumens; or as indicated.

.6 High pressure sodium lamps to be - clear, ED18, 400 Watt, mogul base, 30,000 hour lamp life, 54,000 initial lumens; or as indicated.

.7 Compact fluorescent lamps to be - 18 Watt, G24q-2 base, 12,000 hour lamp life, 12,000 initial lumens, 4100 K, CRI 80; or as indicated.

2.2 BALLASTS

.1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic.

- .1 Rating: 120 or 347 V, 60 Hz, as indicated, for use with 2-32W, T8 octron imperial lamps.
- .2 RFI/EMI suppression circuit to: FCC (CFR47) Part 18, sub-part C, Class A and Part 15, sub-part B, Class B.
- .3 Totally encased and designed for 40 °C ambient temperature.
- .4 Power factor: minimum 98 % with 98% of rated lamp lumens.
- .5 Crest factor: 1.5 maximum.
- .6 Capacitor: thermally protected.
- .7 Thermal protection: non-resettable on coil.
- .8 Harmonics: 10 % maximum THD.
- .9 Operating frequency of electronic ballast: 20 khz minimum.
- .10 Total Circuit Power: 62 Watts.
- .11 Ballast Factor: greater than 0.90.
- .12 Sound rated: Class A.
- .13 Mounting: integral with luminaire.
- .14 Be warranted by manufacturer for five years.

.2 Metal halide ballast: design B.

- .1 Rating: 60 Hz voltage as indicated, for use with metal halide lamp as indicated. Provide circuitry for standby light to provide light for starting and restart.
- .2 Totally encased and designed for 40 °C ambient temperature.
- .3 Power factor: minimum 95 % with 95% of rated lamp lumens.
- .4 Type: constant wattage auto-transformer or solid state.
- .5 Input voltage range: plus or minus 10% of nominal.
- .6 Minimum starting temperature: minus 29 °C at 90% line voltage.
- .7 Mounting: outdoor integral with luminaire.
- .8 Current crest factor: 1.7 maximum current.

.3 High pressure sodium ballast: to ANSI C82.4 design C.

- .1 Rating: 60Hz voltage as indicated, for use with high pressure sodium lamps, as indicated.
- .2 Totally encased and designed for 40 °C ambient temperature.
- .3 Power factor: minimum 95 % with 95% of rated lamp lumens.
- .4 Type: reactor or solid state with matching igniter as recommended by manufacturer.
- .5 Input voltage range: plus 10% to minus 10% of nominal.
- .6 Minimum starting temperature: minus 34 °C at 90% line voltage.
- .7 Mounting: outdoor integral with luminaire.

.8 Current crest factor: 1.7 maximum current.

.4 Low pressure sodium ballast: design D.

.1 Rating: 60 Hz voltage as indicated, for use with low pressure sodium lamps as indicated.

.2 Totally encased and designed for 40 °C ambient temperature.

.3 Power factor: minimum 95% with 95% of rated lamp lumens.

.4 Type: constant wattage.

.5 Input voltage range: plus or minus 20% of nominal.

.6 Minimum starting temperature: minus 34 °C at 90% line voltage.

.7 Mounting: outdoor integral with luminaire.

2.3 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 LUMINAIRES

.1 As indicated in luminaire schedule on drawings. Provide 10% spare lamps of each type noted in luminaire schedule.

2.5 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire schedule on drawings.

Part 3 Execution

3.1 INSTALLATION

.1 Locate and install luminaires as indicated. Install lamps in all fixtures.

.1 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits.

.1 Install flexible conduit for vertical power supply drop to luminaires as indicated. Horizontal wiring using flexible conduit is not permitted.

3.3 LUMINAIRE SUPPORTS

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

3.4 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical and Section 01 91 13 – General Commissioning (Cx) Requirements.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for concrete, steel, aluminum and wood lighting poles.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

.2 Section 26 50 00 - Lighting.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No.206, Lighting Poles.
.2 CAN/CSA-O15, Wood Utility Poles and Reinforcing Stubs.
.3 CSA O80 Series, Wood Preservation.

Part 2 Products

2.1 ALUMINUM POLES

.1 Aluminum poles: to CSA C22.2 No.206 designed for underground wiring and:

.1 Mounting on concrete anchor base without transformer base.
.2 Style: Monotube, round tapered G063-T6 aluminum, wall thickness 6 mm.
.3 Straight for one luminaire mounting brackets.
.4 Access handhole 900 mm above pole base for wiring connections, with welded-on reinforcing frames bolted-on cover.
.5 Size: 7650mm.
.6 Anchor bolts: stainless steel with shims, nuts, washers and covers, as indicated.
.7 Finish: semi-lustrous satin by rotary sand process.
.8 Grounding lug.

2.2 LUMINAIRE MOUNTING BRACKETS

.1 Mounting brackets for specified luminaires:

.1 Single brackets as indicated.
.2 Arm extension length: 300mm or as required (approved) for luminaire mounting.

2.3 LUMINAIRES

.1 Luminaire with cast aluminum weatherproof housing and:

- .1 Lamp type: LED.
- .2 Ballast: 120 V, one lamp, in accordance with Section 26 50 00 - Lighting.
- .3 Optical assembly: see standard of acceptance.
- .4 Light Distribution:
  - .1 IES distribution Type IV
- .5 Factory wired including drivers terminated at terminal block.
- .6 Standard of acceptance: Philips Gardco Pureform 32” fixture, model # P32-1-4-BLC-LCL/LCR-330LA-NW

Part 3 Execution

3.1 INSTALLATION

.1 Install poles true and plumb, complete with brackets in accordance with manufacturer’s instructions.

.2 Install luminaires on pole davits and install lamps.

.3 Check luminaire orientation, level and tilt.

.4 Connect luminaire to lighting circuit.

.5 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK

.1 Testing and commissioning are called for throughout the individual specifications. This does not relieve this trade from providing all testing and commissioning necessary to ensure that systems and equipment operate as required and that they interface with other systems and equipment as required.

1.2 SECTION INCLUDES

.1 Commissioning of all building electrical systems and component including:

.1 Testing and adjustment.
.2 Demonstrations and Training.
.3 Instructions of all procedures for Owner's personnel.
.4 Updating as-built data.
.5 Co-ordination of Operation and Maintenance material.

1.3 RELATED SECTION

.1 Section 26 05 00 – Common Work Results - Electrical.

1.4 REFERENCES

.1 CSA (Canadian Standards Association).

.2 Underwriters Laboratories of Canada.

1.5 QUALITY ASSURANCE

.1 Provide qualified trades persons, certified testing agencies, factory trained and approved by the Commissioning Team Leader.

.2 Submit the names of all personnel to be used during the Commissioning activities for Owner Approval.

1.6 COMMISSIONING

.1 The purpose of the commissioning process is to fully test all building systems including architectural, mechanical and electrical components and operating procedures by challenging these systems to realistic operation conditions.

.2 The Commissioning activities shall be co-ordinated by the General Contractor.

.3 Commissioning activities for the electrical systems must have available up to date as-built drawing information and accurate Operations and Maintenance Manuals. These documents shall be a major part of this activity.

.4 Contractor shall be responsible to update all documentation with information and any changes duly noted during the Commissioning exercise.

.5 Contractor shall arrange for all outside suppliers, equipment manufacturers, test agencies and others as identified in the commissioning sections of this specification. The cost associated with this requirement shall be included as part of the tender price.

1.7 SUBMITTALS

.1 A commissioning document shall be prepared by the Owner's Representative prior to conducting these activities for use by the Commissioning Team.

.2 The electrical sub-contractor shall be responsible for ensuring all activities are properly documented in this manual and co-ordinated through the General Contractor.

.3 As-built drawings and data books must be available two weeks prior to commissioning for review and use by the consultant and Commissioning Team prior to the start of the commissioning activities.

1.8 PREPARATION

.1 Provide test instruments required for all activities as defined in the commissioning documents.

.2 Verify all systems are in compliance with the requirements of the commissioning documents prior to the precommissioning check out operation.

.3 Confirm all scheduled activities have identified personnel available.

.4 Where systems or equipment do not operate as required, make the necessary corrections or modifications, re-test and re-commission.

1.9 SYSTEM DESCRIPTION

.1 Perform all start up operations, control adjustment, trouble shooting, servicing and maintenance of each item of equipment as defined in the commissioning documentation.

.2 Owner will provide list of personnel to receive instructions and will co-ordinate their attendance at agreed upon times.

.3 Prepare and insert additional data in the operations and maintenance manuals and update as-built drawings when need for additional data becomes apparent during the commissioning exercise.

.4 Where instruction is specified in the commissioning manual, instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.

.5 Conduct presentation on Owner's premises. Owner will provide space.

1.10 FINAL REPORT

.1 This trade shall assemble all testing data and commissioning reports and submit them to the Owner.

.2 Each form shall bear signature of recorder, and that of supervisor of reporting organizer.

1.11 SCHEDULE OF ACTIVITIES

.1 Commissioning activities shall be conducted based on pre-established schedule with all members of the commissioning team.

.2 In addition, there will be two meetings held through the contract duration to introduce the parties of the commissioning team, establish the schedules and deadlines for the various activities and review the Commissioning Manual.

.3 Adhering to the established schedule is very important as the co-ordination and scheduling of the participants will be difficult to alter once this is established. Close co-ordination of this schedule is important.

.4 In the event project cannot be commissioned in the allotted time slot, the contractor shall pay for all costs associated with assembling the Commissioning Team at a later date. If the contractor has not performed his duties to reach commissioning stage as outlined earlier, he will incur all expenses of other trades and the Commissioning Team due to his non-compliance.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This section describes the extent of services to be provided for wiring of equipment supplied by others.

.2 Within the context of this section, Others means:

.1 Other divisions of this specification (i.e.: Division 25 – Integrated Automation).

.2 The Owner, as defined in the Contract.

.3 Other contractors supplying and installing equipment to the contract.

1.2 EXTENT OF SERVICES PROVIDED

.1 The work of this contract is to include all power and control wiring of equipment which is provided by Division 26.

.2 All power and control wiring above 50 V for equipment supplied by Division 25 will be the responsibility of this contractor. Coordinate with Integrated Automation contractor for exact requirements.

.3 All control wiring 50 V and less for equipment supplied by Division 25 will be the responsibility of Division 25- Integrated Automation Contractor. Conduit and wire associated with this is the responsibility of Division 25.

.4 All power and control wiring associated with equipment supplied by Division 01 will be the responsibility of this contractor. Coordinate with general contractor for exact requirements.

.5 Final connection of all wiring to equipment provided by others (except control wiring below 50 V associated with Division 25 equipment) will be by division 26. Coordinate with the provider for connection instructions.

1.3 RESPONSIBILITY OF DIVISION 26

.1 It is the responsibility of the Division 26 subcontractor to verify final requirements for wiring of all equipment noted. Verification of wiring requirements to include:

.1 Confirmation of electrical characteristics.

.2 Location of connection point.

.3 Method of connection (i.e. direct or plug-in etc.)

.2 Obtain and become familiar with shop drawings for all relevant equipment.

.3 No claim for extra will be entertained for wiring equipment which has been indicated, or changes to installed wiring where installation proceeded prior to verification of electrical requirements.

Part 2 Products (not applicable)

Part 3 Execution (not applicable)

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Division 03: cast-in-place concrete, forming, curing.

.2 Section 07 21 13 – Board Insulation.

.3 Section 07 26 16 – Under-Slab Vapour Retarder.

.4 Section 31 66 15 – Helical Foundation Piles.

.5 Section 32 12 16 – Asphalt Paving.

.6 Section 32 13 15 – Concrete Paving, Sidewalks, Curbs and Gutters.

.7 Section 32 15 40 – Crushed Stone Surfacing.

.8 Section 32 91 21 – Topsoil Placement and Grading.

.9 Section 33 05 16.01 – Catch Basins.

.10 Section 33 41 00 – Storm Utility Drainage Piping.

1.2 MEASUREMENT FOR PAYMENT

.1 Payment for Division 31, 32 and 33 Work shall be on a lump sum basis as tendered which shall be full compensation for all supervision, labour, materials and equipment necessary to complete the Work, including all subsidiary and incidental items thereto for which separate payment is not elsewhere provided.

1.3 DEFINITIONS

.1 Backfill: Soil material or controlled low strength material used to fill excavations.

.1 Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

.2 Final Backfill: Backfill placed over initial backfill to fill a trench.

.2 Base Course: Course placed between the sub base course and hot mix asphalt paving.

.3 Bedding Course: Course placed over the excavated sub grade in a trench before laying pipe.

.4 Borrow Soil: Satisfactory soil imported from off site for use as fill or backfill.

.5 Capillary Break: Course supporting slab on grade that also minimizes upward capillary flow of pore water.

.6 Common Excavation:

.1 The excavation of materials, including hardpan, quicksand, and frozen earth; also rock, concrete or masonry less than 1.0 m^3 in volume shall be classified as common excavation.

.7 Fill: Soil materials used to raise existing grades.

.8 Rock:

.1 The excavation of rock, concrete or masonry exceeding 1.0 m^3 in volume; and solid ledge rock, concrete or masonry that requires for its removal drilling, blasting, wedging, sledging, barring or breaking with a power operated hand tool shall be classified as rock excavation. Soft or disintegrated rock, concrete or masonry that can be removed with a hand pick, power operated excavator or shovel; and loose, shaken or previously blasted rock will not be classified as rock excavation.

.9 Site Excavated Materials: Site excavated soil is considered as only site material removed by required excavation and grading.

.10 Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below ground surface.

.11 Sub-Base Course: Course placed between the sub-grade and base course for hot mix asphalt pavement, and cement concrete pavement or sidewalk.

.12 Sub-Grade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below sub base, drainage fill, or topsoil materials.

.13 Utilities: On site underground pipes, conduits, ducts, and cables including, but not limited to underground services within buildings.

1.4 STANDARDS

.1 Work of this section shall meet or exceed province of Newfoundland and Labrador design and construction standards, shall meet or exceed requirements of this Section, and shall meet or exceed the following:

.1 Section 01 11 10 – General Requirements: item 1.9 Regulatory Requirements.

.2 Section 01 11 10 – General Requirements: item 1.7 Health and Safety.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide required information in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Submit product data for the following:

.1 Geotextile cloth.

.2 Controlled low-strength material, including design mixture.

.3 Conduct condition survey of adjoining construction and site improvements, including finish surfaces, survey benchmarks, and monuments that may be affected by work:

.4 Submit pre-excavation photographs or videotape before starting any earthwork indicating existing conditions of adjoining construction and site improvements, including finish surfaces that may be misconstrued as damage caused by earthwork operations for this Project

.5 Identify any interferences that could affect the Work and notify the Departmental Representative for additional information.

1.6 QUALITY ASSURANCE

.1 Pay costs for testing and inspection as a part of the Contract.

.2 Carry out testing of materials and compaction of backfill, fill and unshrinkable fill using a testing agency acceptable to the Departmental Representative as follows:

.1 Perform testing under the supervision of a registered professional engineer.

.2 Have testing results signed, stamped and sealed by a registered professional engineer and submitted to the Departmental Representative and Contractor.

.3 Correct any deficiencies noted in the report as directed by the testing agency.

.3 Notify testing agency no later than one week before backfilling or filling operations; provide a 20 kg sample of backfill, fill and unshrinkable fill material proposed for use to confirm properties; start backfilling or filling operations when material has been accepted by Departmental Representative for intended use.

.4 Notify testing agency no later than 48 hours before backfilling or filling operations so that compaction tests can be carried out by designated testing agency; inspect footing excavations before placing footings; results of compaction tests will be submitted to Departmental Representative and Contractor.

1.7 PROTECTION

.1 The Contractor shall be responsible for locating and protecting all existing underground and surface structures, utility pipelines, overhead lines and poles, fences, water and sewer mains, building services, cables, culverts, sidewalks and other works. All damage incurred shall be repaired by the Contractor at its expense.

1.8 MEASUREMENT FOR PAYMENT

.1 The work of this section is part of Contract and included in Bid Price, which shall be full compensation for all labour, materials and equipment necessary to complete the work, including all subsidiary and incidental items.

Part 2 Products

2.1 GENERAL

.1 Supply all labour, materials and equipment required for site grading.

2.2 SOURCE OF SUPPLY

.1 Imported Fill Materials: Consider only fill materials that fully meet specified requirements, including gradations.

2.3 SOIL FILL MATERIALS

.1 General Engineered Fill: Comprised of clean, inorganic granular or clay soils.

.2 Select Engineered Fill: Comprised of clean, well graded granular soils or inorganic low plastic clay soils:

.1 Granular soils used for select engineered fill shall consist of relatively clean, well graded, sand or mixture of sand and gravel (maximum size 75 mm).

.2 Low plastic clay used for select engineered fill shall have the following range of Atterberg limits:

.1 Liquid Limit = 20 to 40%

.2 Plastic Limit = 10 to 20%

.3 Plasticity Index = 10 to 30%

.3 Structural Fill: Comprised of clean, well graded inorganic granular soils.

.4 Lean Mix Concrete: Self-compacting, low-strength concrete having a minimum 28-day compressive strength of 3.5 MPa.

2.4 GRANULAR FILL MATERIALS

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended. Flat and elongated particles of coarse aggregate: to ASTM D4791.

.2 Source aggregate materials locally to extent possible, meeting requirements.

.3 Rock Borrow: Blasted or crushed rock consisting of durable crushed stones, having 100% by mass pass through a 150mm x 150mm screen, and a maximum 10% by mass pass through a maximum 100mm x 100mm screen. Rock to consist of angular fragments obtained by breaking and crushing solid or natural rock, reasonably free from thin, flat elongated or other objectionable pieces and fines or as otherwise approve by the Departmental Representative.

.4 Fill against structure:

.1 Blasted or crushed rock as approved by Departmental Representative. Gradation to be within following limits:

Sieve Designation	**% Passing**
112 mm	100
40 mm	60 - 85
5 mm	25 - 50
0.315 mm	5 - 15
0.080 mm	2 - 7

.5 Granular Sub-Base: Class B, to Section 32 11 16.01 – Granular Sub-Base.

.6 Granular Base: Class A, to Section 32 11 23 – Aggregate Base Courses.

.7 Select Backfill Material: from excavations or other sources, approved by Departmental Representative for use intended, dry, unfrozen and free from ricks larger than 80 mm, cinders, ashes, sods, refuse or other deleterious or unsuitable materials.

.8 Unshrinkable Fill: proportioned and mixed to provide:
- .1 Maximum compressive strength: 1.0 MPa at 28 days.
- .2 Maximum Portland cement content: 25 kg/m3.
- .3 Minimum strength of 0.07 MPa at 24 hours.
- .4 Concrete aggregates: to CAN/CSA A23.1.
- .5 Portland cement: Type GU.
- .6 Slump: 150 mm minimum.

.9 Pit Run Gravel: Comprised of crushed stone or gravel, natural stone and sand, having no cobbles larger than 80 mm in diameter and having a maximum organic content of 2%, within the following nominal gradation limits:

Sieve Size (mm)	% Passing by Weight	Comments
80	100	
50	55-100	Total sample
25	38-100	Material passing 50 mm sieve
16	32-85	
5	20-65	
0.4	6-30	
.08	2-15	
0.0	0	

.10 Crushed Gravel: Comprised of crushed stone or gravel having at least two broken faces, crushed or natural sand and having a maximum organic content of 2%, within the following nominal gradation limits:

- .1 Liquid limit of material passing 0.4 mm sieve shall not exceed 25%.
- .2 Plasticity index of material passing 0.4 mm sieve shall not exceed 6%.
- .3 Minimum of 50%, by weight, of material retained on 5 mm sieve shall have at least one face resulting from fracture.

Sieve Size (mm)	% Passing by Weight	Comments
25	100	
20	100	Total sample
10	60-92	Material passing 20 mm sieve
5	37-62	
2	26-44	
0.4	12-27	
0.15	7-18	
0.08	2-8	

.11 Coarse Gravel: Comprised of crushed stone or gravel, natural stone, crushed or natural sand and having a maximum organic content of 2%, within the following nominal gradation limits:

Sieve Size (mm)	Percent Passing By Weight	Comments
50	100	
40	90-100	Total Sample
20	35-70	Material Passing 40 mm Sieve
10	10-30	
5	0-5	

.12 Sand: Comprised of crushed or natural sand and having a maximum organic content of 2%, within the following nominal gradation limits:

Sieve Size (mm)	Percent Passing By Weight	Comments
10	65-100	
5	50-90	Total Sample
2	35-75	Material Passing 10 mm Sieve
0.4	10-45	
0.15	0-20	
0.08	0-10	

.13 Clean Washed Gravel: Comprised of crushed stone or gravel, or natural stones and being free draining with less than 5% silt or clay content, and no organic material, within the following nominal gradation limits:

Sieve Size (mm)	Percent Passing By Weight	Comments
38	100	Free Draining Material
10	65-100	Total Sample
5	50-90	Material Passing 10 mm Sieve
2	35-75	
0.4	10-45	
0.15	0-20	
0.08	0-5	

2.5 GEOTEXTILE MATERIALS

.1 Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, manufactured from polyolefin or polyester and having elongation less than 50% in accordance with AASHTO M288 and as follows:

.1 Survivability: Class 2.

.2 Apparent Opening Size: 0.250 mm sieve, maximum in accordance with ASTM D4751.

.3 Permittivity: 0.02 per second, minimum in accordance with ASTM D4491.

.4 UV Stability: 50% after 500 hours' exposure in accordance with ASTM D4355.

2.6 ACCESSORIES

.1 Warning Tape for Buried Utilities: Acid and alkali resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 150 mm wide x 100 mm thick, continuously inscribed with a description of the utility; coloured as follows:

.1 Red: Electric.
.2 Yellow: Gas, oil, steam, and dangerous materials.
.3 Orange: Telephone and other communications.
.4 Blue: Water systems.
.5 Green: Sewer systems

Part 3 Execution

3.1 PREPARATION

.1 Notify Departmental Representative minimum two days before beginning excavating operations.

.2 Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations:

.3 Contact all affected utility companies regarding exact location and status of all utilities, voltage of underground and overhead power lines and pressure of natural gas lines.

.4 Notify Departmental Representative if any utility lines have been omitted from or incorrectly indicated on Drawings.

.5 Identify known underground utilities. Stake and flag locations. Identify and flag surface and aerial utilities.

.6 Notify utility company to remove and relocate utility lines.

.7 Coordinate preparation of sub-grade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface as required.

.8 Fence open excavations in accordance with Section 01 11 10 – General Requirements: Temporary Barriers and Enclosures.

.9 Coordinate and maintain erosion and sedimentation controls in accordance with Section 01 11 10 – General Requirements: Environmental Procedures during earthwork operations.

.10 Provide protective insulating materials to protect sub-grades and foundation soils against freezing temperatures or frost.

3.2 DEWATERING

.1 Prevent surface water and ground water from entering excavations, from ponding on prepared sub-grades, and from flooding Project site and surrounding area.

.2 Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.

.3 Reroute surface water runoff away from excavated areas; do not allow water to accumulate in excavations; do not use excavated trenches as temporary drainage ditches.

3.3 SHORING AND UNDERPINNING

.1 Coordinate and maintain shoring and underpinning as required.

3.4 EXCAVATION: GENERAL

.1 Excavate when conditions are dry; avoid excavating under wet conditions or when wet conditions are anticipated.

.2 Perform work by hand and cut roots with a sharp axe when excavating is necessary through roots of plant materials identified to remain.

.3 Protect excavations for bearing surfaces from freezing, excessive wetting or drying; recondition or replace bearing surfaces that have been wetted, dried or frozen using non shrink fill; notify the Departmental Representative for additional criteria before proceeding with reconditioning.

.4 Place spoil piles a minimum of 1000 mm back from edge of excavations; place any other material capable of causing injury or sliding into excavation on the back side of spoil piles; do not operate machinery in close proximity to edge of excavation, and as follows:

.1 Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing.

.2 Place, grade, and shape stockpiles to drain surface water.

.3 Cover to prevent windblown dust.

.4 Keep spoil materials outside of drip line of remaining trees.

.5 Provide sufficient ventilation to excavations where gas powered compaction equipment will be used in accordance with Section 01 11 00 – General Requirements: Health and Safety.

.6 Expose service connections and utilities to be crossed to confirm horizontal and vertical alignment of existing utilities.

.1 Expose existing utility lines by hand excavation to confirm location before machine digging within 600 mm of lines.

.2 Maintain and protect existing above and below grade utilities that pass through work area.

.3 Protect active utility lines exposed by excavation, from damage.

.4 Hand excavate to final elevations and dimensions.

.5 Support trench in a manner approved by utility where existing pipes, ducts or other underground services intersect a trench.

.7 Use safe operating practices and maintain safe working distances where existing overhead lines are in traffic areas, or where equipment will be operating in close proximity to overhead lines:

.1 Temporarily support poles in a manner approved by utility where existing overhead line poles are adjacent to excavations.

.2 Tag safe operating distance with fluorescent flagging or other highly visible means.

.3 Post signs to identify overhead line voltage.

.8 Excavate to sub-grade elevations indicated, and as follows:

.1 Replace unsatisfactory soil materials with satisfactory soil materials where excavated materials intended for fill and backfill include unsatisfactory soil materials and Rock.

.2 Remove Rock to lines and grades indicated to permit installation of permanent construction to the following tolerances:

.1 Minimum of 600 mm from outside of concrete forms other than at footings.

.2 Minimum of 300 mm from outside of concrete forms at footings.

.3 Minimum of 150 mm from outside of minimum required dimensions of concrete cast against grade.

.4 Outside dimensions of concrete walls indicated as cast against Rock without forms or exterior waterproofing treatments.

.5 Minimum of 150 mm from beneath bottom of concrete slabs on grade.

.6 Minimum of 150 mm from beneath pipe in trenches, and the greater of 600 mm wider than pipe or 1065 mm wide.

3.5 EXCAVATION: STRUCTURES

.1 Excavate to indicated elevations and dimensions within a tolerance of 25 mm; extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and to allow for site reviews and inspections.

.2 Take care not to disturb bottom of excavation for load bearing foundations and footings; excavate by hand to final grade just before placing concrete reinforcement; trim bottoms to required lines and grades to leave solid base to receive other work.

.3 Stop excavations 150 mm to 300 mm above bottom of pile cap before piles are placed; remove loose and displaced material after piles are driven; excavate to final grade, leaving solid base to receive concrete pile caps.

.4 Excavate for underground utility structures to elevations and dimensions indicated within a tolerance of 25 mm; prevent disturbance to bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION: SIDEWALKS AND PAVEMENTS

.1 Excavate surfaces at intended sidewalk and pavement areas to indicated lines, cross sections, elevations, and sub-grades.

3.7 EXCAVATION: UTILITY TRENCHES

.1 Excavate trenches to indicated gradients, lines, depths, and elevations; excavate trenches beyond building perimeter to allow for installation of top of pipe below frost line.

.2 Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit and as follows:

.1 Excavate trench walls vertically from trench bottom to 300 mm higher than top of pipe or conduit.

.2 Allow for 300 mm clearance on each side of pipe or conduit.

.3 Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit; shape sub grade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits; remove projecting stones and sharp objects along trench sub grade, and as follows:

.1 Hand excavate trench bottoms and support pipe and conduit on undisturbed sub grade for pipes and conduit less than 150 mm in nominal diameter and flat bottomed, multiple duct conduit units.

.2 Shape bottom of trench to support bottom 90 mm of pipe circumference for pipes and conduit greater than 150 mm in nominal diameter; fill depressions with tamped sand backfill.

.3 Excavate trenches 150 mm deeper than elevation required in Rock or other unyielding bearing material to allow for bedding course.

3.8 SUB-GRADE REVIEW

.1 Notify Departmental Representative when excavations have reached required sub-grade.

.2 Continue excavation and replace with compacted backfill or fill material as directed where Departmental Representative determines that unsatisfactory soil is present.

.3 Proof roll sub grade below the building slabs and pavements using heavy pneumatic tired equipment to identify soft pockets and areas of excess yielding; proof roll dry sub-grades having optimal moisture content, and as follows:

.4 Completely proof roll sub grade in one direction, repeating proof rolling in direction perpendicular to first direction; limit vehicle speed to 5 km/h.

.5 Proof roll using a loaded 10 wheel, tandem axle dump truck weighing not less than 14 tonnes.

.6 Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting as determined by Departmental Representative and replace with compacted backfill or fill as directed.

.7 Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Departmental Representative, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

.1 Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation using lean concrete fill having 28-day compressive strength of 17.2 MPa; refer to Section 32 13 13 – Concrete Paving, Sidewalks, Curbs and Gutters for concrete materials.

.2 Fill unauthorized excavations under other construction or utility pipe as directed by Departmental Representative.

3.10 BACKFILL

.1 Place backfill on sub-grades free of mud, frost, snow, or ice.

.2 Place and compact backfill in excavations promptly after the completion of the following:

.1 Construction below finish grade.

.2 Surveying locations of underground utilities for Project Record Documents.

.3 Testing and inspecting of underground utilities.

.4 Removal of concrete formwork.

.5 Removal of trash and debris.

.6 Removal of temporary shoring and bracing, and sheeting.

.7 Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 UTILITY TRENCH BACK FILL

.1 Place backfill on sub-grades free of mud, frost, snow, or ice.

.2 Place and compact bedding course on trench bottoms; shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

.3 Backfill trenches excavated under footings and within 450 mm of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.

.4 Provide 100 mm thick, concrete base slab support for piping or conduit less than 750 mm below surface of roadways; completely encase piping or conduit in a minimum of 100 mm of concrete before backfilling or placing roadway sub-base after installing and testing.

.5 Place and compact initial soil backfill, free of particles larger than 25 mm in any dimension to a height of 300 mm over utility pipe or conduit.

.6 Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit; coordinate backfilling with utilities testing.

.7 Backfill voids with satisfactory soil while installing and removing shoring and bracing.

.8 Place and compact final backfill of satisfactory soil to final sub grade elevation.

.9 Install warning tape directly above utilities 300 mm below finished grade in landscaped areas and 150 mm below sub grade under pavements and slabs.

3.12 SOIL FILL

.1 Plough, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

.2 Place soil fill on sub-grades free of mud, frost, snow, or ice.

.3 Place and compact fill material in layers to required elevations as follows:

.1 Under grass and planted areas: use satisfactory soil material.

.2 Under walks and pavements: use satisfactory soil material.

.3 Under steps and ramps: use engineered fill.

.4 Under building slabs: use engineered fill.

.5 Under footings and foundations: use engineered fill.

3.13 SOIL MOISTURE CONTROL

.1 Uniformly moisten or aerate sub grade and each subsequent fill or backfill soil layer before compaction to within 2% of optimum moisture content.

.2 Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

.3 Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2% and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

.1 Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

.2 Compact soil materials to not less than 98% Standard Proctor Density to ASTM D698.

.3 Compact areas inaccessible to consolidation by mechanical rollers, and areas within 1500 mm of exterior walls by hand tampers or rollers operated to avoid any damage to existing work.

.4 Sprinkle material with water where necessary to bring to optimum moisture content so that specified density is achieved.

.5 Proof roll sub grade for exterior slabs and paving prior to placing any granular material

3.15 GRADING

.1 Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated, and as follows:

.1 Provide a smooth transition between adjacent existing grades and new grades.

.2 Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

.2 Slope grades to direct water away from buildings and to prevent ponding; finish sub-grades to required elevations within the following tolerances:

.1 Lawn or Unpaved Areas: ±35 mm.

.2 Walks: ±25 mm.

.3 Pavements: ±13 mm.

.3 Finish sub grade on interior of building to a tolerance of 13 mm when tested with a 3 metre straightedge.

3.16 SUBSURFACE DRAINAGE

.1 Coordinate and install subsurface drainage systems if subsurface drainage is indicated for the project.

3.17 SUB-BASE AND BASE COURSES

.1 Place sub-base and base course on sub-grades free of mud, frost, snow, or ice.

.2 Place sub-base and base course under pavements and walks on prepared sub grade as follows:

.3 Install separation geotextile on prepared sub grade in accordance with manufacturer's written instructions, overlapping sides and ends.

.4 Place base course material over sub base course under hot mix asphalt pavement.

.5 Shape sub-base and base course to required crown elevations and cross slope grades.

.6 Place sub-base and base course 150 mm or less in compacted thickness in a single layer.

.7 Place sub-base and base course that exceeds 150 mm in compacted thickness in layers of equal thickness, with no compacted layer more than 150 mm thick or less than 75 mm thick.

.8 Compact sub-base and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98% of maximum dry unit weight in accordance with ASTM D698.

3.18 CAPILLARY BREAK

.1 Place capillary break on sub-grades free of mud, frost, snow, or ice.

.2 On prepared sub-grade, place and compact capillary break under cast in place concrete slabs on grade as follows:

.1 Install geotextile on prepared sub-grade in accordance with manufacturer's written instructions, overlapping sides and ends.

.2 Place capillary break 150 mm or less in compacted thickness in a single layer.

.3 Place capillary break that exceeds 150 mm in compacted thickness in layers of equal thickness, with no compacted layer more than 150 mm thick or less than 75 mm thick.

.4 Compact each layer of capillary break to required cross sections and thicknesses to not less than 95% of maximum dry unit weight in accordance with ASTM D698.

3.19 FIELD QUALITY CONTROL

.1 Notify testing agency to inspect and test sub-grades and each fill or backfill layer; proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

.2 Make compaction tests at following frequencies:

.1 Exterior side of perimeter walls: One test/100 lineal m of compacted lift of backfill.

.2 Within building area under basement and sub-basement floating slabs on grade: one test/1,000 m² of compacted lift of backfill.

.3 Within building area under main floor structural slabs: one test/2,500 m² of compacted lift of backfill.

.4 Under exterior floating concrete slabs: one test/1,000 m² of compacted lift of backfill.

.5 Under exterior structural slabs: one test/2,500 m² of compacted lift of backfill.

.6 Retaining walls: one test/100 lineal m of compacted lift of backfill.

.7 Asphalt pavement sub base: one test/1000 m² of compacted lift of backfill or re-compacted lift of native material.

.8 Asphalt pavement granular base: one test/1000 m² of compacted lift of backfill.

.9 Trenches more than 15 metres in length: 2 density tests per 600 mm of trench depth per 100 m of trench length.

.10 Trenches 15 m or less in length: minimum of 3 density test evenly spaced through the depth and length of trench.

.11 Landscaped areas: One test/2,500 m² of compacted lift of backfill.

.3 Scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and re-test until specified compaction is obtained when testing agency reports that sub-grades, fills, or backfills have not achieved degree of compaction specified

3.20 PROTECTION

.1 Protect newly graded areas from traffic, freezing, and erosion; keep free of trash and debris.

.2 Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

.3 Remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing where settling occurs before Project correction period elapses; restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 RESTORATION

.1 Remove surplus materials and debris, trim slopes, and correct defects noted by Departmental Representative upon completion of work.

.2 Replace topsoil as indicated.

.3 Reinstate pavement, sidewalks, and landscaping to condition and elevation that existed before excavation.

.4 Clean and reinstate areas affected by work as directed by Departmental Representative.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

.1 Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off property in conformance with province of Newfoundland and Labrador requirements.

3.23 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

1.2 REFERENCE STANDARDS

.1 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.

.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.

.5 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide required information in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for polyurethane foam sprayed insulation and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

.3 Samples:

.1 Submit 3 samples of each material listed below for approval prior to delivery of materials to project site.

.2 Tree wound paint: one litre can with manufacturer's label.

.4 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Provide manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

.1 Do construction occupational health and safety in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

.2 Comply with recommended WHMIS MSDS procedures and personal protection equipment.

1.6 STORAGE AND PROTECTION

.1 Prevent damage to features to remain; for example, fencing, trees, shrubs, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, and root systems of trees which are to remain.

.2 Repair damaged items to approval of Departmental Representative.

.3 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.

.1 Trim limbs and tops, and saw into saleable lengths.

.2 Stockpile adjacent to site.

.3 Ash wood mixed with the wood of other species is to all be managed and disposed of as ash wood.

Part 2 Products

2.1 MATERIALS

.1 Bituminous based paint of standard manufacture specially formulated for tree wounds.

.2 Soil Material for Fill:

.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.

.2 Remove and store soil material for reuse.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION

.1 Inspect site and verify with Departmental Representative, items designated to remain.

.2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.3 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.

.4 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.

.5 Notify utility authorities before starting clearing and grubbing.

.6 Keep roads and walks free of dirt and debris.

3.3 APPLICATION

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

3.4 CLEARING

.1 All cutting must be saw cut. Mechanical mulching heads are prohibited.

.2 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.

.3 Clear as indicated or directed by Departmental Representative by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.4 Cut off branches overhanging area cleared as directed by Departmental Representative.

.5 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.5 CLOSE CUT CLEARING

.1 Close cut clearing to ground level.

.2 Perform close cut clearing by hand.

.3 Cut off branches overhanging area cleared as directed by Departmental Representative.

.4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.6 ISOLATED TREES

.1 Cut off isolated trees as indicated or directed by Departmental Representative at height of not more than 300 mm above ground surface.

.2 Grub out isolated tree stumps.

.3 Prune individual trees as indicated.

.4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.

.5 Cut limbs and branches to be trimmed close to bole of tree or main branches.

.6 Paint cuts more than 3 cm in diameter with approved tree wound paint.

3.7 UNDERBRUSH CLEARING

.1 Clear underbrush from areas as indicated at ground level.

3.8 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 200 mm below ground surface.

.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 mü.

.4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.9 REMOVAL AND DISPOSAL

.1 Remove cleared and grubbed materials off site to disposal area designated by Departmental Representative.

.2 Cut timber greater than 125 mm diameter to approved lengths and stockpile as indicated. Stockpiled timber becomes property of Departmental Representative.

.3 Dispose of cleared and grubbed materials by methods approved by authority having jurisdiction and Departmental Representative.

.4 Bury to approval of Departmental Representative by:

.1 Consolidating.

.2 Covering with minimum 500 mm of mineral soil.

.3 Finishing surface.

.5 Chip or mulch and stockpile cleared and grubbed vegetative material on site as directed by Departmental Representative.

.6 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative.

.7 Any ash wood materials in the form of wood chips or logs are to be scattered widely, to maximum 75 mm depth as directed by Departmental Representative.

.8 Any ash wood materials or firewood which is removed from the site is to be transported in an enclosed vehicle and disposed of at an authorized disposal facility.

.9 The Contractor is responsible for monitoring all cut ash wood and firewood until it is properly disposed of as determined by Departmental Representative.

3.10 FINISHED SURFACE

.1 Leave ground surface in condition suitable for immediate grading operations or stripping of topsoil to approval of Departmental Representative.

3.11 CLEANING

.1 Proceed in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, flagging tape, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 31 22 13 – Rough Grading.

1.2 REFERENCE STANDARDS

.1 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

Part 2 Products

2.1 TOPSOIL

.1 Topsoil shall remain property of the Departmental Repetitive.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 STRIPPING OF TOPSOIL

.1 Ensure that procedures are conducted in accordance with applicable federal, provincial and local requirements.

.2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.

.3 Handle topsoil only when it is dry and warm.

.4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal.

.5 Remove brush from targeted area by non-chemical means and dispose of through alternative disposal.

.6 Strip topsoil to depths as indicated or as directed by Departmental Representative.

.7 Avoid mixing topsoil with subsoil.

.8 Pile topsoil in berms in locations as directed by Departmental Representative.

.9 Stockpile height not to exceed 3 m.

.10 Dispose of unused topsoil off-site only upon written direction from the Owner.

.11 Protect stockpiles from contamination and compaction.

.12 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.

.13 All unused topsoil to be disposed of site at end of the project.

3.3 PREPARATION OF GRADE

.1 Verify that grades are correct and notify Departmental Representative if discrepancies occur. Do not begin work until instructed by Departmental Representative.

.1 Grade area only when soil is dry to lessen soil compaction.

.2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.4 PLACING OF TOPSOIL

.1 Place topsoil only after Departmental Representative has accepted subgrade.

.2 Spread topsoil during dry conditions in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.

.3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.

.4 Cultivate soil following spreading procedure.

3.5 CLEANING

.1 Proceed in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, flagging tape, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 31 11 00 – Clearing and grubbing.

.3 Section 31 14 13 – Soil Stripping and Stockpiling.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM D698-12e2, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 Underwriters' Laboratories of Canada (ULC).

1.3 EXISTING CONDITIONS

.1 Examine subsurface investigation report which is bound into specification following Section 00 30 00 – Information Documents.

.2 Known underground and surface utility lines and buried objects are as indicated on site plan.

.3 Refer to dewatering in Section 31 00 99 – Common Work Results for Earthworks.

Part 2 Products

2.1 MATERIALS

.1 Fill material: to Section 31 00 99 – Common Work Results for Earthworks as approved by Departmental Representative.

.2 Excavated or graded material existing on site suitable to use as fill for grading work if approved by Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

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

.2 Visually inspect substrate in presence of Departmental Representative.

.3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 GRADING

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.

.2 Rough grade to following depths below finish grades:

.1 150 mm for grassed areas.

.2 300 mm for flowerbeds.

.3 400 mm for shrub beds.

.4 600 mm for asphalt paving.

.5 150 mm for gravel paving at pavilions and for crusher dust trails.

.6 350 mm for concrete paving.

.3 Slope rough grade away from building 1:50 minimum.

.4 Grade ditches to depth required for maximum run-off.

.5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.6 Compact filled and disturbed areas to maximum dry density to ASTM D698, as follows:

.1 85% under landscaped areas.

.2 95% under paved and walk areas.

.7 Do not disturb soil within branch spread of trees or shrubs to remain.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 - General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 - General Requirements: Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 11 10 - General Requirements: Waste Management and Disposal

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, and surface or underground utility lines which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.

.2 Maintain access roads to prevent accumulation of construction related debris on roads.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 31 14 13 – Soil Stripping and Stockpiling.

.3 Section 31 22 13 – Rough Grading.

1.2 REFERENCE STANDARDS

.1 American Association of State Highway and Transportation Officials (AASHTO)

.1 AASHTO T99-15, Standard Method of test for Moisture-Density Relations of Soils Using a 2.5 kg (5.5lb) Rammer and 305 mm (12 in) Drop.

.2 ASTM International

.1 ASTM D698-12e2, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.3 Underwriters' Laboratories of Canada (ULC).

1.3 DEFINITIONS

.1 Rock Excavation: excavation of:

.1 Material from solid masses of igneous, sedimentary or metamorphic rock which, prior to removal, was integral with parent mass. Material that cannot be ripped with reasonable effort with a Caterpillar D9 crawler bulldozer or equivalent to be considered integral with parent mass.

.2 Boulder or rock fragments measuring in volume 1 cubic metre or more.

.2 Common Excavation: excavation of materials that are not Rock Excavation or Stripping.

.3 Unclassified Excavation: excavation of whatever character other than stripping encountered in the Work.

.4 Free Haul: distance that excavated material is hauled without compensation. Free haul distance to be 0.5 km or less.

.5 Stripping: excavation of organic material covering original ground.

.6 Over Haul: authorized hauling in excess of free haul distance that excavated material is moved.

.7 Embankment: material derived from usable excavation and placed above original ground or stripped surface up to top of subgrade.

.8 Waste Material: material unsuitable for embankment, embankment foundation or material surplus to requirements.

.9 Borrow Material: material obtained from areas outside right-of-way and required for construction of embankments or for other portions of work.

.10 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Submit for approval and review blasting program including preshear details, powder factors fly-rock control, and vibration monitoring methods.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements:

.1 Adhere to regulations of authority having jurisdiction when blasting is required.

.2 Adhere to Provincial and National Environmental requirements when potentially toxic materials are involved.

Part 2 Products

2.1 MATERIALS

.1 Embankment materials require approval by Departmental Representative.

.2 Material used for embankment not to contain more than 3% organic matter by mass, frozen lumps, weeds, sod, roots, logs, stumps or other unsuitable material.

.3 Borrow material:

.4 Obtain from sources such as quarry, or borrow pit as approved, or as designated by Departmental Representative.

.5 Earth Embankment materials to consist of acceptable earth material and processed rock material free from objectionable quantities of organic matter, frozen soil, stumps, trees, moss, and other unsuitable materials.

.6 Rock Embankment material to consist of fragmented rock produced by drilling and blasting operations, and boulders which cannot be placed in layers as specified for Earth Embankments.

.7 Rock Embankment to conform to gradation as follows:

Sieve Designation	Percent Passing by Weight
150 mm	100
100 mm	85 – 100
75 mm	10 - 50
No. 200	* 0 - 3

* Gradation is determined by that portion passing 75 mm screen.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that condition of substrate is acceptable for roadway embankment Work:

.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 COMPACTION EQUIPMENT

.1 Compaction equipment: vibratory rollers or vibrating plate compactors capable of obtaining required density in materials on project.

.1 Demonstrate compaction equipment effectiveness on specified material and lift thickness by documented performance of test-strip before start of Work.

.2 Replace or supplement equipment that does not achieve specified densities.

.2 Operate compaction equipment continuously in each embankment when placing material.

3.3 WATER DISTRIBUTORS

.1 Apply water with equipment capable of uniform distribution.

3.4 STRIPPING OF TOPSOIL

.1 Stripping: to Section 31 14 13 – Soil Stripping and Stockpiling.

3.5 EXCAVATING

.1 Refer to Section 31 00 99 – Common Work Results for Earthworks.

.2 General:

.1 Notify Departmental Representative when waste materials are encountered and remove to depth and extent directed.

.2 Sub-excavate 500 mm below subgrade in cut sections unless otherwise directed by Departmental Representative.

.1 Compact top 150 mm below sub-excavate to minimum 95% maximum dry density, to ASTM D698.

.2 Replace with approved embankment material and compact to specified embankment density.

.3 Treat ground slopes where subgrade is on transition from excavation to embankment at grade points as directed by Departmental Representative.

.4 Treat ground slopes, where subgrade is on transition from excavation to embankment, at grade points in accordance with standard plans for "Cut and Fill Construction Methods at Grade Points" as directed by Departmental Representative.

.3 Drainage:

.1 Maintain profiles, crowns and cross slopes to provide good surface drainage.

.2 Provide ditches as work progresses to provide drainage.

.3 Construct interceptor ditches as indicated or as directed before excavating or placing embankment in adjacent area.

.4 Rock excavation:

.1 Notify Departmental Representative when material appearing to conform to classification for rock is encountered to enable measurements to be made to determine volume of rock. Provide 12-hour notification.

.2 Submit blasting program to Departmental Representative, for approval 48-hours minimum before start of Work.

.1 Do not proceed without written approval of blasting program from Departmental Representative.

.3 Shatter rock to 300 mm below subgrade elevation as indicated.

.4 Reduce overbreak and increase stability of rock faces by using smooth blasting techniques.

.5 Use smooth blast and excavate short sections in rock cuts to determine optimum spacing of holes when requested by Departmental Representative.

.6 Stem holes as necessary to contain blast.

.7 Do not use prilled type ammonium nitrate and fuel oil (ANFO) explosives within 4 m of final cut line.

.8 Form back wall by pre-splitting at least 10 m in advance of production blasting.

.9 Smooth wall blast just prior to or just after production blast as determined by approved blast program.

.10 Scale rock backslopes to achieve smooth, stable face, free of loose rock and overhangs to design backslope.

.11 Control blasting to minimize flying particles.

.5 Borrow Excavation:

.1 Completely use in embankments, suitable materials removed from right-of-way excavations before taking material from borrow areas.

.2 Obtain embankment materials, in excess of what is available from cut areas, from designated borrow areas.

.3 Departmental Representative to designate extent of borrow areas and allowable depth of excavation.

.4 Remove waste and stripping material from borrow pits to designated locations.

.5 Slope edges of borrow areas to minimum 2:1 and provide drainage as directed.

.6 Trim and leave borrow pits in condition to permit accurate measurement of material removed.

3.6 EMBANKMENTS

.1 Scarify or bench existing slopes in side hill or sloping sections to ensure proper bond between new materials and existing surfaces.

.1 Method used to be to be pre-approved in writing by Departmental Representative.

.2 Break up or scarify existing road surface prior to placing embankment material.

.3 Do not place material which is frozen nor place material on frozen surfaces except in areas authorized by Departmental Representative.

.4 Maintain crowned surface during construction to ensure ready run-off of surface water.

.5 Drain low areas before placing materials.

.1 Place and compact to full width in layers not exceeding 200 mm loose thickness. Departmental Representative may authorize thicker lifts if specified compaction can be achieved and if material contains more than 25% by volume stone and rock fragments larger than 100 mm.

.6 Where material consists of rock:

.1 Place to full width in layers of sufficient depth to contain maximum sized rocks, but in no case is layer thickness to exceed 1 m.

.2 Distribute rock material to fill voids with smaller fragments to form compact mass.

.3 Fill surface voids at subgrade level with rock spalls or selected material to form earth-tight surface.

.4 Do not place boulders and rock fragments with dimensions exceeding 150 mm within 300 mm of pavement subgrade elevation.

.7 Deductions from excavation will be made for overbuild of embankments.

3.7 COMPACTION

.1 Break material down to sizes suitable for compaction and mix for uniform moisture to full depth of layer.

.2 Deposit, spread, and level, embankment material in layers 200 mm maximum thickness before compaction.

.1 Compact each layer of embankment until compaction equipment achieves no further significant consolidation.

.2 Ensure required compaction for each layer before placing any material for next layer.

.3 Use specialized compaction equipment supplemented by routing, hauling, and levelling equipment over each layer of fill.

.4 Obtain written approval from Departmental Representative before using specialized compaction equipment such as tamping rollers, vibratory rollers, or other alternate compaction equipment that produces the required results.

.1 For tamping rollers, use equipment that exerts 1000 kPa minimum of pressure on tamping surface of each tamping foot in transverse row.

.5 Compact each layer to minimum 95% maximum dry density: ASTM D698 except top 150 mm of subgrade.

.6 Compact top 150 mm to 100% maximum dry density.

.7 Add water or dry as required to bring moisture content of materials to level required to achieve specified compaction.

3.8 FINISHING

.1 Shape entire roadbed to within 25 mm of design elevations.

.2 Finish slopes, ditch bottoms and borrow pits true to lines, grades and drawings where applicable. Scale slope by removing loose fragments, for cut slopes in bedrock steeper than 1:1.

.3 Remove rocks over 150 mm in dimension from slopes and ditch bottoms.

.4 Hand finish slopes that cannot be finished satisfactorily by machine.

.5 Round top of backslope 1.5 m both sides of top of slope.

.6 Run tractor tracks over slopes exceeding 3 m in height to leave tracks parallel to centreline of highway.

.7 Trim between constructed slopes and edge of clearing to provide drainage and free of humps, sags and ruts.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.5 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.10 PROTECTION

.1 Maintain finished surfaces in condition conforming to this section until acceptance by Departmental Representative.

.2 Provide silt fences and erosion protection as required to mitigate and prevent impacts to adjacent properties.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM D4491/D4491M-16, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

.3 ASTM D4595-11, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.

.4 ASTM D4716/D4716M-14, Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.

.5 ASTM D4751-16 Standard Test Methods for Determining Apparent Opening Size of a Geotextile.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-4.2 No. 11.2-M89(R2013), Textile Test Methods - Bursting Strength - Ball Burst Test.

.2 CAN/CGSB-148.1(2003), Methods of Testing Geotextiles – (Complete Set).

.1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.

.2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.

.3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.

.4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.

.5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.

.3 CSA International

.1 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitation.

.3 Samples:

.1 Provide following samples 4 weeks prior to beginning Work.

.1 Minimum length of 2 m of roll width of geotextile.

.2 Methods of joining.

.4 Test and Evaluation Reports:

.1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Store materials off ground in dry location, and in accordance with manufacturer's recommendations.

.2 Store and protect geotextiles from direct sunlight and UV rays.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Geotextile: woven or non-woven synthetic fibre fabric, supplied in rolls.

.1 Width: 3.5 m minimum.

.2 Length: 150 m minimum.

.3 Composed of: minimum 85% by mass of polypropylene or polyester with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.

.2 Physical properties:

.1 Thickness: to CAN/CGSB-148.1, No.3, minimum 9 mm.

.2 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 270 g/m^2.

.3 Tensile strength and elongation (in any principal direction): to ASTM D4595.

.1 Tensile strength: minimum 2 N, wet condition.

.2 Elongation at break: minimum 45 %.

.3 Seam strength: minimum 1.5 N, and equal to or greater than tensile strength of fabric.

.4 Grab tensile strength and elongation: to CAN/CGSB-148.1, No.7.3.

.1 Breaking force: minimum 45 N, wet condition.

.2 Elongation at future: minimum 55%.

.3 Hydraulic properties:

.1 Apparent opening size (AOS): to ASTM D4751, 45 - 150 micrometres.

.2 Filtration opening size (FOS): to CAN/CGSB-148.1 No.10.

.3 Transmissivity: to ASTM D4716, minimum 50 kPa.

.4 Permitivity: to ASTM D4491, 2 pers.

.4 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m^2 to ASTM A123/A123M.

.5 Factory seams: sewn in accordance with manufacturer's recommendations.

.6 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material 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 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with approved instruments.

.2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.

.3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.

.4 Overlap each successive strip of geotextile 600 mm over previously laid strip.

.5 Join successive strips of geotextile by sewing.

.6 Pin successive strips of geotextile with securing pins at manufacturer’s recommended intervals at mid-point of lap.

.7 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.

.8 After installation, cover with overlying layer within 4 hours of placement.

.9 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

.10 Place and compact soil layers in accordance with Section 31 00 99 – Common Work Results for Earthworks, and 31 24 13 - Roadway Embankments.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 31 32 19.16 – Geotextiles.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A90/A90M-13, Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.

.2 ASTM A313/A313M-13 Standard Specification for Stainless Steel Spring Wire.

.3 ASTM A641/A641M-09a(2014) Standard Specification for Zinc–Coated (Galvanized) Carbon Steel Wire.

.4 ASTM A974-97(2016) Standard Specification for Welded Wire Fabric Gabions and Gabion Mattresses (Metallic-Coated or Polyvinyl Chloride (PVC) Coated).

.5 ASTM AS1064/A1064M-16b, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.6 ASTM B117-16 Standard Practice for Operating Salt Spray (Fog) Apparatus

.7 ASTM D412-15a Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

.8 ASTM D638-14 Standard Test Method for Tensile Properties of Plastics

.9 ASTM D746-14 Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact

.10 ASTM D792-13 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

.2 CSA International

.1 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's installation instructions, printed product literature and datasheets for gabions and include product characteristics, details, performance criteria, wire thickness, finish and limitations.

.3 Test and Evaluation Reports:

.1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and with manufacturer's written instructions.

.2 Storage and Handling Requirements:

.1 Store materials off ground in dry location, and in accordance with manufacturer's recommendations.

.2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Standards: welded steel wire mesh gabions & mattresses shall meet or exceed the requirements of the following standards:

.1 ASTM A90/A90M.

.2 ASTM A641/A641M.

.3 ASTM AS1064/A1064M.

.2 Architectural Gabions – General:

.1 Factory fabricated so that sides, ends, lid and internal diaphragms can be readily assembled at site into rectangular baskets of sizes as indicated.

.2 Single unit construction or with joints having strength and flexibility equal to that of mesh.

.3 Gabions shall consist of square wire mesh formed containers filled with rock. Gabions will conform to the following: Welded wire mesh with a uniform square pattern and a resistance weld at each intersection.

.4 The welded wire connections shall conform to the requirements of ASTM A185, including wire smaller than W1.2 (3.15 mm.); except that the welded connections shall have minimum average shear strength of 70% and minimum shear strength of 60% of the minimum ultimate tensile strength of the wire.

.5 The wire shall have a minimum tensile strength of 413 MPa. Galvanized steel wire shall conform to ASTM A 641, Class 3, and Soft Temper.

.6 Provide diaphragms of same mesh as gabion walls, when length exceeds horizontal width. Diaphragms to divide basket into equal cells of length not to exceed horizontal width.

.3 Fusion-Bonded PVC Coating – General, minimum requirements:

.1 Specific gravity, to ASTM D792: 1.30 to 1.40.

.2 Abrasion resistance, to ASTM D1242, Method B at 200 cycles, CSI-A Abrader Tape, 80 Grit.

.3 Brittleness temperature to ASTM D746: not higher than -10 degrees C.

.4 Tensile strength, to ASTM D638: not less than 15.7 MPa at 100 percent strain.

.5 Modulus of elasticity, to ASTM D638: not less than 14 MPa at 100 percent strain.

.6 Ultraviolet light exposure, to ASTM G23: test period not less than 3,000 hours using apparatus type E at 63 degrees C.

.7 Salt spray test, to ASTM B117: test period not less than 3,000 hours.

.4 Gabion Baskets, to ASTM A974:

.1 The mesh openings shall be approximately 75 mm x 75 mm.

.2 Secure perimeter edges with accessories supplied by manufacturer.

.3 Wire to have following dimensions:

.1 Hot dip galvanized welded mesh: 2.7 mm diameter plus 0.51 mm thick PVC coating (full circumference).

.2 Hot dip galvanized lacing wire: 2.2 mm diameter plus 0.51 mm thick PVC coating.

.3 Hot dip galvanized spiral Binder: minimum 2.7 mm diameter plus 0.51 mm thick PVC coating (full circumference).

.4 Wire: hot dip galvanized and coated with fusion-bonded PVC.

.1 Hot dip galvanized with minimum coverage of 260 g/m^2 to CAN/CSA G164. Cover, full circumference, with minimum 0.51 mm thick polyvinyl chloride coating, fusion-bonded to the hot dip galvanized wire.

.2 Colour: gray.

.5 Interlocking wire fasteners: stainless steel to ASTM A313.

.5 Gabion Mattresses:

.1 Factory fabricated sides, ends, lid and internal diaphragms ready to assemble at site into rectangular mats.

.2 Single unit construction or with joints having strength and flexibility equal to that of mesh.

.3 Provide diaphragms of same mesh as gabion walls, when length exceeds horizontal width. Diaphragms to divide mat into equal cells not to exceed 1 m x 3 m.

.4 Welded wire mesh gabion mats (modular), to ASTM A974:

.5 The mesh openings shall be approximately 38 mm x 75 mm.

.6 Secure perimeter edges with accessories supplied by manufacturer.

.7 Wire to have following dimensions:

.1 Hot dip galvanized welded mesh: 2.2 mm diameter plus 0.51 mm thick PVC coating (full circumference).

.2 Hot dip galvanized lacing wire: 2.2 mm diameter plus 0.51 mm thick PVC coating.

.3 Hot dip galvanized spiral Binder: minimum 2.7 mm diameter plus 0.51 mm thick PVC coating (full circumference).

.8 Wire: hot dip galvanised and coated with fusion-bonded PVC.

.1 Hot dip galvanized with minimum coverage of 260 g/m^2 to CAN/CSA G164. Cover with minimum 0.51 mm thick polyvinyl chloride coating full circumference), fusion-bonded to the hot dip galvanized wire.

.2 Colour: gray.

.9 Interlocking wire fasteners: stainless steel to ASTM A313.

.6 Stone fill: Locally sourced.

.1 Rounded stone: hard, durable, abrasion-resistant, capable of resisting degradation from action of wetting and drying, freezing and thawing cycles.

.1 Baskets: minimum 150 mm to a maximum 200 mm dimension for individual stones.

.2 Mattresses: minimum 76 mm to a maximum 125 mm dimension for individual stones.

.7 Geotextile filter: in accordance with Section 31 32 19.16 - Geotextiles.

.8 Gabion Seat Wall:

.1 Cedar Seat on Gabion Wall: western red cedar seat on gabion basket wall. 12 mm radius edges, 25 mm overhang; Secure to top of wood frame assembly with 2-inch stainless steel nails countersunk. Pressure treated wood frame centered and vertical (a central vertical post support) in gabion basket, wood to not be visible after filled with stone.

.2 Gabion seat wall: 50 x 500x6 mm flat bar aluminum straps predrilled for fasteners; straps installed at 90-degree angle to direction of cedar boards; western red cedar boards, back fastened to straps with stainless steel wood screws, countersunk

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for gabion 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 gabions and geotextiles to lines and grades as indicated. Follow manufacturer's instructions in assembling baskets and mats.

.2 Excavate for and backfill behind gabions in accordance with Section 31 00 99 – Common Work Results for Earthworks. Install a base of 19 mm diameter clear stone under gabions.

3.3 PLACING GABIONS

.1 Wherever possible, place baskets and mats in position prior to filling with stones.

.2 Join adjacent baskets and mats together at corners as recommended by manufacturer, to ensure joints are as strong as mesh.

.3 For underwater placement, prefill gabions. Provide special devices to handle filled baskets and mats without distortion and to place them in position. Connect adjacent gabions together when in place using a diver.

3.4 CEDAR GABION SEAT WALL

.1 Build and install cedar seats as indicated, to Section 06 10 10.

3.5 FILLING BASKETS AND MATS

.1 Tension geogrid gabions according to manufacturer's instructions before filling with stone. Do not release wall tension until sufficient stone fill has been placed to prevent wall slackening.

.2 On exposed faces of gabions, place stones by hand with flattest surfaces bearing against face mesh to produce satisfactory alignment and appearance.

.3 For wire mesh gabions, fill gabion cells in lifts not to exceed 300 mm and connect opposite walls with two tie wires after each lift.

.4 For geogrid gabions, fill cells in lifts not to exceed 300 mm and connect opposite walls with two polyethylene braids after each lift.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

.1 Protect gabion materials and filled gabions from construction damage, and repair or replace damaged units as required and at direction of Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 99 – Common Work Results for Earthworks.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.

.2 ASTM C618-15, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

.2 CSA International

.1 CSA A23.1-14/A23.2-14, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete, Includes Update No. 1 (2015).

.2 CSA A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014), Update No. 3 (2014).

Part 2 Products

2.1 STONE

.1 Hard, dense, with relative density (formally specific gravity) not less than 2.65, durable quarry stone, free from seams, cracks or other structural defects, to meet following size distribution for use intended:

.2 Swale rip-rap (Rock Swale):

.1 Washed, round rock; well-graded mix of 100 - 150 mm diameter stones. Submit one 1 litre sample, to Departmental Representative for approval, prior to incorporation into the work.

.3 Armour rip-rap (Rock Armour):

.1 Not more than 10% of total volume of stones with individual volume less than 30 dm^3.

.2 Not less than 0% of total volume of stones with individual volume of 225 dm^3 or more.

.3 Remaining percentage of total volume to have uniform distribution of stones between 30 and 225 dm^3 size.

.4 Heavy rip-rap:

.1 Not more than 10% of total volume of stones with individual volume less than 30 dm^3.

.2 Not less than 50% of total volume of stones with individual volume of 140 dm^3 or more.

.3 Remaining percentage of total volume to have uniform distribution of stones between 30 and 140 dm^3 size.

.5 Random rip-rap:

.1 Not more than 10% of total volume of stones with individual volume less than 15 dm^3.

.2 Not less than 50% of total volume of stones with individual volume of 85 dm^3 or more.

.3 Remaining percentage of total volume to have uniform distribution of stones between 15 and 85 dm^3 size.

.6 Hand placed rip-rap:

.1 Minimum size of individual stones 10 dm^3.

.2 Not less than 75% of total volume of stones with individual volume of 25 dm^3 or more.

.3 Supply rock spalls or cobbles to fill open joints.

2.2 CEMENT MORTAR

.1 Cement: to CAN/CSA A3000, type 10.

.2 Sand for mortar: to ASTM C 144.

.3 Mortar mix: 1 part by volume of cement to 3 parts sand, to consistency approved by Departmental Representative.

2.3 GEOTEXTILE FABRIC

.1 Geotextile soil stabilization: in accordance with Section 31 32 19.16 – Geotextiles.

Part 3 Execution

3.1 PLACING

.1 Where rip-rap is to be placed on slopes, excavate trench at toe of slope to dimensions as indicated.

.2 Fine grade area to be rip-rapped to uniform, even surface. Fill depressions with suitable material and compact to provide firm bed.

.3 Place geotextile on prepared surface in accordance with Section 31 32 19.16 – Geotextiles, and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.

.4 Place rip-rap to thickness and details as indicated.

.5 Place stones in manner approved by Departmental Representative to secure surface and create a stable mass. Place larger stones at bottom of slopes.

.6 Hand placing:

.1 Use larger stones for lower courses and as headers for subsequent courses.

.2 Stagger vertical joints and fill voids with rock spalls or cobbles.

.3 Finish surface evenly, free of large openings and neat in appearance.

.7 Mortar:

.1 Where rip-Rap voids are to be mortar-filled:

.1 Use mortar within one hour after water has been added. Do not add additional water after initial mixing.

.2 Begin applying mortar at bottom courses above water line and work upwards completely filling voids except for sub-drainage relief holes as required, and leaving outer faces of stones exposed. Remove excess mortar to expose faces of stones.

.3 Cure and protect mortar in accordance with CAN/CSA A23.1 keeping fabric continuously wet.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Techno Metal Post helix system: pile with one or more helical shape steel helix attached to a central steel shaft connected to the structure with a steel bracket.

1.2 SYSTEM DESIGN

.1 Design requirements: helical piles have to be designed by a professional engineer experienced in the design of this work and licensed at the place where the project is located.

.2 Based on the geotechnical report, the experienced professional engineer must design the helical piles (diameter of the central shaft, helix, penetration depth, etc.), depending on the capacity needed.

1.3 SUBMISSION

.1 Shop drawings: Submit shop drawings showing profiles and products components, including helix and accessories.

.2 Provide CCMC Evaluation Report for acceptance of product demonstrate product compliance with the National Building Code 2010.

.3 Register precisely the following: the location of the helical pile, the diameter and length of the steel shaft, the diameter of the helix, the installation angle below the horizontal (as required) and the extension in the axis of the shaft length; the installation torque on all helical pile and the calibration of the torque.

1.4 QUALITY INSURANCE

.1 The installers must be certified by the helical pile manufacturer, experienced and specialize in the installation of similar structures to those required in this project. Provide installers ID card who will be present on job site.

.2 Provide manufacturer's certificate confirming that the process of making helical piles is governed by a quality control system. This document must confirm the quality of raw materials (central shaft and steel helix) by metallurgical certificates and weld quality by physical tests.

Part 2 Products

2.1 COMPONENTS MANUFACTURED

.1 Helical piles: Use the following components designed by the manufacturer or an approved equivalent:

.1 Techno Metal Post (Techno Pieux)

.2 Components:

.2 Manufacture components from materials (steel) respecting standards CAN/G40.21, 500 Grade C and/or CAN/CSA G40.21.

.3 According to lifetime requested by the Client, protecting components by hot dip galvanizing in accordance with standard ASTM A-123-13 or in a cathodic protection system approved.

Part 3 Execution

3.1 INSTALLATION

.1 Complete the installation by a certified installer.

.2 Do not damage surrounding structures.

.3 Provide installation equipment capable of positioning the helical pile resistance and the desired angle. Provide a tool for measuring the torque as part of the installation equipment unit or as a separate instrument. Provide access to measurement data calibration torque to the engineer, inspector or the owner.

.4 Place the helical pile as design on drawings and ensure that the position of the piles is within the prescribed limits of the project. Establish appropriate alignment angle at the beginning of the installation.

.5 Check the torque applied by the installation device during the entire operation and record the values attained for each helical pile. Ensure that the torque is gradual and constant in the last meter installation. Remove all obstructions encountered or relocate and adjust screw piles as required. The installer must ensure that the helix of the pile is placed into undisturbed soil.

.6 Provide extension equipment to obtain the required depth, coupled with bolts or by welding.

3.2 REQUIREMENT QUALITY ON SITE

.1 Test on site: Check torque applied by the installation device during the entire operation.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Techno Metal Post helix system: pile with one or more helical shape steel helix attached to a central steel shaft connected to the structure with a steel bracket.

1.2 SYSTEM DESIGN

.1 Design requirements: helical piles have to be designed by a professional engineer experienced in the design of this work and licensed at the place where the project is located.

.2 Based on the geotechnical report, the experienced professional engineer must design the helical piles (diameter of the central shaft, helix, penetration depth, etc.), depending on the capacity needed.

1.3 SUBMISSION

.1 Shop drawings: Submit shop drawings showing profiles and products components, including helix and accessories.

.2 Provide CCMC Evaluation Report for acceptance of product demonstrate product compliance with the National Building Code 2010.

.3 Register precisely the following: the location of the helical pile, the diameter and length of the steel shaft, the diameter of the helix, the installation angle below the horizontal (as required) and the extension in the axis of the shaft length; the installation torque on all helical pile and the calibration of the torque.

1.4 QUALITY INSURANCE

.1 The installers must be certified by the helical pile manufacturer, experienced and specialize in the installation of similar structures to those required in this project. Provide installers ID card who will be present on job site.

.2 Provide manufacturer's certificate confirming that the process of making helical piles is governed by a quality control system. This document must confirm the quality of raw materials (central shaft and steel helix) by metallurgical certificates and weld quality by physical tests.

Part 2 Products

2.1 COMPONENTS MANUFACTURED

.1 Helical piles: Use the following components designed by the manufacturer or an approved equivalent:

.1 Techno Metal Post (Techno Pieux).

.2 Components:

.1 Manufacture components from materials (steel) respecting standards CAN/G40.21, 500 Grade C and/or CAN/CSA G40.21.

.2 According to lifetime requested by the Client, protecting components by hot dip galvanizing in accordance with standard ASTM A-123-13 or in a cathodic protection system approved.

Part 3 Execution

3.1 INSTALLATION

.1 Complete the installation by a certified installer.

.2 Do not damage surrounding structures.

.3 Provide installation equipment capable of positioning the helical pile resistance and the desired angle. Provide a tool for measuring the torque as part of the installation equipment unit or as a separate instrument. Provide access to measurement data calibration torque to the engineer, inspector or the owner.

.4 Place the helical pile as design on drawings and ensure that the position of the piles is within the prescribed limits of the project. Establish appropriate alignment angle at the beginning of the installation.

.5 Check the torque applied by the installation device during the entire operation and record the values attained for each helical pile. Ensure that the torque is gradual and constant in the last meter installation. Remove all obstructions encountered or relocate and adjust screw piles as required. The installer must ensure that the helix of the pile is placed into undisturbed soil.

.6 Provide extension equipment to obtain the required depth, coupled with bolts or by welding.

3.2 REQUIREMENT QUALITY ON SITE

.1 Test on site: Check torque applied by the installation device during the entire operation.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 31 11 00 – Clearing and Grubbing.

.3 Section 32 92 19.16 – Hydraulic Seeding.

.4 Section 32 92 23 – Sodding.

.5 Section 32 93 43.01 – Tree Pruning.

1.2 REFERENCE STANDARDS

.1 American National Standard Institute (ANSI) / Trees Care Industry Association
- .1 ANSI A300 National Tree Care Standards:
  - .1 ANSI A300 (Part 1) - 2008 (R2014) Pruning.
  - .2 ANSI A300 (Part 2) - 2011 Soil Management: a. Modification, b. Fertilization, and c. Drainage.
  - .3 ANSI A300 (Part 3) - 2013 Supplemental Support Systems (includes Cabling, Bracing, Guying, and Propping).
  - .4 ANSI A300 (Part 5) - 2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction.
  - .5 ANSI A300 (Part 6) - 2012 Planting and Transplanting.
  - .6 ANSI A300 (Part 7) - 2012 Integrated Vegetation Management (IVM).
  - .7 ANSI A300 (Part 9) - 2011 Tree Risk Assessment.

.2 ASTM International
- .1 ASTM A1064/A1064M-16b, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.3 Atlantic Canada Pesticide Applicator Training Manual Series
- .1 Applicator Core Training Manual, July 2006.

.4 CSA Group
- .1 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement, includes Update No. 1 (2012).

.5 Health Canada - Pest Management Regulatory Agency (PMRA)
- .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.7 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .2 Fertilizers Act (R.S. 1985, c. F-10).
- .3 Fertilizers Regulations (C.R.C., c. 666).
- .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 DEFINITIONS

.1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:
- .1 Obtain approval from Departmental Representative of schedule indicating beginning of Work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's instructions, printed product literature and data sheets for tree and shrub preservation materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Provide monthly written reports on maintenance during warranty period, to Departmental Representative identifying:
  - .1 Maintenance work carried out.
  - .2 Development and condition of plant material.
  - .3 Preventative or corrective measures required which are outside Contractor's responsibility.
- .3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and 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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect tree and shrub preservation materials from damage.
- .3 Replace defective or damaged materials with new.

1.7 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
- .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
- .2 Apply pesticides in accordance with the following:
  - .1 Atlantic Canada Applicator Core Training Manual.
  - .2 National Standard for Pesticide Education, Training and Certification in Canada.
  - .3 Federal, Provincial and Municipal regulations as and when required to control

insects, fungus and disease.

.4 Obtain product approval from Departmental Representative prior to application.

.3 Apply fertilizer in early spring at manufacturer's suggested rate.

.4 Remove dead, broken or hazardous branches from plant material. Dispose of debris through alternative disposal, composting or mulching as approved by Departmental Representative.

2 Products

2.1 MATERIALS

.1 Fill:

.1 Obtain fill from local sources.

.2 Class A: clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.

.3 Class B: excavated pervious soil (or imported from local sources if excavated material not pervious), free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc.). Excavated material shall be approved by Departmental Representative before use as fill.

.2 Coarse washed stones: 35-75 mm diameter clean round hard stone.

.3 Draintile: 100 mm diameter corrugated plastic perforated tubing, complete with snap couplings. Fill vents with 20 mm clear stone.

.4 Unamended Peatmoss:

.1 Derived from partially decomposed species of Sphagnum Mosses.

.2 Elastic and homogeneous.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded minimum particle size: 5 mm.

.5 To have a natural pH and is not to be amended with lime.

.5 Fertilizer:

.1 To Canada Fertilizer Act and Fertilizers Regulations.

.2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.

.6 Anti-desiccant: commercial, wax-like emulsion.

.7 Filter Cloth:

.1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m^2 mass.

.2 Type 2: biodegradable burlap.

.8 Temporary site fencing materials:

.1 T-Bars: 2400 mm steel T-bars.

.2 Wire Ties: 9-guage galvanized wire.

.3 Plastic Fencing: standard orange snow (safety) fencing, 1.2-metre-high plastic fence.

.4 Lumber, to Section 06 10 10 - Rough Carpentry: 25 mm x 75 mm.

.9 Board Cladding: to consist of 50 x 100 mm lumber secured around the perimeter of tree trunks with plastic strapping or other means which will not damage the tree.

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for tree and shrub preservation 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 IDENTIFICATION AND PROTECTION

.1 Tree protection to be installed prior to the start of any on site work.

.2 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.

.3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.

.4 Ensure no root pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

3.3 TREE PROTECTION

.1 Drive T-bars into ground sufficient to withstand loads, spaced 1500 mm on centre. Wire T-bars to inside of plastic snow fencing at each T-bar location, using three wire connections per T-bar, equally spaced.

.2 At framed hoarding locations, plastic snow fencing shall be supported by T-Bars at 1800 mm on centre, supported by lumber framing (25 mm x 75 mm) across top.

3.4 ROOT CURTAIN SYSTEM

.1 Identify limits for required construction excavation as approved by Departmental Representative.

.2 Prior to construction excavation, hand dig trench minimum 500 mm wide x 1500 mm deep, along perimeter of excavation limits.

.3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.

.4 Install wooden posts and welded wire fabric against construction edge of trench.

.5 Securely attach Type 2 filter fabric on plant side of wire mesh.

.6 Prepare homogeneous mixture of fertilizer, parent material and organic matter.
- .1 Add organic matter to mixture to achieve 7-9% organic matter content by weight.
- .2 Incorporate with mixture grade 2:12:8 ratio fertilizer (dry) at rate of 1.5 kg/m^2.

.7 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to 85% Standard Proctor Density.

.8 Protect root curtain from damage during construction operations.

.9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.

.10 Protect root curtain before during backfill operations, except as follows: ensure root curtain is cut down to 300 mm below finished grade and remove cut material.

3.5 AIR LAYERING SYSTEM

.1 Using manual methods, carefully remove turf, plants, leaves and organic matter in area of root system, dispose of plant matter through compost site or alternative means acceptable to Departmental Representative and slightly loosen topsoil surface. Avoid damage to root system.

.2 Lay horizontal system of perforated drain pipe on surface of existing grade.
- .1 Slope drain tile minimum 3% for drainage away from trunk of tree.
- .2 Connect system with general site drainage system or drain to low point on site.

.3 Install plastic vent pipes vertically over joints in horizontal pipe system or where indicated. Top of vent pipe to be 20 mm above finished grade of fill. Keep top of vent pipe covered during construction.

.4 Cover joints with Type 1 filter fabric and place coarse washed stone around joints and vertical pipes to secure their position.

.5 Construct drywell around trunk of tree.
- .1 Ensure open ends of horizontal pipe system and vertical vent pipes are left exposed for air circulation to root system.
- .2 Protect openings from blockage during construction.
- .3 Install protective caps on exposed horizontal openings.

.6 Place 200 mm depth of coarse washed stone on surface of original ground and horizontal pipe system to limits.

.7 Place Type 1 filter fabric over surface of granular layer.

.8 Place Class A fill over filter fabric to required depth without disturbing or damaging drain pipe system. Avoid damage to filter fabric.

.9 Complete topsoil and sodding, and finished paving over area of sub-surface system within 1 week of placing fill.

.10 Remove temporary protective covering from vent pipe openings. Install protective caps flush with finished grade.

3.6 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

.1 Centre line location and limits of trench/tunnel excavation to be approved by Departmental Representative prior to excavation. Tunnel excavation to extend 2000 mm from edge of trunk on either side.

.2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.

.3 Excavate tunnel under centre of tree trunk using methods and equipment approved by Departmental Representative.

.4 Minimum acceptable depth to top of tunnel: 1000 mm.

.5 Backfill for tunnel and trench to 85% Standard Proctor Density. Avoid damage to trunk and roots of tree.

.6 Complete tunnelling and backfilling at tree within 2 weeks of beginning Work.

3.7 LOWERING GRADE AROUND EXISTING TREE

.1 Begin Work in accordance with schedule approved by Departmental Representative.

.2 Cut slope not less than 500 mm from tree trunk to new grade level or retaining wall as applicable to site conditions and location.

.3 Excavate to depths as indicated. Protect root zone designated to remain from damage.

.4 When severing roots at excavation level, cut roots with clean, sharp tools.

.5 Cultivate excavated surface manually to 15 mm depth.

.6 Prepare homogeneous soil mixture consisting by volume of:
- .1 60% excavated soil cleaned of roots, plant matter, stones, debris.
- .2 25% coarse, clean sterile sand.
- .3 15% organic matter.
- .4 Grade 2:12:8 fertilizer at rate of 1.5 kg/m^2.

.7 Place soil mixture over area of excavation to finished grade level. Compact to 85% Standard Proctor Density.

.8 Water entire root zone to optimum soil moisture level.

.9 Install surface cover of seeding and sodding in accordance with Section 32 92 19.16 – Hydraulic Seeding and Section 32 92 23 – Sodding.

3.8 PRUNING

.1 Prune in accordance with Section 32 93 43.01 – Tree Pruning.

.2 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris through alternative disposal, composting or mulching as approved by Departmental Representative.

3.9 ANTI-DESICCANT

.1 Apply anti-desiccant to foliage where applicable and as directed by Departmental Representative.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Waste Management and Disposal.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 32 11 23 – Aggregate Base Courses.

1.2 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C117-13, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C131/C131M-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D422-63(2007)e2, Standard Test Method for Particle-Size Analysis of Soils.
- .5 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).
- .6 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
- .7 ASTM D1883-16, Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils.
- .8 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 U.S. Environmental Protection Agency (EPA) / Office of Water
- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and with manufacturer's written instructions.

.2 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations and erosion and sedimentation control plan.
- .2 Replace defective or damaged materials with new.

2 Products

2.1 MATERIALS

.1 Obtain materials locally to extent possible.

.2 Granular sub-base material: in accordance with Section 31 00 99 – Common Work Results for Earthworks, and following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.
.2 Gradations to be within limits specified when tested to ASTM C136.
.3 Table

Class B Granular Sub-Base

Sieve	Percent Passing - Type 1	Percent Passing - Type 2
150 mm	100	n/a
106 mm	n/a	100
37.5 mm	n/a	n/a
26.5 mm	50-100	50-100
19.0 mm	n/a	n/a
13.2 mm	n/a	n/a
9.5 mm	n/a	n/a
4.75 mm	20-100	20-55
1.18 mm	10-100	10-40
300 µm	2-65	5-22
150 µm	n/a	n/a
75 µm	0-8.0	0-10.0

Notre: when Class B is used for granular backfill for pipe sub-drains, 100% shall pass 37.5 mm sieve.

.4 Other properties as follows:
.1 Liquid Limit: to ASTM D4318, Maximum 25.
.2 Plasticity Index: to ASTM D4318, Maximum 6.
.3 Los Angeles degradation: to ASTM C131.
.1 Maximum loss by mass: 40%.
.4 Particles smaller than 0.02 mm: to ASTM D422, Maximum 3%.
.5 Soaked CBR: to ASTM D1883, minimum 40 when compacted to 100% of ASTM D1557.

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base 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 PREPARATION

.1 Temporary Erosion and Sedimentation Control:
.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.

.2 Construct granular sub-base to depth and grade in areas indicated.

.3 Ensure no frozen material is placed.

.4 Place material only on clean unfrozen surface, free from snow or ice.

.5 Begin spreading sub-base material on crown line or high side of one-way slope.

.6 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

.1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.

.9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.10 Remove and replace portion of layer in which material has become segregated during spreading.

3.4 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.

.3 Equipped with device that records hours of actual work, not motor running hours.

.4 Compact to density of not less than 98% maximum dry density in accordance with ASTM D 698.

.5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.6 Apply water as necessary during compaction to obtain specified density.

.7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative DCC Representative Consultant.

.8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 PROOF ROLLING

.1 Locations: proof roll only at areas receiving asphalt or concrete pavement.

.2 For proof rolling use standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.

.3 Obtain written approval from Departmental Representative to use non standard proof rolling equipment.

.4 Proof roll at level in sub-base.
- .1 If non-standard proof rolling equipment is approved, Departmental Representative will determine level of proof rolling.

.5 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.6 Where proof rolling reveals areas of defective subgrade:
- .1 Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.
- .2 Backfill excavated subgrade with common material and compact in accordance with Section 31 00 99 – Common Work Results for Earthworks sub-base material and compact in accordance with this section.
- .3 Replace sub-base material and compact.

.7 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.8 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 32 11 16.01 – Granular Sub-Base.

1.2 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C117-13, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C131/C131M-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D422-63(2007)e2, Standard Test Method for Particle-Size Analysis of Soils.
- .5 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).
- .6 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
- .7 ASTM D1883-16, Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils.
- .8 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 U.S. Environmental Protection Agency (EPA) / Office of Water
- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and with manufacturer's written instructions.

.2 Storage and Handling Requirements:
- .1 Stockpile minimum 50% of total aggregate required prior to beginning operation.
- .2 Store materials off ground in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .3 Replace defective or damaged materials with new.
- .4 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

2 Products

2.1 MATERIALS

.1 Granular base: material in accordance with Section 31 00 99 – Common Work Results for Earthworks, and following requirements:

.1 Crushed stone or gravel.

.2 Gradations to be within limits specified when tested to ASTM C136.

.3 Table

Class A Granular Base

Sieve	Percent Passing
150 mm	n/a
106 mm	n/a
37.5 mm	n/a
26.5 mm	100
19.0 mm	85-100
13.2 mm	65-90
9.5 mm	50-73
4.75 mm	35-55
1.18 mm	15-40
300 µm	5-22
150 µm	n/a
75 µm	2.0-8.0

.4 Other properties as follows:

.1 Liquid limit: to ASTM D4318, maximum 25

.2 Plasticity index: to ASTM D4318, maximum 6.

.3 Los Angeles degradation: to ASTM C131.

.1 Max. % loss by weight: 45.

.4 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face. Material to be divided into ranges using methods of ASTM C136.

Passing		Retained on
50 mm	to	25 mm
25 mm	to	19.0 mm
19.0 mm	to	4.75 mm

.5 Soaked CBR: to ASTM D1883, minimum 80, when compacted to 100% of ASTM D1557.

3 Execution

3.1 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PLACEMENT AND INSTALLATION

.1 Place granular base after sub-base surface is inspected and approved in writing by Departmental Representative.

.2 Placing:
- .1 Construct granular base to depth and grade in areas indicated.
- .2 Ensure no frozen material is placed.
- .3 Place material only on clean unfrozen surface, free from snow and ice.
- .4 Begin spreading base material on crown line or on high side of one-way slope.
- .5 Place material using methods which do not lead to segregation or degradation of aggregate.
- .6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
  - .1 Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
- .8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .9 Remove and replace that portion of layer in which material becomes segregated during spreading.

.3 Compaction Equipment:
- .1 Ensure compaction equipment is capable of obtaining required material densities.
- .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.
- .3 Equipped with device that records hours of actual work, not motor running hours.

.4 Compacting:
- .1 Compact to density not less than 100% maximum dry density to ASTM D698.
- .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
- .3 Apply water as necessary during compacting to obtain specified density.
- .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.
- .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

.5 Proof rolling:
- .1 For proof rolling use standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.
- .2 Obtain written approval from Departmental Representative to use non standard proof rolling equipment.
- .3 Proof roll at level in granular base as indicated.
  - .1 If use of non standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.

.4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.5 Where proof rolling reveals areas of defective subgrade:

.1 Remove base, sub-base and subgrade material to depth and extent as directed by Departmental Representative.

.2 Backfill excavated sub-grade with common material and compact in accordance with Section 31 00 99 – Common Work Results for Earthworks sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-Base.

.3 Replace sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-base.

.4 Replace base material and compact in accordance with this Section.

.6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Departmental Representative and replace with new materials in accordance with Section 32 11 16.01 - Granular Sub-base and this section at no extra cost.

3.3 SITE TOLERANCES

.1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 99 – Common Work Results for Earthworks.

.2 Section 31 32 19.16 – Geotextiles.

.3 Section 32 11 16.01 – Granular Sub-Base.

.4 Section 32 11 23 – Aggregate Base Courses.

.5 Section 32 13 13 – Concrete Paving, Sidewalks, Curbs and Gutters.

.6 Section 32 17 23 – Pavement Markings.

.7 Section 33 41 00 – Storm Utility Drainage Piping.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM D242/D242M-09(2014), Standard Specification for Mineral Filler For Bituminous Paving Mixtures.

.2 ASTM D692/D692M-15, Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.

.3 ASTM D946/D946M-15, Standard Specification for Penetration-Graded Asphalt Binder for Use in Pavement Construction.

.4 ASTM D979/D979M-15, Standard Practice for Sampling Bituminous Paving Mixtures.

.5 ASTM D995-95b (2002), Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.

.6 ASTM D1073-16, Standard Specification for Fine Aggregate for Asphalt Paving Mixtures.

.7 ASTM D2027/D2027M-13, Standard Specification for Cutback Asphalt (Medium-Curing Type).

.8 ASTM D3515 01, Hot-Mixed, Hot -Laid Bituminous Paving Mixtures.

.9 ASTM D4797-12a, Standard Test Methods for Gravimetric Analysis of White and Yellow Thermoplastic Traffic Marking.

.10 ASTM D5581-07a(2013), Standard Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus (6 inch-Diameter Specimen).

.11 ASTM D6373-15, Standard Specification for Performance Graded Asphalt Binder.

.2 Asphalt Institute (AI)

.1 Asphalt Institute IS-91, Full-Depth Asphalt Pavements for Parking Lots, Service Stations and Driveways.

.2 Asphalt Institute MS-4, The Asphalt Handbook (7th Edition).

.3 Asphalt Institute SS-1, Model Construction Specifications for Asphalt Concrete.

.4 Asphalt Institute SS-3, Specifications and Construction Details for Asphalt Curbs and Gutters.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 1.5-M91, Low Flash Petroleum Spirits Thinner.

.2 CAN/CGSB 1.74-2001, Paint, Traffic, Alkyd.

.3 CAN/CGSB 8.1-88, Sieves Testing, Woven Wire, Inch Series.

.4 CAN/CGSB 8.2-M88, Sieves Testing, Woven Wire, Metric.

.5 CAN/CGSB 16.1-M89, Cutback Asphalts for Road Purposes.

.6 CAN/CGSB 16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.

.7 CAN/CGSB 16.3-M90, Asphalt Cements for Road Purposes.

.4 Canadian Standards Association (CSA)

.1 CSA A23.4-16, Precast Concrete - Materials and Construction.

1.3 REGULATORY REQUIREMENTS

.1 Comply with the following Regulatory Requirements:

.1 National Building Code of Canada, 2010, and Amendments.

.2 Province of Newfoundland and Labrador:

.1 The Department of Transportation and Works Specifications Book.

.2 NL Master Specification Guide for Public Funded Buildings, Divisions 31 and 32.

1.4 ASPHALT DRIVE AND PARKING AREAS

.1 Standard: to AASHTO Guide for the Design of Pavement Structures.

.2 The following pavement structure is required for the Asphalt Driveway and Parking Areas:

MATERIAL TYPE	THICKNESS
Asphalt Seal, Mix Type C	50 mm
Asphalt Seal, Mix Type B	50 mm
Granular Base, Granular Class A	200 mm
Granular Base, Granular Class B	300 mm

.3 Compact granular base and premium borrow materials to a minimum 100% of Standard Proctor maximum dry density. Compact asphalt layers to at least 93% of the mix Maximum Theoretical Relative Density. Place and compact asphalt in one lift. Slope paved surfaces a minimum of 1.5% towards drainage structures.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Submit product datasheets and specifications for materials specified.

.3 Submit asphalt concrete mix design and trial mix test results and list of equipment and materials proposed for use to Departmental Representative for review.

.4 Submit a certificate of compliance indicating that the asphalt meets the requirements of the specifications, standards listed above and good local construction practices.

.5 Submit proposed design for grading and pavement construction for Departmental Representatives review. Indicated direction of flow, site water retention area meeting local requirements, thickness and types of asphalt, line painting and pre-cast curb placement, stamped and signed by professional engineer.

.6 Mock-Ups: Install mock-up in accordance with Section 01 11 10 – General Requirements: Quality Control, and as follows:

.1 Apply single paint strip, specified width x 5 m long, and directional handicap parking symbol to the pavement in location directed by the Departmental Representative.

.2 When reviewed and found acceptable by the Departmental Representative, mock-up shall be standard of quality for Work. Accepted work may form a part of the work, unaccepted work shall be removed and replaced.

.7 Testing Results:

.1 Materials shall be tested by accredited testing laboratory and paid for directly by Owner.

.2 Sampling will follow recommended practice of ASTM D979.

.3 Submit test certificates showing suitability of materials at least 4 weeks prior to commencing work.

1.6 QUALITY ASSURANCE

.1 Comply with the requirements of Section 01 11 10 – General Requirements: Quality Control.

.2 Asphalt concrete mixing plants shall conform to ASTM D995.

.3 Provide the equipment, materials, and labour to complete the job. Variations in the size and amount of equipment will depend on the size of the area being paved.

1.7 COORDINATION

.1 Coordinate requirements for curb cuts, turn in, and out lanes and entrance ramp construction.

Part 2 Products

2.1 HOT-MIX HOT-LAID ASPHALT

.1 Design and prepare plant hot-mixed, hot-laid pavement mixtures utilizing asphalt cement and aggregate in accordance with ASTM D3515 and the following requirements.

2.2 BITUMINOUS MATERIALS

.1 Asphalt Cement: to ASTM D946, penetration grade of 200 - 300 for parking areas, and 120 - 150 for curbs. Aggregates shall be coated with a minimum film thickness of 6.5 m in accordance with Marshall Mix Design Criteria and requirements of ASTM D5581.

.2 Tack Coat: emulsified anionic asphalt, SS 1 or SS 1h, mixed with water and meeting the requirements of ASTM D977.

.3 Primer Coat: medium curing, medium viscosity cutback asphalt, MC-80 meeting the requirements of ASTM D2027.

2.3 MINERAL AGGREGATE

.1 Mineral aggregate for asphalt plant-mix shall consist of crushed stone, crushed gravel, sand, mineral filler, to ASTM D692 and ASTM D1073 and mineral filler. Mineral filler may be Portland cement, pozzolan, or commercially ground stone dust conforming to ASTM D242.

.2 Coarse aggregate shall be sound, angular crushed stone, crushed gravel, or crushed slag. Uncrushed coarse aggregate may be used in base course mixtures if the mixture meets all design criteria. The fine aggregate shall be well graded, moderately sharp to sharp sands.

.3 Mineral aggregate and asphalt shall be combined in a mixing plant to meet the following gradations for asphalt concrete:

Base and Surface Asphalt New Paving

Sieve Size		% Passing by Weight	
		Aggregate	Filler
19.0 mm	(¾")	100	
9.5 mm	(3/8")	60-80	
4.75 mm	(#4)	40-65	
2.36 mm	(#8)	30-50	
600 μm	(#30)	15-30	100
300 μm	(#50)	10-25	95-100
150 μm	(#100)	5-20	
75 μm	(#200)	3-8	70-100

Asphalt content as a percentage of weight by total mix shall conform to the requirements of Asphalt Institute MS-4.

2.4 ACCESSORIES

.1 Line Paint: to Section 32 17 23 – Pavement Markings.

.2 Adjustment Rims: as required to adjust elevation of maintenance hole rims and valve chambers.

.3 Where asphalt is to be milled to create a key for overlapping to existing, provide bitumen joint tape with self-adhesive face, and primer; purpose-made for application, for use at low temperatures; complies with ZTV Fug-StB.

.4 Integral Edge Restraint: flexible L-shaped 6005 Alloy aluminum asphalt restraints, black. Designed for use over aggregate, asphalt overlay, and asphalt over concrete.

.5 Asphalt impregnated fibreboard expansion joint material.

.6 Sub-Base: Class B granular, to Section 32 11 16.01 - Granular Sub-Base.

.7 Base: Class A granular, to Section 32 11 23 - Aggregate Base Courses.

.8 Surge rock: 2-inch to 9-inch washed round river rock.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that condition of substrate is acceptable for asphalt paving Work:

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Grades and elevations shall be established by the Contractor. The Contractor shall set grade stakes to the correct elevation as indicated on the Drawings. Coordinate grades with existing features and adjoining properties to ensure proper drainage.

.2 All debris, vegetation, or other perishable materials shall be removed from the site, except for trees or shrubs designated for preservation.

.3 Grade site in accordance with Section 31 22 13 to the required section and remove excess material from site.

.4 When granular base course is the substrate for an asphalt pavement layer, apply an asphalt prime coat. When asphalt pavement is the substrate for an asphalt pavement layer, apply an asphalt tack coat.

.5 Compact top 300 mm subgrade to a minimum of 100% Standard Proctor maximum dry density at moisture content within 2% of optimum moisture content.

.6 The surface of the subgrade after compaction shall be hard, uniform, smooth, and true to grade and cross section.

.7 Confirm compaction by driving a heavily loaded truck over subgrade and note deflection.

.8 Roll subgrade to correct conditions where significant deflection occurs.

.9 Scarify subgrade to a depth of 150 mm and re compact where rolling does not correct the soft condition.

.10 Remove and replace subgrade with select materials where re compaction does not correct soft condition.

.11 Treat subgrade with a soil sterilant at the rate specified by the manufacturer to prevent the growth of weeds prior to placing base courses.

.12 Prepare granular base courses in accordance with Section 31 05 00.

.13 Apply emulsified asphalt tack coat to prepared subgrade at a minimum rate of 0.25 L/m^2. Dilute asphalt emulsion with equal parts of water.

.14 Apply cutback asphalt prime coat to prepared granular base courses at a minimum rate of 0.7 L/m^2.

3.3 PAVEMENT CONSTRUCTION

.1 Light Traffic Construction (Regular Asphalt): Lay plant hot mixed, hot laid asphalt on prepared subgrade and base courses to a total compacted thickness of 275 mm. Place material in a single thick lift.

.2 Heavy Traffic Construction (Heavy-Duty Asphalt): Lay plant hot mixed, hot laid asphalt (HL3 Surface Course) on prepared subgrade and base courses to a total compacted thickness of 325 mm. Place material in single lift.

.3 Locations as indicated on Drawings, placed in lifts no greater than 75 mm, except that material shall be placed in a single thick lift during weather colder than 5°C.

.4 Spreading Base and Surface Courses:

.1 For areas greater than 840 m^2:

.1 Asphalt base and surface courses shall be spread and struck off with a paver.

.2 Any irregularities in the surface of the pavement course shall be corrected directly behind the paver.

.3 Excess material forming high spots shall be removed with a shovel or a lute.

.4 Indented areas shall be filled with hot mix and smoothed with a lute or the edge of a shovel being pulled over the surface.

.5 Casting of mix over such areas shall not be permitted.

.2 For areas less than 840 m^2 and in areas where it is not practical to use a paver or spreader box:

.1 Spread asphalt base and finish surface courses by hand.

.2 Use rigidly supported wood or steel forms to ensure correct grade and cross section

.3 Placing by hand shall be performed carefully to avoid segregation of the mix.

.4 Broadcasting of the material will not be permitted.

.5 Any lumps that do not break down readily shall be removed.

.5 Profile surfaces to a minimum slope of 20 mm in 1 m towards drains, drop paving at drain locations to prevent standing water. Slopes shall not exceed 32 mm in 1 m.

.6 Roll and compact hot mix material immediately without displacement. Rolling shall continue until thoroughly compacted and all roller marks have disappeared.

.7 In areas too small for the roller, a vibrating plate compactor or hand tamper shall be used to achieve thorough compaction.

3.4 EDGE RESTRAINT INSTALLATION

.1 At junction of asphalt and loose gravel or soft landscaping finishes (e.g., at decorative gravel beds around boulders, sod, seeded topsoil, etc.), install edge restraints in accordance with manufacturer's printed installation instructions, technical datasheets and details.

.2 Base Installation:

- .1 Install base per specifier/design instructions.
- .2 Extend base at least 6 inches beyond edge of restraint edging.
- .3 Level base beneath restraint edging.

.3 Edging Installation and Related Asphalt Work:

- .1 Install edging leaving 3/8" between sections for expansion.
- .2 Drive spikes through edging holes in base of asphalt restraint edging (or drive nails through aluminum base when using powder actuated fastening system) at spaces for following applications:
  - .1 Anchor each section end.
  - .2 Aggregate Base: Spiral steel spikes at 4 inches to 12 inches on center.
  - .3 Softer or Thinner Asphalt Base: Spiral steel spikes at 4 inches to 12 inches on center spacing.
  - .4 Older, Harder, or Thicker Asphalt Base: Hilti DX A41 Fully Automatic Powder Actuated Tool is desirable where sufficient hold can be obtained. Provide 1-1/2 inch to 2-1/2 inch nails at 4 inches to 12 inches on center spacing with applicable charge recommended.
- .3 Securely connect sections in accordance with manufacturer's instructions. Provide additional anchors at closer spacing as necessary to firmly secure edging for permanent intended use.
- .4 Avoid excessive asphalt temperatures when placing asphalt over edging.
- .5 Lay asphalt pavement adjacent to and approximately 1/2 inch over top of restraint edging, depending on expected compaction results. Then, compact first pass with desired equipment within 6 inches of restraint edging. "Pinch roll" to create a hard joint. Subsequent passes may be directly against or over top of edging to ensure complete compaction of asphalt pavement.
- .6 Finish pavement shall be compacted and level with, but not to exceed 1/4 inch above top of restraint edging.

3.5 ASPHALT PAVEMENT TOLERANCES

.1 Smoothness: the finished asphalt surface must meet the smoothness criteria listed below. If smoothness tolerances are not met, deficient areas shall be ground down and resurfaced as directed by the Departmental Representative.

.2 Levelness: the completed work shall be level to 6 mm when tested with a 3 m straightedge.

.3 Grade: Maximum variation from designated grade elevations must not exceed 6mm, and the surface shall not contain irregularities that affect drainage or create puddles larger than 0.2 m^2 (2 ft^2).

.4 Surface Texture: Finished surface texture must be tightly knit and free of visible signs of poor workmanship.

.5 Thickness: the completed asphalt pavement mat shall be within 10% of the design thickness. An additional 25 mm asphalt topping layer shall be applied to asphalt pavement mats that are less than 10% of the design thickness.

.6 Compaction: asphalt pavement shall be compacted to 98% of Marshall Density.

3.6 PAVEMENT MARKING

.1 Provide pavement markings to Section 32 17 23 – Pavement Markings.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Remove spillage and over-spray of paint from pavement, sidewalks, building and other site features. Use methods and materials without damaging and leaving visible residue on substrates.

.2 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.4 Remove recycling containers and bins from site and dispose of materials at appropriate facility

3.8 PROTECTION

.1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38°C. Do not permit stationary loads on pavement for 24-hours minimum after placement.

.2 Keep traffic off pavement markings for a time as recommended by paint manufacturer.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 32 11 16.01 – Granular Sub-Base.

.3 Section 32 11 23 – Aggregate Base Courses.

.4 Section 32 12 16 – Asphalt Pavement.

.5 Structural Drawings: cast-in-place concrete, reinforcement, shoring, curing.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A775/A775M-16, Standard Specification for Epoxy-Coated Steel Reinforcing Bars.

.2 ASTM A1064/A1064M-16b, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.3 ASTM C42/C42M-13, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.

.4 ASTM C117-13, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.5 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.6 ASTM C171-16, Standard Specification for Sheet Materials for Curing Concrete.

.7 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.

.8 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.9 ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.

.10 ASTM C666/C666M-15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

.11 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.12 ASTM D1752-04a(2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.13 ASTM D2628-91(2011), Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.

.14 ASTM D5329-16, Standard Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphalt Pavements and Portland Cement Concrete Pavements.

.15 ASTM D6297-13, Standard Specification for Asphaltic Plug Joints for Bridges.

.16 ASTM D6690-15, Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.

.17 ASTM D7116-16, Standard Specification for Joint Sealants, Hot Applied, Jet Fuel Resistant Types, for Portland Cement Concrete Pavements.

.2 Canadian Standards Association (CSA)

.1 CSA A23.1-14/A23.2-14, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete, Includes Update No. 1 (2015).

.2 CAN/CSA A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014), Update No. 3 (2014).

.3 CAN/CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.

.4 G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, Includes Update No. 1 (2014).

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meeting: Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation with Contractor, Departmental Representative, affected trades to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building trades.

.2 Coordination: Coordinate with local authorities having jurisdiction for requirements concerning standard sidewalks, curbs, and gutters.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit design mixes for each concrete pavement mixture, including alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances require adjustments.

.2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada.

.3 Inform Departmental Representative of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing work.

.4 If materials have been tested by accredited testing laboratory testing laboratory approved by Departmental Representative within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.

.3 Samples:

.1 Submit samples of exposed aggregate in 4.5 kg bags for review and acceptance by Departmental Representative.

.4 Certificates: Submit to Departmental Representative, manufacturer's test data and certification that the following material meets requirements of this section prior to starting concrete work:

.1 Cementitious materials.

.2 Steel reinforcement and reinforcement accessories.

.3 Admixtures.

.4 Joint Sealants.

.5 Curing Materials.

.6 Joint Filler.

1.5 QUALITY ASSURANCE

.1 Installer Qualifications: Company or person specializing in Portland cement concrete paving with minimum 5-years documented experience who has completed systems similar in materials, design and extent to that indicated for Project and with a record of successful performance. Submit evidence of compliance at request of Departmental Representative.

1.6 TESTING

.1 Compaction testing of base, and testing of concrete, to Sections 03 30 00 and Section 31 00 99 respectively.

1.7 JOB CONDITIONS

.1 Prevent damage to buildings and property.

.2 Protect surfaces of fresh concrete against damage by rain, dirt and dust, debris and traffic until sufficient strength attained to resist damage.

.3 Use winter concreting methods in accordance with CSA A23.1 when the mean daily temperature falls below 5°C. Concrete shall not be considered a seasonal deficiency and shall be installed with heating and hoarding as part of the Contract.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Mix design requirements:

.1 Submit concrete mix design to Departmental Representative for approval 4-weeks prior to commencing work

2.2 MATERIALS

.1 Cement Type: Normal Portland Cement in accordance with CSA A3000, Type GU.

.2 Water: Meeting requirements of CSA A23.1/A23.2.

.3 Aggregates for Concrete: to CSA A23.1/A23.2 and as follows:

.1 Coarse aggregate:

.1 Produce coarse aggregate in at least two separate sizes which, when combined, yields gradation specified. Each component size to form approximately equal percentage of total coarse aggregate.

.2 Gradation: to CSA A23.1/A23.2, table 5, nominal size 28-5 or 40-5 as required by the mix design.

.3 Flat and elongated particles: to CSA A23.1/A23.2 (13A) (length to width and width to thickness ratio greater than 3) not to exceed 0.5% by mass.

.2 Fine aggregate:

.1 Gradation: to CSA A23.1/A23.2, Table 1. Material passing 0.160 mm sieve: maximum 5%.

.2 Aggregates for use in concrete pavement shall not be susceptible to D-cracking. Unless field experience, aggregate history or prior laboratory testing have proven otherwise.

.3 Aggregates for use in concrete pavement shall be tested in accordance with ASTM C666/C666M. Test shall be in accordance with Procedure A for a period of 350 cycles.

.4 Supplementary cementing materials: to CSA A3000.

.5 Air entraining admixture: to ASTM C260/C260M.

.6 Chemical admixtures: to ASTM C494/C494M. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.7 Curing Compound: to ASTM C309, Type 2 white pigmented, Class B resin-based, liquid membrane-forming type.

.8 Joint Sealants and Fillers, tested to ASTM D5329.

.1 Preformed Joint Filler:

.1 Asphalt impregnated type, to ASTM D1751.

- or -

.2 Preformed sponge rubber, cork or recycled PVC expansion joint fillers, to ASTM D1752.

.3 Use one preformed joint filler product for entire project as approved by Departmental Representative.

.9 Sheet material for curing: to ASTM C171, waterproof paper or plastic sheets.

.10 Burlap mats for curing: to ASTM C71.

.11 Dowels and tie-bars: to CSA G30.18.

.1 Dowels: clean, straight and free from flattened or burred ends, plain round bars of grade 300 or better conforming to CSA G40.20/G40.21 and be epoxy-coated to ASTM A775/A775M.

.2 Tie-Bars: deformed steel bars in compliance with CSA G30.18 and be epoxy-coated to ASTM A775/A775M.

.12 Protective covers and insulation for cold weather concreting: to CSA A23.1/A23.2.

.13 Sub-Base: Class B granular, to Section 32 11 16.01 - Granular Sub-Base.

.14 Base: Class A granular, to Section 32 11 23 - Aggregate Base Courses.

2.3 MIXES

.1 Job mix formula to be approved by Departmental Representative. Design ready-mix concrete conforming to CSA A23.1/A23.2.

.2 Design ready-mix concrete conforming to CSA A23.1/A23.2, and as indicated in Structural Specifications:

.1 Use type 10 cement.

.2 Compressive Strength: Minimum 35 MPa after 28 days.

.3 Class of Exposure: C-2.

.4 Use of chemical admixture will be approved only when specified mix requirements or workability cannot be achieved by proportioning of aggregates, water, cement and air entraining admixture.

.3 Temperature of concrete mix at placing shall be no less than 10°C and no greater than 27°C. Provide mix toward lower end of temperature range during hot weather and toward higher end of temperature range during cold weather, in accordance with CSA A23.1.

.4 Use of admixtures, other than air-entraining admixtures, are not permitted without prior written approval of Departmental Representative. Use of fly-ash is not permitted.

.5 Site mix concrete is permitted for placements not exceeding 1 m^3 and for core filling of non-load bearing masonry and bond beams.

.6 Add an air entraining admixture to all concrete exposed to the weather or in contact with the ground, producing entrained air in accordance with CSA A23.1, Table 10; air entraining admixture is not required for interior slabs on grade.

.7 Proposed changes in material source to be approved by Departmental Representative. New mix design to be approved by Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for concrete paving 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 EQUIPMENT

.1 Concrete plant: in accordance with CSA A23.1/A23.2.

.2 Use following equipment on approval of Departmental Representative:

- .1 Hand operated transverse screeds spanning side forms.
- .2 Mechanically powered vibrating beam spanning side forms.
- .3 Hand operated floats and fluting tools used by skilled workers.

.3 Provide following miscellaneous equipment where required:

- .1 Edging tool.
- .2 Water truck equipped with pump, hose line and fine spray nozzle.

.4 Self-propelled concrete saws equipped with rubber-tired wheels, readily adjustable blade depth controls, and sawing line guide pointers both front and rear. Provide adequate number of units to complete sawing at rate required and have ample supply of suitable saw blades and at least one standby sawing unit available on job site before concrete placement is started.

3.3 FORMWORK

.1 Install in accordance with structural engineering specifications (refer to Drawings) and to following requirements:

- .1 For fixed form paving:
  - .1 Provide steel forms of sufficient strength to support and keep alignment under weight of spreading and finishing machines.
  - .2 Use of wood forms for fillet areas to be approved by Departmental Representative.
  - .3 Set forms true to line and grade, join neatly and tightly and stake securely to resist concrete pressure and impact from tampers without springing.
  - .4 Clean and oil forms before each use.
  - .5 Obtain Departmental Representative's approval of forms before placing concrete.

3.4 SUBGRADE AND SUBBASE PREPARATION

.1 Soft, yielding materials or other portions of subgrade that will not compact to specification shall be removed and replaced with suitable material. Subgrade to be brought to a firm unyielding condition with a uniform density. It shall be compacted at or above optimum moisture content to 95% Standard Proctor density.

.2 When concrete is placed directly on subgrade, it will be checked for conformity with the cross-section tolerance. Finished surface shall not deviate more that 0 mm above and 20 mm below specified grade and cross-section, and the surface shall not deviate more than 10 mm at any place on a 3 mm template.

.3 Subbase to consist of specified material and have a compacted thickness of not less than specified.

.4 For slip-form paving, subbase travelled by tracks in paving machine shall be firm and have a smooth surface.

.5 Subbase shall be compacted to specified density.

.6 Prepared subbase shall be checked for conformity with the cross-section and grad tolerances. Finished surface of subbase shall not deviate more than 0 mm above and 20 mm below specified grade and cross-section, and surface shall not deviate more than 10 mm at any place on a 3 mm template.

.7 Repair damage to subbase resulting from hauling or equipment operations.

.8 Prior to placing concrete, subbase shall be thoroughly wetted. Wetting shall be carried out, such that standing water is not present on grade.

.9 Surface condition of base to be approved by Departmental Representative before placing concrete.

3.5 REINFORCING STEEL AND DOWELS

.1 Place reinforcing steel and dowels as indicated and to structural engineering specifications (refer to Drawings).

.2 Dowel bars shall be plain round bars of grade 300 or better conforming to CSA G40.20/G40.21, and be epoxy-coated to requirements of ASTM A775/A775M, also coated with bond breaker material.

.3 Steel for tie bars or tie bolts to comply to CSA G30.18, and be epoxy-coated to ASTM A775/A775M.

.4 Place sufficient number of joint dowel assemblies in advance of paver to avoid delay in concrete placement.

.5 Remove oil, grease, dirt and deleterious material from reinforcing bars before placing concrete.

.6 Steel placement to be approved by Departmental Representative before placing concrete.

3.6 PLANT AND MIXING REQUIREMENTS

.1 If washing of aggregate required, allow aggregate to drain for 24-hours or longer as required to stabilize moisture content.

.2 For truck mixers, mixing to be in accordance with CSA A23.1/A23.2.

.3 Mix produced to be within following tolerances from mix design:

.1 Air content: to CSA A23.1/A23.2, Table 10.

3.7 TRANSPORT AND DELIVERY OF MIX

.1 Time from initial mixing to final placing to be not more than 90 minutes if mix is transported by agitating equipment (e.g. truck mixer) in accordance with CSA A23.1/A23.2, clause 18.4.2 - Delivery with Agitating Equipment.

.2 Transport mix by non-agitating equipment only if time from addition of cement to time of placing does not exceed 45 minutes. Haul units shall be of sufficient capacity to transport at least one regular size batch from mixer. Haul routes shall be well maintained to prevent undue disturbance of concrete mix during transport.

3.8 PLACING

.1 Place concrete to lines, grades and depths as indicated.

.2 Discharge concrete into forms as soon as practical after mixing.

.3 Construct pavement lanes in sequence approved by Departmental Representative.

.4 Use hand placing where machine spreading is not feasible.

.5 Spread uniformly with approved equipment to thickness sufficient to allow for proper consolidation and finishing. Do not apply external tractive force to paver.

.6 Operate with continuous forward momentum. Schedule concrete supply to minimize interruptions.

.7 Insert tie bars as indicated.

.8 When completing concrete placement for day, carry placement through to scheduled control or contraction joint locations.

.9 Where concrete placement is stopped for more than 30 min due to breakdowns, weather or other reasons, construct extra bulkhead and construction joint as directed by Departmental Representative.

.10 Do not place concrete on frozen surface.

.11 No concrete shall be placed during rain.

.12 When rain appears imminent paving operation should cease. Protect freshly laid concrete from rain damage and adverse weather condition and in accordance with CSA A23.1/A23.2. Extend protective coverings over edges of concrete and arrange so as not to bear on unprotected edges.

.13 Concrete placed when the ambient temperature is at or above 27 degrees C to be cured by continuous water curing from soaker hoses providing complete coverage of the pavement to minimize the temperature rise of the concrete.

.14 When concrete has been placed in cold weather and the sire temperature is expected to drop below 5 degrees C, insulating curing blankets or other suitable material shall be placed on the concrete pavement and weighted to prevent movement. Curing to continue until the cumulative number of days, or fraction thereof, during which the temperature of the concrete is above 10 degrees C, has totalled a minimum of 7 days. Alternatively, if compressive tests of cylinders cured under field conditions achieve at least 70% of the specified compressive strength, curing may be discontinued.

.15 Concrete pavement placed in cool weather shall experience a minimum of 30 day air-drying period, following final curing, before first application of de-icing salts.

3.9 CONSOLIDATION

.1 When internal vibrators are used:

.1 For slab depths up to 50 mm, mount vibrators parallel to base at mid depth. For slab depths greater than 50 mm, mount vibrators with tips minimum 50 mm above base and tops minimum 50 mm beneath pavement surface.

.2 Operate at manufacturer's recommended number of vibrations and specifications.

.2 When surface vibrators are used (omit for slabs greater than 50 mm depth):

.1 Synchronize units on each individual screed or pan.

.2 Operate at minimum of 3,500 vibrations per minute and minimum amplitude of 0.4 mm.

.3 Treat each pavement section to at least 1 pass of vibratory equipment unless otherwise directed by Departmental Representative.

.3 Stop vibrators when paver stops.

.4 Use hand operated vibrator on odd shaped slabs inaccessible to frame mounted units. Do not operate vibrator in one location longer than 5 seconds.

.5 Ensure concrete adjacent to edge forms or previously constructed slabs is thoroughly vibrated.

3.10 FINISHING

.1 After consolidation by vibration, finish with equipment approved by Departmental Representative.

.2 When striking off concrete surface, maintain uniform roll of concrete ahead of first screed for its full length when finishing machine is on first pass.

.3 Make 2 passes with transverse finishing machine.

.4 Where joints are formed rather than sawn, form longitudinal and transverse joints after final pass of finishing machine.

.5 Hand finish areas inaccessible to finishing machines to same quality and surface characteristics as machine finished surfaces.

.6 Finish concrete surface with approved float at proper time. Operate from edge to edge with wiping motion while advancing, with each succeeding pass overlapping previous one.

.7 Check surface with approved 3.5 m long straightedge. Correct irregularities exceeding 5 mm before concrete takes initial set.

.8 Do not patch surfaces with cement paste.

3.11 SURFACE TEXTURING

.1 Refer to Section 03 35 00 – Concrete Finishing.

.2 Commence texturing immediately after float finishing.

.3 Provide surface texture by transverse wire comb leaving grooves in surface of plastic concrete in accordance with American Concrete Pavement Association publications.

.4 Texturing to be straight, precise and not damaging to pavement edges.

3.12 CURING

.1 Cure for minimum 7 days by following method:

.1 Curing compound:

.1 Apply in two coats with approved spray equipment to form complete and unbroken film on surface of concrete. Mechanically agitate compound before and during use.

.2 For hand application apply first coat immediately after texturing operations, second coat to be applied immediately after first coat in a perpendicular direction.

.3 For machine application curing compound to be applied in accordance with manufacturers' specifications.

.4 Apply second spray in accordance with manufacturer's instructions.

.5 Apply each spray at application rate recommended by manufacturer.

.6 Spray slab edges immediately after removal of forms.

.7 Protect formed or sawed joints from evaporation during curing period.

.8 Respray areas where membrane is damaged during curing period.

3.13 PROTECTION

.1 Do not open concrete pavement to traffic or construction equipment until concrete reaches a minimum compressive strength of 20 MPa.

.2 When placing concrete in lanes adjacent to existing concrete, operate placing equipment on rubber wheels or pads to prevent damage to existing surface.

3.14 TOLERANCES

.1 Place concrete in accordance with tolerances listed in CSA A23.1/A23.2, and as follows:

.1 Elevation: 6 mm.

.2 Thickness: +10 mm, -6 mm.

.3 Surface: Gap below 3 m long, unlevelled straightedge not to exceed 6 mm.

.4 Lateral Alignment and Spacing of Tie Bars and Dowels: 25 mm.

.5 Vertical Alignment of Tie Bars and Dowels: 6 mm.

.6 Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 13 mm.

.7 Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 6 mm per 300 mm.

.8 Joint Spacing: 75 mm.

.9 Contraction Joint Depth: +6 mm, no minus.

.10 Joint Width: +3 mm, no minus.

3.15 JOINTS

.1 General:

.1 Construct joints plumb, straight and square to details indicated.

.2 Transverse joints to coincide with those in adjacent pavement unless indicated or directed otherwise.

.3 Install preformed joint filler at locations and to details indicated.

.4 Install isolation joints around structures and features that project through, into or against pavement.

.2 For sawn joints.

.3 Ensure joints are sawn straight. Install end stakes to ensure straight joint alignment across paved area. Mark joint alignment with chalk line or other suitable guide to approval of Departmental Representative.

.4 Saw joints using approved equipment and methods to produce joint dimensions indicated.

.5 Restrict speed of saw cutting to ensure proper joint alignment and to avoid damage to concrete.

.6 Supply sufficient workers and equipment including standby equipment, to maintain satisfactory sawing schedule.

.7 Schedule sawing operations on 24-hour basis and consistent with concrete placing.

.8 Make initial saw cuts in progressive manner and as soon as concrete surface has hardened sufficiently to resist ravelling as cut is made and before shrinkage cracks occurs.

.9 If cracking occurs ahead of saw cut, stop sawing immediately. Move ahead several joints and cut one or more joints before returning to saw intermediate joints. Where cracking persists, make 1 m saw cut from one edge and complete sawing from opposite edge. Adjust sawing schedule accordingly.

.10 If uncontrolled cracking or other surface damage results from inadequate or improper sawing techniques suspend further concrete operations until situation is corrected and immediately remove and replace damaged slabs.

.11 Immediately on completion of sawing, flush joints with water to remove laitance.

.12 Sealing:

.1 Seal joints before allowing vehicular traffic on new pavement.

.2 Provide Departmental Representative with copy of sealant manufacturer's instructions for application.

.3 Just prior to sealing joint, clean with compressed air or flush with high pressure water to remove laitance, curing compound and protrusions of hardened concrete. Clean and dry by compressed air and vacuum to remove loose and foreign material.

.4 Do not apply joint sealant in rainy weather or when ambient temperature is less than 5 degrees C.

.5 Insert approved filler and bond breaking material in joint prior to applying sealant, then fill joint from bottom up with sealant to avoid trapping air.

.6 Prepare sealant for application using equipment and methods approved by Departmental Representative.

.7 Apply sealant strictly in accordance with manufacturer's recommendations with special attention to temperature ranges for safe heating and for application of hot poured sealants and cleanliness of concrete to be bonded.

.8 On completion of first application of sealant, return and top up any underfilled areas.

.9 Replace sealant which fails to bond to concrete or fails to cure properly, as directed by Departmental Representative.

3.16 DEFECTIVE CONCRETE

.1 Concrete is defective when:

.1 It contains: honeycombing, embedded debris, uncontrolled shrinkage cracking, or other surface defects.

.2 It is damaged by freezing.

.3 It is placed at too high temperature.

.4 Standard deviation of 28-day strength test results exceeds CSA A23.1/A23.2 clause 17.6.7.1 requirements.

3.17 REPAIR / RESTORATION

.1 Repair of defective concrete work:

.1 Where defective concrete is identified by Departmental Representative during plastic condition, repair using methods approved by Departmental Representative.

.2 Grind off high surface variations where directed by Departmental Representative.

.2 Remove and replace defective concrete where directed by Departmental Representative.

.1 Remove minimum 3 m of pavement by sawing through concrete across full lane width.

.2 Replace with new concrete to this specification.

.3 Construct contraction joint at boundary between sawn face of existing concrete and new concrete.

3.18 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.19 PROTECTION

.1 Keep vehicular traffic off newly paved areas until paving has properly cured and joints have been sealed.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 32 11 16.01 – Granular Sub-Base.

.3 Section 32 11 23 – Aggregate Base Courses.

.4 Section 32 15 40 – Crushed Stone Surfacing.

1.2 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures Submittal Procedures.

.2 Shop Drawings:
- .1 Indicate on drawings layout, pattern and relationship of paving joints to fixtures and project formed details.

.3 Test and Evaluation Reports:
- .1 Submit following sampling and testing data:
  - .1 Sieve analysis for gradation of bedding and joint material.

1.4 QUALITY ASSURANCE

.1 Qualifications:
- .1 Installer: company or person specializing in precast concrete paver installations with 5 years documented experience.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and 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 off ground and cover.
- .2 Store and protect stone pavers from damage.
- .3 Replace defective or damaged materials.

2 Products

2.1 WALKWAY STONES

.1 Walkway Stones: as salvaged from site and stockpiled; clean, wash and prepare for use.

2.2 BEDDING AND JOINT MATERIAL

.1 Bedding material: Class A base and Class B sub-base.

.2 Joint material: crusher dust, to Section 32 15 40 – Crushed Stone Surfacing.

2.3 CLEANING COMPOUND

.1 Clear, organic solvent, designed and recommended by cleaning manufacturer for cleaning walkway stones of contamination encountered.

2.4 BASE AND SUB-BASE

.1 Sub-Base: to Section 32 11 16.01 – Granular Sub-Base.

.2 Base: to Section 32 11 23 – Aggregate Base Courses.

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for precast concrete unit paving 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 STRUCTURAL SURFACE

.1 Verify that structural surfaces conform to levels and compaction required for installation of stone units. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.

.2 Verify that top of structural surface (top of base) does not exceed plus or minus 10 mm of grade over 3 m straightedge.

.3 Ensure that structural surface is not frozen or standing water is present during installation.

3.3 PLACING OF BEDDING MATERIAL

.1 Ensure bedding material is not saturated or frozen at all times until installation is complete.

.2 Spread and screed material on structural surface to achieve 25 mm compacted thickness after vibrating pavers in place. Do not use joint crusher dust for bedding material.

.3 Do not disturb screeded material. Do not use bedding material to fill depressions in structural surface.

3.4 INSTALLATION OF WALKWAY STONES

.1 Place stones as indicated. Joints between pavers: 15 to 25 mm wide, maximum.

.2 Use appropriate selection of stones to maximize density of stone surface coverage.

.3 Installation by mechanical equipment:
- .1 Prepare installation sequence and obtain approval of sequence by Departmental Representative.
- .2 Place stone pallets and other materials without exceeding load bearing capacity, or otherwise detrimentally affecting installations.
- .3 Run equipment approved for installation only on surfaces vibrated in place.
- .4 Complete installation after placing each 100 square metres or after placing each 5 m width of installation.
- .5 Inspect stone units and remove chipped, broken or otherwise damaged units if structural performance or aesthetics is adversely compromised.
- .6 Replace stone units removed without altering layout and structural quality.

.4 Use a low amplitude, high frequency plate compactor capable of at least 22 kN centrifugal compaction force to vibrate pavers into bedding.

.5 Inspect, remove, and replace chipped, broken and damaged stone units.

.6 Sweep dry joint crusher dust material into joints.

.7 Settle crusher dust by vibrating pavers with plate compactor.

.8 Continue application of joint material and vibrating of pavers until joints are full. Do not vibrate within 1 m of unrestrained edges of pavers.

.9 Complete installation to within 1 m of laying face, with crusher dust-filled joints, at completion of each work day and before any work-stoppage greater than 1 hour.

.10 Sweep off excess joint material when installation is complete.

.11 Final surface elevations not to exceed plus or minus 10 mm under 3 m long straightedge.

.12 Surface elevation of stone walkway: flush with adjacent surfaces to prevent trip hazard.

.13 Ensure conformance of final elevations.

3.5 STONE UNIT CLEANING

.1 Carry out cleaning at times and conditions recommended by manufacturer of cleaning compound as directed by Departmental Representative.

.2 Remove and dispose of loose, extraneous materials from surfaces to be cleaned.

.3 Apply cleaning compounds appropriate for removal of various contaminants encountered in accordance with manufacturer's recommendations.

.4 Final surface to be free of contamination.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.
   .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.
   .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 99 – Common Work Results for Earthworks.

.2 Section 31 32 19.16 – Geotextiles.

.3 Section 32 11 16.01 – Granular Sub-Base.

.4 Section 32 11 23 – Aggregate Base Courses.

1.2 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .2 ASTM C117-13 Standard, Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).
- .4 ASTM D4318-10e1 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Access: allow access to building at all times.

.2 Scheduling: co-ordinate paving schedule to minimize interference with normal use of premises.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit submittals in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and with manufacturer's written instructions.

.2 Store crushed stone as and where directed by Departmental Representative.

2 Products

2.1 MATERIALS

.1 Granular sub-base: in accordance with Section 32 11 16.01 – Granular Sub-Base.

.2 Granular base: in accordance with Section 32 11 23 – Aggregate Base Courses.

.3 Granular topping (Crusher Dust):
- .1 Screenings: hard, durable, crushed stone particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .2 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117.

Sieve Designation	% Passing
9.5 mm	100
4.75 mm	50-100
2.00 mm	30-65
0.425 mm	10-30
0.075 mm	5-10

.4 Geotextile filter: Section 31 32 19.16 – Geotextiles.

2.2 EDGE RESTRAINTS

.1 Edge Restraint: flexible L-shaped 6005 Alloy aluminum edge restraints, black. Designed for use over compacted granular base.

.2 Aluminum or stainless steel spikes as recommended by manufacturer; length as required to hold restraints in place.

3 Execution

3.1 SUBGRADE

.1 Ensure subgrade preparation conforms to levels and compaction required, to allow for installation of granular base.

3.2 GEOTEXTILE FILTER

.1 Install geotextile filter in accordance with Section 31 32 19.16 – Geotextiles.

3.3 GRANULAR SUB-BASE

.1 Granular sub-base material minimum thickness: as indicated.

.2 Place material in uniform layers not to exceed 150 mm compacted thickness.
- .1 Compact layer to 100% Standard Density in accordance with ASTM D698.

3.4 EDGE RESTRAINTS

.1 At trail landings at switchbacks, install edge restraints over compacted sub-base in accordance with manufacturer’s printed installation instructions, technical datasheets, details and specifications. Secure in place with manufacturer’s recommended spikes.

3.5 GRANULAR BASE

.1 Granular base material thickness: as indicated.

.2 Spread and compact granular base material in uniform layers not exceeding 100 mm compacted thickness.

.3 Compact to a density of not less than 95% Standard Density in accordance with ASTM D698.

3.6 GRANULAR TOPPING

.1 Place granular topping to compacted thickness as indicated.

.2 Place material in uniform layers not to exceed 50 mm compacted thickness.
  .1 Compact layer to 98% Standard Density in accordance with ASTM D698.

3.7 FIELD QUALITY CONTROL

.1 Inspection and testing of crusher dust: carried out by designated testing laboratory at discretion and sole option of Departmental Representative.

.2 Costs of tests: paid by Departmental Representative.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.
    .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 TRAIL RESTORATION

.1 Where trail used for equipment access, and immediately prior to review for Certificate of Substantial Performance, top up trail surface with granular topping as required and compact to match adjacent trial contours.

3.10 PROTECTION

.1 Prevent damage to buildings, landscaping, curbs, sidewalks, trees, fences, roads and adjacent property.
  .1 Repair damages incurred.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 32 12 16 – Asphalt Pavement.

1.2 REFERENCES

.1 American Society of Testing and Materials (ASTM)
- .1 ASTM D4797-12a, Standard Test Methods for Gravimetric Analysis of White and Yellow Thermoplastic Traffic Marking.
- .2 ASTM E1360-05(2015), Standard Practice for Specifying Color by Using the Optical Society of America Uniform Color Scales System.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meeting:
- .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Construction Progress Schedule.
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Coordination with other building trades.
  - .4 Review manufacturer's installation instructions and warranty requirements.

.2 Scheduling:
- .1 Submit work schedule for various stages of pavement marking to Departmental Representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Departmental Representative for changes in work schedule.
- .3 Schedule painting operations to prevent disruption of and by other trades.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data
- .1 Submit manufacturer's printed product literature and data sheets for pavement markings and include product characteristics, performance criteria, physical size, finish, and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements

.3 Samples:
- .1 Submit to Departmental Representative following material sample quantities at least 4 weeks prior to commencing work.
  - .1 Two 1 L samples of each type of paint.
  - .2 One 1 kg sample of glass beads.
  - .3 Sampling to MPI Painting Manual.

.2 Mark samples with name of project and its location, paint manufacturer's name and address, name of paint, MPI specification number and formulation number and batch number.

.4 Operations and Maintenance Data: submit information on materials relative to work of this Section for inclusion in operations and maintenance manual, and as follows:
- .1 Product name, type and use.
- .2 Manufacturer's product number.
- .3 Colour numbers.
- .4 Maintenance guidelines.

.5 Manufacturer's Instructions:
- .1 Submit manufacturer's installation and application instructions.

.6 Submit quality assurance submittals in accordance with Section 01 11 10 – General Requirements: Quality Control.
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.5 QUALITY ASSURANCE

.1 Comply with the requirements of Section 01 11 10 – General Requirements: Quality Control.

.2 Mock-Up:
- .1 Apply single paint strip, specified width x 5 m (15' 0") long, and symbol (type as selected by Departmental Representative) to the pavement in location as directed by the Departmental Representative.
- .2 Application shall be in presence of the Departmental Representative and Construction Manager. When approved, sample shall be standard of quality for Work

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 Common Product Requirements and 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, maintained within a temperature range recommended by the manufacturer.

.4 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Paint and Markings:

.1 To MPI #32, Alkyd zone/traffic marking.

.2 Traffic Marking Coatings: maximum VOC limit 450 g/L to SOR/2009-264 Schedule 1.

.3 Paints: in accordance with MPI recommendation for surface conditions.

.4 Colour: to MPI listed, yellow, blue, black and white as required.

.5 Upon request, Departmental Representative will supply qualified product list of paints applicable to work. Qualified paints may be used, but Departmental Representative reserves right to perform further tests.

.2 Thinner: to MPI listed manufacturer.

.3 Glass reflective beads: type suitable for application to wet paint surface for light reflectance.

Part 3 Execution

3.1 MANUFACTURER’S INSTRUCTIONS

.1 Compliance: comply with manufacturer's printed installation instructions, data sheets, standard details, and specifications.

3.2 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates and surfaces to receive pavement markings previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer’s instructions prior to pavement markings installation.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Pavement surface: dry, free from water, frost, ice, dust, oil, grease and other deleterious materials.

.3 Proceed with Work only after unacceptable conditions have been rectified.

3.3 EQUIPMENT REQUIREMENTS

.1 Paint applicator: approved pressure type with positive shut-off distributor capable of applying paint in single, double and dashed lines and capable of applying marking components uniformly, at rates specified, and to dimensions as indicated.

.2 Distributor: capable of applying reflective glass beads as overlay on freshly applied paint.

3.4 APPLICATION

.1 Pavement markings: Lay out pavement markings in compliance with Regulatory Requirements.

.2 Clean pavement surface in accordance with paint manufacturers written instructions.

.3 Apply paint only when air temperature is above 10 degrees C, wind speed is less than 60 km/h, and no rain is forecast within next 4 hours. Apply paint using specified equipment only.

.4 Apply traffic paint evenly to a minimum wet film thickness of 30 mil (0.762 mm).

.5 Do not thin-paint.

.6 Striping, symbols, and letters: in compliance with Regulatory Requirements.

.7 Paint lines of uniform colour and density with sharp edges. Paint lines 100 mm wide where no dimension is indicated otherwise.

.8 Thoroughly clean distributor tank before refilling with paint of different colour.

.9 Apply glass beads at rate of 0.5 kg/l of painted area immediately after application of paint.

3.5 SITE TOLERANCES

.1 Paint markings: within plus or minus 12 mm of dimensions indicated.

.2 Remove incorrect markings in accordance with manufacturer's recommended procedures.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

3.7 PROTECTION OF COMPLETED WORK

.1 Protect pavement markings until dry.

.2 Repair damage to adjacent materials caused by pavement marking application.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 41 13 – Selective Site Demolition.

.2 Section 06 10 10 – Rough Carpentry.

.3 Section 31 00 99 – Common Work Results for Earthworks.

.4 Section 32 11 16.01 – Granular Sub-Base.

.5 Section 32 11 23 – Aggregate Base Courses.

.6 Section 32 13 15 – Concrete Paving, Sidewalks, Curbs and Gutters.

.7 Section 32 15 40 – Crushed Stone Surfacing.

.8 Section 32 91 13 – Mulches.

.9 Section 32 91 21 – Topsoil and Grading.

.10 Section 32 92 23 – Sodding.

.11 Section 33 42 13.01 – High Density Polyethylene Culverts.

1.2 REFERENCES

.1 American Wood Preservers Association (AWPA):
  .1 AWPA Book of Standards, 2012

.2 CSA International (CSA)
  .1 CSA O141-05 (R2014), Softwood Lumber.

.3 National Lumber Grading Association (NLGA):
  .1 Standard Grading Rules for Canadian Lumber 2010.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:
  .1 Provide manufacturer's instructions, printed product literature and data sheets for furniture and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
  .1 Submit shop drawings indicating dimensions, sizes, assembly, layout and arrangement, anchorage and installation details for each furnishing and site feature specified.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for care and cleaning of site furnishings for incorporation into manual specified in Section 01 11 10 – General Requirements: Closeout Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and 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 off ground in dry location, protect from weather, and store in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect furnishings from damage.
- .3 Replace defective or damaged materials with new.

2 Products

2.1 GENERAL

.1 Timber, lumber and logs: seasoned, and free of warps, checks and cracks; species as specified.

.2 Wood Preservative: to Section 06 10 10 Rough Carpentry, and AWPA Book of Standards.

.3 Base: Class A granular fill, to Section 32 11 23 – Aggregate Base Courses.

.4 Sub-Base: Class B granular fill, to Section 32 11 16.01 – Granular Sub-Base.

.5 Excavation, backfilling and compaction: to Section 31 00 99 – Common Work Results for Earthworks.

.6 Topsoil: to Section 32 91 21 – Topsoil and Grading.

.7 Sod: to Section 32 92 23 – Sodding.

.8 Mulch: to Section 32 91 13 – Mulches.

.9 Crusher dust: to Section 32 15 40 – Crushed Stone Surfacing.

.10 HDPE pipe: to Section 33 42 13.01 – High Density Polyethylene Culverts.

2.2 PARK PICNIC TABLES

.1 Pre-manufactured picnic tables with hot dip galvanized factory-painted steel frame; modify 1 picnic table per entrance location (1 each at north and south entrances) for wheelchair access, locate where directed by Departmental Representative.
- .1 Frame: 60 mm (2-3/8") steel tube welded on 6 mm X 102 mm (1/4" X 4") steel flat.
- .2 Center strap: 711 mm (28") steel flat under table top.
- .3 Reinforced straps (2): Steel flat 51 mm X 152 mm (2" X 6").
- .4 Braces (2): V-shape steel flat.
- .5 Bracing plates (4):1524 mm (5') steel flat on slats; as required for covering type selected.
- .6 Structure Finish: factory-painted hot dipped galvanized.
- .7 Planks: 51 mm X 152 mm (2" X 6") or 51 mm X 254 mm (2" X 10"), as selected by Departmental Representative.

.8 Fasteners: Hot-dipped galvanized, supplied by manufacturer.

.2 Dimensions:
- .1 Height: 787 mm.
- .2 Depth:1511 mm.
- .3 Length: 1803 mm.

.3 Accessories:
- .1 4 stainless steel bolts.
- .2 4 drop-in anchors with stainless steel theft-proof bolts.

.4 Finishes:
- .1 Structure: pre-painted hot dip galvanized, colour selected by Departmental Representative from manufacturer's standard range.
- .2 Coverings: as selected by Departmental Representative from manufacturer's standard range.

.5 Concrete Slab:
- .1 Anchor picnic tables to concrete slab, 4 anchors per table.
- .2 Slab dimensions per table location: 1067 mm x 1829 mm x 152 mm.
- .3 Concrete slab: to Section 32 13 15 – Concrete Paving, Sidewalks, Curbs and Gutters.

2.3 TRAIL RAILINGS

.1 Materials:
- .1 Fasteners: galvanized steel.
- .2 Hot dip galvanized lag screws: 10 x 150 mm.
- .3 Posts: 150 mm diameter pressure treated.
- .4 Rails: 100 mm pressure treated rails.

.2 Preparation and Fabrication: refer to Section 06 10 10 – Rough Carpentry.
- .1 Treat cut ends with field-applied wood preservative.
- .2 Cut posts and rails as indicated.
- .3 Drill holes for posts with post hole auger.
- .4 Allow for 6 mm joint between ends of rails where they meet at posts.
- .5 All exposed surfaces sanded smooth, with no slivers.
- .6 Wood species: Juniper, seasoned.

2.4 LOG STEPPERS

.1 Materials:
- .1 Fasteners: galvanized steel.
- .2 Hot dip galvanized lag screws: sized as required.
- .3 Posts: 200 - 400 mm diameter sanded seasoned Juniper posts, free of splinters.
- .4 Plugs: Eastern White Cedar or Juniper dowels.

.2 Preparation and Fabrication: refer to Section 06 10 10 – Rough Carpentry.
- .1 Bevel top of posts to 10 mm radius.
- .2 Pre-drill logs for lag bolts, minimum 500 mm on centre. Countersink bolts and plug with Cedar dowel.
- .3 Treat below-grade portion of posts with 2 coats clear penetrating wood preservative.
- .4 Treat cut ends with wood preservative.

2.5 HORIZONTAL LOG STEPS AND HORIZONTAL LOGS ABOVE GRADE

.1 Wood species: Juniper, seasoned.

.2 Horizontal logs: peeled Juniper logs, lightly sanded, with no slivers.

.3 Diameters: as indicated or as otherwise approved by Departmental Representative in writing.

.4 Lengths: as indicated or as otherwise approved by Departmental Representative in writing.

.5 Cut: as indicated and noted on Drawings.

.6 Fasteners, hot dip galvanized: timber screws, spiral spikes.

.7 Posts: Eastern White Cedar logs, seasoned, below grade portion treated with 2-coats of clear penetrating wood preservative. Cut ends treated.

2.6 HILL SLIDE

.1 Premanufactured children's outdoor play slide system: complete kit, consisting of the following:
- .1 Triple rail wave slide; 1,524 mm model.
- .2 Hill to slide assembly.
- .3 Collar posts.
- .4 Collar.
- .5 Collar installation hardware.
- .6 Slide entrance platform.
- .7 Pre-mitred log border.
- .8 2-cedar picket wing walls.
- .9 Manufacturer's supplied mats to retain hill on either side of slide.
  - .1 Recycled moulded rubber, non-slip cellular structure.
  - .2 Perforated: 2.5 cm holes.
  - .3 Tested to BS/EN 1177:2008, SS/EN 7188:1998, approved by RARPA and TU.
  - .4 Meets ADA requirements.

2.7 WOOD CHIP MULCH PLAYING SURFACE

.1 Playing Surface: wood chip mulch, to Section 32 91 13 – Mulches.

2.8 PLAY TUNNEL

.1 Materials:
- .1 Class A gravel, Type 1.
- .2 HDPE Pipe, 600 mm diameter, corrugated exterior, smooth interior, length as required.
- .3 Fasteners: hot dipped galvanized.
- .4 Round wood posts: peeled juniper, lightly sanded.
- .5 Spikes: galvanized, spiral, 600 mm long.
- .6 Preservative treat lower 900 mm of below grade portion of all posts.
- .7 Wood chip mulch.
- .8 Topsoil.

2.9 TRASH CONTAINERS

.1 Reuse trash containers on site: remove, store, and reinstall where directed by Departmental Representative.

.2 Refer to Section 02 41 13 – Selective Site Demolition.

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for exterior site furnishing 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 PREPARATION

.1 Locate and protect utility lines.

.2 Notify and acquire written acknowledgement from utility authorities before beginning installation Work.

3.3 INSTALLATION

.1 Assemble furnishings in accordance with manufacturer's written recommendations.

.2 Install furnishings true, plumb, anchored, firmly supported, as indicated.

.3 Install features as indicated.

.4 Touch-up damaged finishes to approval of Departmental Representative.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 - General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 - General Requirements: Waste Management and Disposal.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by site furnishings installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 99 – Common Work Results for Earthworks.

.2 Section 32 11 16.01 – Granular Sub-Base.

.3 Section 32 11 23 – Aggregate Base Courses.

.4 Section 32 12 16 – Asphalt Pavement.

.5 Section 32 13 15 – Concrete Paving, Sidewalks, Curbs and Gutters.

.6 Section 32 15 40 – Crushed Stone Surfacing.

.7 Section 32 91 13 – Mulches.

.8 Section 32 92 19.16 – Hydraulic Seeding.

.9 Section 32 92 23 – Sodding.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Shop drawings:

.1 Show layout plans, elevations, orientations and relationships.

1.3 PROJECT CONDITIONS

.1 Field Measurements: verify layout information for boulders shown on drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

Part 2 Products

2.1 MATERIALS

.1 Furnish boulders from local sources, similar in appearance and approximate sizes indicated (600 mm to 1600 mm diameters). No evidence of drilling, scrapes, large flakes, or cracks shall be visible after the boulder is set in place.

Part 3 Execution

3.1 EXAMINATION

.1 Verify areas to receive boulders are prepared and ready to receive boulders.

.2 Ensure locations of boulder placement are clearly established.

3.2 INSTALLATION

.1 Coordinate with Departmental Representative prior to setting boulders to ensure desired location, and face and orientation is achieved.

.2 Form pockets as required for boulder installation, ensuring that boulders are buried one-third (1/3) of boulder depth.

.3 Place and compact sub-base and base.

.4 Set boulders, even and true to line. Cluster in random sizes where indicated.

.5 Install surface materials as specified and indicated.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect boulders from damage, and clean and free of concrete or asphalt residue and dust.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 32 91 21 – Topsoil Placement and Grading.

.3 Section 32 93 10 – Tree, Shrub and Ground Cover Planting.

.4 Section 32 93 11 – Landscape Maintenance and Warranty.

1.2 REFERENCES

.1 ASTM International

.1 ASTM D3786/D3786M-13, Standard Test Method for Bursting Strength of Textile Fabrics—Diaphragm Bursting Strength Tester Method.

.2 ASTM D4533/D4533M-15, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

.3 ASTM D4632/D4632M-15a, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

.4 ASTM D7367-14, Standard Test Method for Determining Water Holding Capacity of Fiber Mulches for Hydraulic Planting.

.5 ASTM D7986-15, Standard Practice for Preparing Specimens of Hydraulic Erosion Control Products for Index Property Testing.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Samples:

.1 Submit samples of mulches specified.

1.4 PRODUCT DELIVERY, HANDLING AND STORAGE

.1 Supply mulch as specified on approved landscape drawings and specifications.

.2 Protect mulch stockpile on site from contamination of airborne herbicides, pesticides, fertilizers and other hazardous chemicals.

.3 Avoid the placement of mulches in excessively wet conditions or when frozen.

.4 All organic mulches shall be generally free of diseases, moulds, fungi and insect infestations.

.5 All organic mulches shall be free of inorganic materials such as metal, glass, rock and other foreign materials.

1.5 QUALITY ASSURANCE

.1 Obtain mulches from local sources to approval of Departmental Representative.

1.6 SUBSTITUTIONS

.1 All mulches shall be supplied and installed as specified. Substitutions will not be allowed unless approved by the Departmental Representative.

1.7 INSPECTION

.1 The Departmental Representative will review all mulches prior to installation. The Contractor must provide a mulch sample to the Departmental Representative for approval prior to site installations.

1.8 MAINTENANCE

.1 Spot control of weeds and seedling growth twice per year or as required.

.2 All mulched areas to be weed-free for duration of Contract.

.3 Coordinate with Section 32 93 11 – Landscape Maintenance and Warranty.

Part 2 Products

2.1 SHREDDED WOOD MULCH

.1 Shredded wood mulch: Untreated shredded fibres produced by mills in Atlantic Canada. Submit sample to Departmental Representative for approval prior to incorporation into the work.

.1 Mulch shall be comprised of 70 percent (%) coniferous tree material and 30 percent (%) deciduous tree material. Mulch shall contain bark and wood shredded to sizes ranging from 50 to 150 mm in length, with 35 to 45 percent (%) moisture content. Mulch may contain stringy twigs and seed, but shall be free of non-organic material or diseased wood. Mulch shall contain no more than 5% of the following materials in total: soil, sawdust, peat moss, coniferous wood and needles.

2.2 ROCK MULCH

.1 Rock Type 1: Washed, rounded rock; well-graded mix of 200+ mm diameter stones. Submit one 1 litre sample, to Departmental Representative for approval, prior to incorporation into the work.

.2 Rock Type 2: Washed, rounded rock; well-graded mix of 30-80 mm diameter stones. Submit one 1 litre sample, to Departmental Representative for approval, prior to incorporation into the work.

.3 Pea gravel / decorative gravel: washed, rounded rock, various colours: well-graded 10-20 mm diameter stones. Submit one 1 litre sample, to Departmental Representative for approval, prior to incorporation into the work.

2.3 WEED BARRIER

.1 Weed Barrier: 5.0 oz. woven, needle punched, polypropylene fabric, purpose-made as a weed barrier, meeting or surpassing the following properties:

.1 Grab Tensile Strength, to ASTM D4632: Warp: 100; Fill: 60 lbs.

.2 Grab elongation, to ASTM F4632: Warp: 23%; Fill: 17%.

.3 Trapezoidal Tear, to ASTM D4533: Warp: 70; Fill: 70 lbs.

.4 Mullen Burst, to ASTM D3786: 85 psi.

.5 UV Exposure: >70% after 2500 hrs. Carbon Arc exposure.

.6 Weatherometer, 5-year minimum, FEDTM 191: 70%.

.2 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m^2 to ASTM A123/A123M.

.3 Factory seams: sewn in accordance with manufacturer's recommendations.

.4 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

2.4 PROHIBITED MULCHES

.1 The following mulches are prohibited: deciduous tree sawdust and shavings, peat moss, manures or raw composts, paper products, plastics, rubbers, aluminum foils, gelatinous sprays, pallets, plywood and other lumbers containing chemical adhesives or wood preservatives. Crushed gravel shall also not be accepted.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that condition of substrate is acceptable for mulch application:

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Remove all weeds and debris from area of installation.

.2 Weed barrier shall accompany wood chip mulch except in turf.

3.3 WOOD MULCH INSTALLATION

.1 Install mulches in planting beds as follows:

.1 Obtain approval of topsoil and soil mix from Departmental Representative before placing in shrub beds and plant pits.

.2 Install when ground is frost-free.

.3 Level the subsoil providing positive drainage away from building foundations where present or to finish subgrades indicated on the construction drawings.

.4 Remove unwanted vegetation, lumps or debris from areas of installation.

.5 Install approved landscape edger as per manufacturer's specifications and along planting bed perimeters where indicated on the Drawings.

.6 Place topsoil or soil mix into beds, feathering to existing vegetation and where applicable 100 mm below top of edger. All mulches shall be kept at least 50 to 75 mm away from tree trunks and shrubs.

.7 Place landscape fabric by unrolling onto finish grading surfaces and retain in position.

.8 Protect fabric from displacement or damage until and during placement of overlaid material layers.

.9 Overlap each successive strip of fabric 500 mm over previously laid strip.

.10 Remove and replace fabric damaged or deteriorated as directed by Departmental Representative.

.11 Cut fabric to accommodate plant material as indicated on the Drawings.

.12 Install required plant materials.

.13 Plastic mulch is NOT allowed.

.14 Place specified mulch to a depth of 100 mm; ensuring finished grade is 25 mm lower than finished grade and flush with top of the edger.

.15 During application, all mulches shall be kept at least 50 mm to 75 mm away from tree trunks and shrubs.

3.4 ROCK MULCH INSTALLATION

.1 Rough grade to finish grade. Eliminate rough areas and compact as required for proper installation of rock mulch.

.2 Carefully place landscape fabric with minimum 150 mm overlap on parallel seams. Pin fabric securely in place.

.3 Carefully cut holes in landscape fabric in plant locations.

.4 After plant material is installed, distribute stones evenly over areas indicated, using Rock Type 1 immediately adjacent to plant material and Rock Type 2 in the remainder of the beds. Place stones carefully to ensure that stones do not damage plant material located in stone mulch areas. Backfill voids with pea gravel. Do not overfill. Prepare sample mulch area and confirm with Departmental Representative prior to finishing remainder of rock mulch areas.

.5 Type 2 and fabric is required at hose bibs.

.6 Ensure no fabric is visible upon completion.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.

.1 Clean roadway, pathways and surrounding turf of mulches and other debris caused by work under this section at the end of each working day or as directed by the Departmental Representative.

.2 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility

3.6 PROTECTION

.1 Protect installations from damage during construction.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 31 05 00 – Common Work Results for Earthworks.

.2 Section 31 14 13 – Soil Stripping and Stockpiling.

.3 Section 31 22 13 – Rough Grading.

1.2 SOURCE QUALITY CONTROL

.1 Topsoil shall be obtained from local source approved by Departmental Representative. Reuse site topsoil where possible, with deleterious materials removed after stripping.

.2 Advise Departmental Representative of sources of any off-site soil, peat moss or sand to be utilized seven days in advance of starting work.

.3 Contractor is responsible for soil analysis and requirements for amendments to supply topsoil as specified.

Part 2 PRODUCTS

2.1 GENERAL

.1 Use of local sources for topsoil.

2.2 TOPSOIL FOR TURF AREAS

.1 Class Loam for turf areas: mixture of mineral particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.

.2 Soil texture based on the Canadian System of Soil Classification, to consist of minimum 30% sand and contains 5 to 10% organic matter by weight.

.3 Fertility: major soil nutrients present in following ratios:

- .1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
- .2 Phosphorus (P): 10 to 20 micrograms of phosphate per gram of topsoil.
- .3 Potassium (K): 80 to 120 micrograms of potash per gram of topsoil.
- .4 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
- .5 pH value: 6.0 to 7.5

.4 Contain no toxic or growth inhibiting materials.

.5 Free from:

- .1 Debris and stones over 50 mm diameter.
- .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
- .3 Weed growth and weed seeds.

.6 Consistency: friable when moist.

2.3 PLANTING SOIL MIX

.1 Departmental Representative will identify if there are any locations where planting beds are required, and identify locations for the Contractor.

.2 Soil mix: 2 parts on-site topsoil, 1-part compost and 1-part horticultural sand, plus amendments and fertilizers as required by test results.

.3 Bone Meal: 2-11-0 submit product test data for approval.

.4 Same soil mix for planting beds, tree pits and turfstone seeding areas.

2.4 SOIL AMENDMENTS

.1 Compost:

- .1 Derived from organic waste compost.
- .2 Elastic and homogeneous, brown in colour.
- .3 Free of wood and deleterious material which could prohibit growth.
- .4 Shredded particle minimum size: 5 mm.
- .5 pH value: submit test results for review.

.2 Sand: washed coarse silica sand, medium to course textured.

.3 Limestone:

- .1 Ground agricultural limestone containing minimum calcium carbonate equivalent of 85%.
- .2 Gradation requirements; percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.4 Fertilizer:

- .1 To Canada "Fertilizers Act" and "Fertilizer Regulations".
- .2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.

Part 3 EXECUTION

3.1 PREPARATION OF SUB-GRADE

.1 Do not perform work under adverse field conditions such as frozen soil, excessively wet or dry soil or soil covered with snow, ice or standing water.

.2 Grade sub-grade in turf areas to eliminate uneven areas and low spots, ensuring positive drainage and allowing for soil placement depths.

.3 Verify that sub-grade elevations are correct to within 25 mm and receive approval from Departmental Representative prior to soil placement.

.4 Sub-grade to be clean of weeds, weed seeds, debris exceeding 50 mm diameter, and contamination by petroleum and other deleterious materials.

.5 Coarse cultivate sub-grade in turf areas to a depth of 100 mm before soil placement. Cross cultivate those areas where equipment has compacted the sub-grade materials.

3.2 SOIL PLACING AND SPREADING

.1 Place soil after sub-grade has been approved by Departmental Representative.

.2 Spread soil in uniform layers not exceeding 150 mm lifts, over unfrozen sub-grade free of standing water.

.3 Spread soil to 150 mm minimum depth after settlement and 80% compaction.

3.3 SOIL AMENDMENTS

.1 Soil amendments may be pre-mixed before spreading or mixed after spreading to full depth of the soil.

.2 Thorough mixing is required.

3.4 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage. Fine grade to final elevations to within 20 mm and ensure surface drainage away from structures to minimum 2% slope.

.2 Consolidate soil to smooth, uniform and firm surface.

3.5 ACCEPTANCE

.1 The soil is acceptable when:

.1 Soil testing and analysis meets the specifications.

.2 Soil material, depths and finish grading are inspected in place and approved by Departmental Representative.

.2 Testing of soil to be carried out by testing laboratory approved by Departmental Representative paid for by Contractor. Soil sampling, testing and analysis are to be in accordance with Provincial regulations and standards.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 - General Requirements: Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 - General Requirements: Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 11 10 - General Requirements: Waste Management and Disposal

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 32 91 21 – Topsoil and Finish Grading.

.3 Section 32 93 11 – Landscape Maintenance and Warranty.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 11 10 – General Requirements: Project Meetings.

.2 Scheduling:
- .1 Schedule hydraulic seeding to coincide with preparation of soil surface.
- .2 Schedule hydraulic seeding between dates recommended by Provincial Agricultural Department.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for seed, mulch, tackifier, fertilizer, liquid soil amendments and micronutrients.
- .2 Submit product data relating to fertilizer and fertilizer application rates based on soils analysis of topsoil used for the project.
- .3 Fibre mulch and tackifier manufacturer's product data, installation instructions and application rate for approval.
- .4 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

.3 Site Planes:
- .1 Submit site plan showing planned locations for seed mixture types for approval of Departmental Representative.

.4 Submit in writing 14 days prior to commencing work:
- .1 Volume capacity of hydraulic seeder in litres.
- .2 Amount of material to be used per tank based on volume.
- .3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.

.5 Written documentation for approval before commencing work regarding:
- .1 Type and volume capacity of hydraulic seeding and mulching equipment in litres.
- .2 Amount of each material in kilograms and including water in litres to be used per tank based on volume to achieve required application rate.
- .3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.

.6 Samples:
- .1 Submit 500 g sample of each seed mixture intended for use. Submit samples in clean containers with label identifying project, seed sample and lot number, supplier and date. Seed mix sample shall match tested seed lots.

.2 Submit 0.5 kg container of each type of fertilizer used.

.7 Certificates:
- .1 Certificate(s) of analysis of each seed sample. Seed analysis report shall be current and show specie and variety of seed, date and results of all tests.
- .2 Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.8 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.4 QUALITY ASSURANCE

.1 Qualifications:
- .1 Landscape Contractor: to be a Member in Good Standing of Canadian Nursery Landscape Association.
- .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
- .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

.2 All original seed labels and seed bags at completion of seeding to confirm amount of seed used on site.

.3 Conform to requirements of Federal and Provincial seed regulations.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:
- .1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.
- .2 Inoculant containers to be tagged with expiry date.

.3 Storage and Handling Requirements:
- .1 Store fertilizer off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new.

1.6 WARRANTY

.1 For seeding, 12 months’ warranty period is extended to 1 full growing season.

.2 Contractor hereby warrants that seeding will remain free of defects in accordance with General Conditions CCDC GC 12.3, but for 1 full growing season.

.3 End-of-warranty inspection will be conducted by Departmental Representative.

2 Products

2.1 MATERIALS

.1 Fertilizer: synthetic fertilizer, granular in composition, minimum 50% of elements derived from organic sources.

.2 Grass seed: certified Canada No. 1 seed, free of disease, weed seeds or other foreign materials in accordance with the Canada "Seeds Act" and "Seeds Regulations" and having minimum purity of 97% and germination of 75%.

.3 Water: clean, fresh, and free of substances or matter that would inhibit vigorous and healthy growth of grass.
- .1 Contractor shall supply clean water, equipment, methods of transportation, water tanker, hoses, attachments, and other accessories as necessary for all seeding requirements, maintenance and other related work.
- .2 All costs for supply of water incurred during the contract period shall be borne by Contractor.
- .3 Tackifier: non-toxic, water dilutable, liquid dispersion, mulch binder free of growth or germination inhibiting factors.

.4 Fibre mulch: wood or wood cellulose fibre meeting following requirements:
- .1 Free of growth or germination inhibiting ingredients.
- .2 Specially manufactured for use in hydraulic seeding and mulching equipment.
- .3 Minimum organic matter content of 95%.
- .4 Minimum moisture content of 12%.
- .5 Water absoption potential of 800-900% for wood cellulose fibre mulch and 1200-1350% for wood fibre mulch.

.5 Erosion control agent: A mulch binder with a pH value of 7 to 8.

2.2 GRASS SEED MIXTURES

.1 Seed mixture:
- .1 60% of certified annual rye.
- .2 40% of CRF (creeping red fescue).

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for hydraulic seeding 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 INSTALLERS

.1 Use installers members in Good Standing of Canadian Nursery Landscape Association.

3.3 PROTECTION OF EXISTING CONDITIONS

.1 Protect structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.

.2 Immediately remove any material sprayed where not intended as directed by Departmental Representative.

3.4 PREPARATION OF SURFACES

.1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.

.2 Fine grade areas to be seeded free of humps and hollows.
- .1 Ensure areas are free of deleterious and refuse materials.

.3 Cultivated areas identified as requiring cultivation to depth of 25 mm.

.4 Ensure areas to be seeded are moist to depth of 150 mm before seeding.

.5 Obtain Departmental Representative's approval of grade and topsoil depth before starting to seed.

3.5 FERTILIZING PROGRAM

.1 Composition of fertilizer during year 1: 10-20-20.

.2 Composition of fertilizer during year 2: 19-19-19.

.3 Fertilize prior to fine grading applying fertilizer equally distributed.

.4 Apply fertilizer at least 6 days before seeding or planting.

.5 Spread fertilizer uniformly with mechanical spreaders at rate determined on basis of soil tests.

.6 Incorporate fertilizer thoroughly into upper 50 mm of growing media

3.6 HYDRAULIC SEEDING

.1 Proceed with hydro seeding only after final grade has been reviewed by Departmental Representative.

.2 Mix seed with water and fertilizer in following application rates:
- .1 Grass seed: 175 kg/ha.
- .2 Fertilizer: 400 kg/ha.

.3 Thoroughly mix seed, fertilizer, mulch, binder (if required) and water in a uniform slurry.

.4 Apply slurry within 24-hours of dry seeding. Apply slurry to produce a uniform cover and at specified rates.

.5 Do not hydroseed when wind velocities would cause seed mix to be blown.

.6 Apply hydroseed to all areas of seed or as shown on the Drawings.

.7 Re apply where application is not uniform.

.8 Remove slurry from items and areas not designated to be sprayed.

3.7 PROTECTION OF SEEDED AREAS

.1 Provide adequate protection to protect seeded areas from all damage, disturbance, or other construction activity after seeding operations are complete. Remove protection after seed areas are properly established.

.2 Damaged seed areas resulting from inadequate protection shall be promptly repaired with topsoil, fertilizer and seed at Contractor's expense. All damages shall be repaired prior to final acceptance.

.3 Keep site well drained and landscape excavations dry.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 Keep pavement and area adjacent to site clean and free from mud, dirt, and debris at all times.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Cleaning.
- .1 Clean and reinstate areas affected by Work.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .2 Divert unused fertilizer from landfill to official hazardous material collections site approved by Departmental Representative.

3.9 PROTECTION

.1 Protect seeded areas from trespass until plants are established.

.2 Remove protection devices as directed by Departmental Representative.

3.10 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Ensure maintenance is curried out under supervision of certified Landscape Maintenance Supervisor.

.2 Perform following operations from time of seed application until acceptance by Departmental Representative.

.3 Grass Mixture:

.1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
.2 Mow grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass.
.3 Fertilize seeded areas 10 weeks after germination provided plants have mature true leafs in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.
.4 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.
.5 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

.4 Legume Mixture:
.1 Repair minor dead and bare spots as determined by Departmental Representative to allow establishment of seed prior to acceptance.
.2 Repair major dead and bare spots as determined by Departmental Representative in accordance with site climatic averages and recommendations of local agricultural or horticultural governmental representative.
.3 Mow legume mixtures to 100mm whenever height reaches 200 mm and as follows:
.1 Do not mow within period commencing 3 weeks before and ending 3 weeks after first severe, average fall frost date and 3 weeks after actual severe fall frost.
.2 When mowing after first severe fall frost, mow at a height of not less than 300 mm.
.4 Remove clippings that will smother plants.
.5 Water seeded areas to maintain optimum soil moisture level for germination and continued growth. Control watering to prevent washouts.

3.11 ACCEPTANCE

.1 Seeded areas will be accepted by Departmental Representative provided that:
.1 Plants are uniformly established and seeded areas are free of rutted, eroded, bare or dead spots.
.2 Areas have been mown at least twice.
.3 Areas have been fertilized.

.2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

3.12 MAINTENANCE DURING WARRANTY PERIOD

.1 Perform following operations from time of acceptance until end of warranty period:
.1 Repair and reseed dead or bare spots to satisfaction of Departmental Representative.
.2 Mow areas seeded, remove clippings that will smother grassed areas, as directed by Departmental Representative.
.3 Fertilize seeded areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 32 92 21 – Topsoil and Finish Grading.

1.2 REFERENCE STANDARDS

.1 Canadian Food Inspection Agency (CFIA); Plant Production Division, Fertilizer Section:
- .1 Canadian Fertilizer Act and Regulations
- .2 Canadian Fertilizer Quality Assurance Program

.2 Canadian Nursery Landscape Association (CNLA):
- .1 Canadian Standards for Nursery Stock, Nursery Sod

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:
- .1 Schedule sod laying to coincide with preparation of soil surface.
- .2 Schedule sod installation when frost is not present in ground.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 11 10 – General Requirements: Project Meetings.

1.4 SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittals Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for sod, geotextile and fertilizer and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

.3 Samples:
- .1 Submit:
  - .1 Sod for each type specified.
    - .1 Install approved samples in1 square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.
  - .2 Bio-degradable geotextile fabric.
  - .3 0.5 kg container of each type of fertilizer used.
- .2 Obtain approval of samples by Departmental Representative.

.4 Test Reports: Submit certified test reports of seed analyses showing compliance with specified performance characteristics and physical properties

.5 Certificates: Submit product certificates signed by manufacturer certifying that materials supplied to the project comply with specified performance characteristics and criteria and physical requirements.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements: Use only fertilizers, pesticides, micro-nutrients and supplements that are registered by the Canadian Food Inspection Agency and that meet requirements of referenced acts and regulations.

.2 Qualifications:
- .1 Landscape Contractor: to be a Member in Good Standing of Canadian Nursery Landscape Association.
- .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
- .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 - General Requirements: Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:
- .1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.

.3 Storage and Handling Requirements:
- .1 Store fertilizer off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new

1.7 WARRANTY

.1 For seeding, 12 months' warranty period is extended to 1 full growing season.

.2 Contractor hereby warrants that seeding will remain free of defects in accordance with General Conditions CCDC GC 12.3, but for 1 full growing season.

.3 End-of-warranty inspection will be conducted by Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Number One Grade Turf Grass: Provide sod that is sown and cultivated in local nursery fields as turf grass crop from certified seed, and that has matured under environmental conditions similar to that of the project and as follows:
- .1 Turf Grade Sod: Mow sod to a height of 50 mm within 36 hours prior to lifting with clippings removed and as follows:
  - .1 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.

.2 Turf Grass Nursery Sod quality:
- .1 Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.
- .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
- .3 Mowing height limit: 35 to 65 mm.
- .4 Soil portion of sod: 6 to 15 mm in thickness

2.2 ACCESSORIES

.1 Sod Establishment Support: Provide biodegradable geotextile fabric and pegs as required to prevent washouts and to establish strong root growth.

.2 Water: Provide water from local source or from trucked source as required during maintenance period and until vigorous growth has been established.

.3 Fertilizer: Provide slow release fertilizer that contains a minimum of 65% water insoluble nitrogen, and other nutrients required to establish vigorous growth in proportions necessary to amend topsoil as determined by analysis.

2.3 SOURCE QUALITY CONTROL

.1 Obtain written approval from Departmental Representative of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

.3 Obtain sod only from CNLA listed grower that can provide certification of seed source with growing location in close proximity to project site; provincial associations belonging to CNLA are acceptable for this requirement.

.4 Provide a nutrient analysis of topsoil and provide test data and recommended fertilizer application constituents and rates to Departmental Representative before delivering materials to the project site.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that grades are correct and prepared ready for placement of sodding materials

- .1 Do not perform work under adverse conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .2 Starting work of this Section indicates acceptance of conditions.

3.2 PREPARATION

.1 Fine grade surface free of humps and hollows to smooth, even grade, to contours and elevations indicated to tolerance of ±8 mm and to allow surface to drain naturally.

.2 Remove and dispose of weeds, debris, stones larger than 50 mm diameter, soil contaminated by oil, gasoline and other deleterious materials off site and in accordance with requirements of local authority having jurisdiction.

3.3 INSTALLATION

.1 Sod Placement:

- .1 Lay sod within 24-hours of being lifted if air temperature exceeds 20°C.
- .2 Lay sod sections in rows with joints staggered and ends butted closely without overlapping or leaving gaps between sections; cut out irregular or thin sections with sharp implements.
- .3 Roll sod as required to obtain close contact between sod and soil using light rolling; use of heavy rolling to correct irregularities in grade is not permitted.

.2 Sod Placement on Slopes:

- .1 Install and secure geotextile fabric in areas having a slope greater than 3:1 to prevent soil erosion in accordance with manufacturer's instructions.
- .2 Lay sod starting from bottom of slopes.
- .3 Peg sod on slopes steeper than 3:1, within 1 metre of catch basins and within 1 metre of drainage channels and ditches to following pattern:
  - .1 First sod sections along contours of slopes: 100 mm below top edge at 200 mm on centre.
  - .2 Areas above first sod sections: Not less than 3 to 6 pegs/m^2.
  - .3 Areas at drainage structures Not less than 6 to 9 pegs/m^2.
  - .4 Adjust pattern as required to obtain firm contact with topsoil and to prevent movement
- .4 Drive pegs to 20 mm above soil surface of sod sections

.3 Fertilizing Program: Fertilize during establishment and warranty periods at a rate and frequency established by source quality control testing and until vigorous growth is established.

.4 Maintenance during Establishment Period: Perform following operations from time of installation until vigorous growth is established:

- .1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
- .2 Cut grass to 50 mm when or prior to it reaching height of 75 mm; remove clippings that have potential to smother grassed areas.
- .3 Fertilize areas in accordance with fertilizing program listed above; spread half of required amount of fertilizer in one direction and remainder at right angles and water in well where rainfall is not expected within 2 to 3 hours of fertilizing.

.5 Acceptance: Departmental Representative will accept installation provided that:

- .1 Sodded areas are properly established and free of bare and dead spots with no surface soil from a height of 1500 mm when grass has been cut to height of 50 mm; when sodded areas are cut a minimum of 2 times prior to acceptance; and that fertilizing in accordance with fertilizer program has been carried out at least once.

.6 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.4 MAINTENANCE DURING WARRANTY PERIOD

.1 Maintenance during Warranty Period: Perform following operations from time of acceptance until end of warranty period:

- .1 Water Turf Grade Sod at weekly intervals to obtain optimum soil moisture conditions listed above.
- .2 Repair and reapply sod to dead or bare spots before expiration of warranty period.
- .3 Cut grass and remove clippings that have potential to smother grass to heights listed above.
- .4 Cut grass at 2 week intervals or as otherwise required to maintain grass at correct growing height at intervals so that approximately one third of growth is removed in single cut.
- .5 Eliminate weeds by mechanical means to extent acceptable listed above.

.2 Cleaning: Remove surplus materials, rubbish, tools and equipment barriers after completion of work of this Section.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 32 92 21 – Topsoil and Finish Grading.

.3 Section 32 91 13 – Mulches.

.4 Section 32 91 19.16 – Hydraulic Seeding.

.5 Section 32 92 23 – Sodding.

.6 Section 32 93 11 – Landscape Maintenance and Warranty.

.7 Planting Plans (Drawings): Plant Schedules.

1.2 REFERENCE STANDARDS

.1 Agriculture and Agri-Food Canada (AAFC).
- .1 Plant Hardiness Zones in Canada-2015.

.2 American National Standard Institute (ANSI) / Trees Care Industry Association
- .1 ANSI A300 National Tree Care Standards:
  - .1 ANSI A300 (Part 1) - 2008 (R2014) Pruning.
  - .2 ANSI A300 (Part 2) - 2011 Soil Management: a. Modification, b. Fertilization, and c. Drainage.
  - .3 ANSI A300 (Part 3) -2013 Supplemental Support Systems (includes Cabling, Bracing, Guying, and Propping).
  - .4 ANSI A300 (Part 5) - 2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction.
  - .5 ANSI A300 (Part 6) - 2012 Planting and Transplanting.
  - .6 ANSI A300 (Part 7) - 2012 Integrated Vegetation Management (IVM).
  - .7 ANSI A300 (Part 9) - 2011 Tree Risk Assessment.

.3 ANSI A300 (Part 10)-2016: IPM.

.4 Canadian Nursery Landscape Association (CNLA)
- .1 Canadian Standards for Nursery Stock-2006.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.6 U.S. Environmental Protection Agency (EPA) / Office of Water
- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

.1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling: obtain approval from Departmental Representative of schedule 7days in advance of shipment of plant material.

.2 Schedule to include:
- .1 Quantity and type of plant material.
- .2 Shipping dates.
- .3 Arrival dates on site.
- .4 Planting Dates.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for trees, shrubs, ground cover, fertilizer, mycorrhiza, anti-desiccant, anchoring equipment, and mulch, and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

.3 Samples:
- .1 Submit samples of mulch and mycorrhiza.

1.6 QUALITY ASSURANCE

.1 Qualifications:
- .1 Landscape Contractor: to be a Member in Good Standing of Canadian Nursery Landscape Association.
- .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
- .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Ornamental Maintenance designation.

.2 Work shall comply with ANSI A300 National Tree Care Standards.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
- .2 Protect plant material from damage during transportation:
  - .1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
  - .2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
  - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.

.3 Storage and Handling Requirements:
- .1 Immediately store and protect plant material which will not be installed within 1 hour in accordance with supplier's written recommendations and after arrival at site in storage location approved by Departmental Representative.
- .2 Protect stored plant material from frost, wind and sun and as follows:
  - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil and watering to full depth of root zone.
  - .2 For pots and containers, maintain moisture level in containers.
  - .3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.
- .3 Store and manage hazardous materials in accordance with manufacturer's written instructions.

1.8 WARRANTY

.1 For plant material over 75 mm caliper the 12 months' warranty period is extended to 24 months.

.2 Contractor hereby warrants that plant material over 75 mm caliper plant material as itemized on plant list will remain free of defects in accordance with General Conditions CCDC GC 12.3, but for 1 full growing season, one time only providing adequate maintenance has been provided.

.3 End-of-warranty inspection will be conducted by Departmental Representative.

.4 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

2 PRODUCTS

2.1 PLANT MATERIAL

.1 Refer to and comply with Planting Plan (Drawings): Plant Schedule.

.2 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.
- .1 Source of plant material: grown in Zone in accordance with Plant Hardiness Zones in Canada.
- .2 Plant material must be planted in zone specified as appropriate for its species.
- .3 Plant material in location appropriate for its species.

.3 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.

.4 Trees: with straight trunks, well and characteristically branched for species.

.5 Trees larger than 200 mm in height: half root pruned during each of two successive growing seasons, the latter at least one growing season before arrival on site.

.6 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.

.7 Collected stock: maximum 40 mm in caliper, with well developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.
- .1 During collection, ensure 10% maximum seed crop (or plants) are collected from healthy population of many individuals, and from several plants of same species.
- .2 Leave remainder for natural dispersal and as food for dependent organisms.

2.2 WATER

.1 Free of impurities that would inhibit plant growth.

2.3 STAKES

.1 T-bar, steel, 40 x 40 x 5 x 2440 mm.

.2 Wood, pointed one end, 38 x 38 x 2300 mm.

2.4 WIRE TIGHTENER

.1 Type 1: galvanized steel, stamped plate type, rod, triangular shape.

.2 Type 2: turnbuckle, galvanized steel, 9.5 mm diameter with 270 mm open length.

2.5 GUYING WIRE

.1 Type 1: steel, 3 mm wire.

.2 Type 2: 1.5 mm diameter multi-wire steel cable.

.3 Type 3: 3 mm diameter multi-wire steel cable.

2.6 CLAMPS

.1 U-bolt: galvanized, 13 mm diameter, c/w curved retaining bar and hex nuts.

.2 Crimp type.

2.7 ANCHORS

.1 Wood:
- .1 Type 1: 38 x 38 x 460 mm.
- .2 Type 2: 38 x 67 x 600 mm.

.2 Drive-in type.
- .1 Type 1: 13 mm diameter x 75 mm long, aluminum.
- .2 Type 2: 18 mm diameter x 120 mm long, aluminum.

.3 Screw-in type:
- .1 Type 1: 100 mm diameter hot dip galvanized steel disc.

2.8 GUYING COLLAR

.1 Tube: plastic, 13 mm diameter, nylon reinforced.

2.9 TRUNK PROTECTION

.1 Wire mesh: galvanized, electrically welded 1.4 mm wire with 25 x 25 mm mesh and fastener.

.2 Plastic: perforated spiralled strip.

.3 Burlap: clean 2.5 kg/mý minimum mass and 150 mm minimum wide, and twine fastener.

.4 Tar impregnated crepe paper and twine fastener.

2.10 MULCH

.1 Bark chip: varying in size from 25 to 50 mm in diameter, from bark of coniferous trees.

.2 Wood chip: varying in size from 50 mm to 75 mm and 5 to 20 mm thick, free of bark, small branches and leaves.

.3 Shredded wood: varying in size from 25to 125 mm in length, from coniferous trees.

.4 Synthetic or inorganic mulch.

2.11 FERTILIZER

.1 Synthetic commercial type as recommended by soil test report manufacturer.
- .1 Ensure new root growth is in contact with mycorrhiza.
- .2 Use mycorrhiza as recommended by manufacturer's written recommendations.

2.12 ANTI-DESICCANT

.1 Wax-like emulsion.

2.13 FLAGGING TAPE

.1 Fluorescent, colour.

2.14 SOURCE QUALITY CONTROL

.1 Obtain approval from Departmental Representative of plant material prior to ordering plant material, and prior to planting.

.2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for planting 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 PRE-PLANTING PREPARATION

.1 Proceed only after receipt of written acceptability of plant material from Departmental Representative.

.2 Remove damaged roots and branches from plant material.

.3 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.

.4 Locate and protect utility lines.

.5 Notify and acquire written acknowledgement from utility authorities before beginning excavation of planting pits for trees and shrubs.

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

3.3 EXCAVATION AND PREPARATION OF PLANTING BEDS

.1 Establishment of sub-grade for planting beds in accordance with Section 31 05 99 – Common Work Results for Earthworks.

.2 Preparation of planting beds in accordance with Section 32 91 21 - Topsoil Placement and Grading.

.3 For individual planting holes:
- .1 Stake out location and obtain approval from Departmental Representative prior to excavating.
- .2 Excavate to depth and width as indicated.
- .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
- .4 Scarify sides of planting hole.
- .5 Remove water which enters excavations prior to planting. Notify Departmental Representative if water source is ground water.

3.4 PLANTING

.1 For bare root stock, place 50 mm backfill soil in bottom of hole.
  .1 Plant trees and shrubs with roots placed straight out in hole.

.2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball.
  .1 Do not pull burlap or rope from under root ball.

.3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.

.4 Plant vertically in locations as indicated.
  .1 Orient plant material to give best appearance in relation to structure, roads and walks.

.5 For trees and shrubs:
  .1 Backfill soil in 150 mm lifts.
    .1 Tamp each lift to eliminate air pockets.
    .2 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.
    .3 After water has penetrated into soil, backfill to finish grade.
  .2 Form watering saucer as indicated.

.6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.

.7 Water plant material thoroughly.

.8 After soil settlement has occurred, fill with soil to finish grade.

3.5 TRUNK PROTECTION

.1 Install trunk protection on deciduous trees as indicated.

.2 Install trunk protection before installation of tree supports.

3.6 TREE SUPPORTS

.1 Install tree supports as indicated.

.2 Use single stake tree support for deciduous trees less than 3 m in height and evergreens less than2 m in height.
  .1 Place stake on prevailing wind side and 150 mm minimum from trunk.
  .2 Drive stake 150 mm minimum into undisturbed soil beneath roots.
    .1 Ensure stake is secure, vertical and unsplit.
  .3 Install 150 mm long guying collar 1500 mm above grade.
  .4 Thread Type 1 guying wire through guying collar tube.
    .1 Twist wire to form collar and secure firmly to stake. Cut off excess wire.

.3 Use 3 guy wires and anchors for deciduous trees greater than 3 m in height and evergreens greater than 2 m in height.
  .1 Use Type 2 guying wire with clamps for trees less than 75 mm in diameter and Type 3 guying wire with clamps for trees greater than 75 mm in diameter.
  .2 Use Type 1 anchors for trees less than 75 mm in diameter and Type 2 anchors for trees greater than 75 mm in diameter.

.3 Install guying collars above branch to prevent slipping at approximately 2/3 height for evergreens and 1/2 height for deciduous trees. Collar mounting height not to exceed 2.5 m above grade.
.4 Guying collars to be of sufficient length to encircle tree plus 50 mm space for trunk clearance. Thread guy wire through collar encircling tree trunk and secure to lead wire by clamp or multi-wraps; cut wire ends close to wrap. Spread lead wires equally proportioned about trunk at 120 degrees.
.5 Install anchors at equal intervals about tree and away from trunk so guy wire will form 45-degree angle with ground. Install anchor at angle to achieve maximum resistance for guy wire.
.6 Attach guy wire to anchors. Tension wire and secure by multi-wraps installing clamps.
.7 Install wire tightener ensuring that guys are secure and leave room for slight movement of tree.
.8 Saw tops off wooden anchors which extend in excess of 100 mm above grade or as directed by Departmental Representative.
.9 Install flagging tape to guys as indicated.

.4 After tree supports have been installed, remove broken branches with clean, sharp tools.

3.7 MULCHING

.1 Ensure soil settlement has been corrected prior to mulching.

.2 Spread mulch as indicated.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.
.1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
.1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
.2 Remove weeds monthly.
.3 Replace or re-spread damaged, missing or disturbed mulch.
.4 For non-mulched areas, cultivate as required to keep top layer of soil friable.
.5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.
.6 Remove dead or broken branches from plant material.
.7 Keep trunk protection and guy wires in proper repair and adjustment.
.8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.9 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
.1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
.2 Reform damaged watering saucers.
.3 Remove weeds monthly.
.4 Replace or re-spread damaged, missing or disturbed mulch.

.5 For non-mulched areas, cultivate monthly to keep top layer of soil friable.
.6 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.
.7 Apply fertilizer in early spring as indicated by soil test.
.8 Remove dead, broken or hazardous branches from plant material.
.9 Keep trunk protection and tree supports in proper repair and adjustment.
.10 Remove trunk protection, tree supports and level watering saucers at end of warranty period.
.11 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
.12 Submit monthly written reports to Departmental Representative identifying:
  .1 Maintenance work carried out.
  .2 Development and condition of plant material.
  .3 Preventative or corrective measures required which are outside Contractor's responsibility.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with 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 Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Waste Management and Disposal.
  .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
  .2 Divert discarded burlap, wire and plastic plant containers materials from landfill to plastic recycling facility approved by Departmental Representative.
  .3 Dispose of unused fertilizer at official hazardous material collection site approved by Departmental Representative.
  .4 Dispose of unused anti-desiccant at official hazardous material collections site approved by Departmental Representative.
  .5 Divert unused wood and mulch materials from landfill to recycling composting facility approved by Departmental Representative.

3.11 CLOSEOUT ACTIVITIES

.1 Submit maintenance reports for trees, shrubs, and other plantings.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 01 90.33 – Tree and Shrub Preservation.

.2 Section 32 91 13 – Mulches.

.3 Section 32 91 19.16 – Hydraulic Seeding.

.4 Section 32 92 23 – Sodding.

.5 Section 32 93 10 – Tree, Shrub and Ground Cover Planting.

.6 Section 32 93 43.01 – Tree Pruning.

1.2 REFERENCES

.1 Agriculture and Agri-Food Canada (AAFC).
- .1 Plant Hardiness Zones in Canada-2015.

.2 American National Standard Institute (ANSI) / Trees Care Industry Association
- .1 ANSI A300 National Tree Care Standards:
  - .1 ANSI A300 (Part 1) - 2008 (R2014) Pruning.
  - .2 ANSI A300 (Part 2) - 2011 Soil Management: a. Modification, b. Fertilization, and c. Drainage.
  - .3 ANSI A300 (Part 3) -2013 Supplemental Support Systems (includes Cabling, Bracing, Guying, and Propping).
  - .4 ANSI A300 (Part 5)-2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction.
  - .5 ANSI A300 (Part 6)-2012 Planting and Transplanting.
  - .6 ANSI A300 (Part 7)-2012 Integrated Vegetation Management (IVM).
  - .7 ANSI A300 (Part 9) - 2011 Tree Risk Assessment.

.3 Atlantic Canada Pesticide Applicator Training Manual Series
- .1 Applicator Core Training Manual, July 2006.

.4 Canadian Nursery Landscape Association (CNLA)
- .1 Canadian Standards for Nursery Stock-2006.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.6 U.S. Environmental Protection Agency (EPA) / Office of Water
- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 SUMMARY

.1 Work includes all labour, tools, specialized equipment, materials, qualified supervision and transportation to perform complete landscape maintenance work including weed control, and watering to maintain the plantings in a healthy and attractive condition as described herein. All work in this specification is required to be performed as a part of this contract whether described in an active tense or not.

.2 Provide regular maintenance services as outlined in these Landscape Maintenance Specifications and submit attached Maintenance Table to the Departmental Representative for record.

.3 Examine the landscape as described in this document during each required visit, looking for problems or potential problems.

.4 Provide at your own risk and expense all labour, materials, tools, equipment, insurance, transportation, hauling, dumping, and all other items needed to provide the services outlined in this Specification.

.5 Work of this contract, River Passage Park, is considered a Class A park for maintenance purposes.

1.4 PROTECTION

.1 Take reasonable precautions required to protect plants from abnormal temperatures.

.2 Confine work to areas designated.

.3 Prevent damage to adjacent property.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:

- .1 Provide manufacturer's instructions, printed product literature and data sheets for tree and shrub maintenance materials and include product characteristics, performance criteria, and limitations.
- .2 Provide monthly written reports on maintenance during warranty period, to Departmental Representative identifying:
  - .1 Maintenance work carried out.
  - .2 Development and condition of plant material.
  - .3 Preventative or corrective measures required which are outside Contractor's responsibility.
- .3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

.2 Submit samples and information sheets to the Departmental Representative for review for any proposed substitution(s) and for materials not specified by manufacturers and as noted herein.

.3 Required submittals include the following:

- .1 Fertilizer.
- .2 Herbicides.
- .3 Pesticides.
- .4 Pesticide Application Records.
- .5 Maintenance Schedule and Maintenance Table.

1.6 QUALITY ASSURANCE

.1 Qualifications:
- .1 Landscape Contractor: to be a Member in Good Standing of Canadian Nursery Landscape Association.
- .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
- .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Ornamental Maintenance designation.

.2 Work shall comply with ANSI A300 National Tree Care Standards.

1.7 MAINTENANCE TABLE

.1 Update Maintenance Table after each site visit.

.2 Note on the Maintenance Table weeks in which visits do not occur or tasks that are not completed.

.3 Provide The Maintenance Table for review by Departmental Representative at any time.

.4 Submit completed Maintenance Table at end of each quarter to Departmental Representative for review and record.

.5 Retain a record copy of all completed Maintenance Tables.

1.8 NOTIFICATION

.1 Review site during each site visit to determine presence of any conditions hazardous to health, safety, or welfare. Notify the Departmental Representative immediately of any hazardous conditions.

1.9 SCHEDULING AND FREQUENCY

.1 Perform general maintenance at each site during the growing season and at the frequencies prescribed for various tasks below.

.2 Growing season: the average frost-free season as substantiated by Environment Canada (90 percent probability of temperatures above 28 deg F (-2 deg C)).

.3 Required minimum maintenance visits may be in addition to, or in conjunction with, other visits that are required to perform the tasks outlined in Specifications.

.4 Provide the Departmental Representative with a Maintenance Schedule indicating the average growing season for the planting location, proposed days of visits, names of supervisor, and contact person.

.5 Submit this schedule on a yearly basis at the beginning of the contract year and revise as needed.

1.10 INSPECTION OF WORK

.1 Regularly inspect all maintenance performed under this contract.

.2 The Departmental Representative may at any time request correction or improvement of maintenance practices if they fall below contract standards.

.3 Make necessary corrections within 72-hours of receipt of such request.

.4 These requests may be made in writing, email, by telephone, facsimile or in person, and may be given to you or your on-site representative.

1.11 CONTACT PERSON

.1 Provide the Departmental Representative with a phone number and an email address where a message can be left for the contractor 24-hours a day. An answering machine connected to the contractor's normal phone line is an acceptable method of meeting this requirement. Check for messages every 24-hours or less.

1.12 DEFINITIONS

.1 Landscape Contractor or Contractor: The person, partnership, corporation, or agency that will perform the landscape maintenance work.

.2 Departmental Representative: The person, partnership, corporation, or agency that contracted for the performance of the landscape maintenance work.

.3 Excluded damage:

.1 Damage caused by vandalism, pedestrians, vehicles, animals, or other unusual factors.

.2 This term does not include damage caused by the contractor's actions, lack of reasonable care, insects or rodents, diseases, or plant loss due to lack of water or over watering.

1.13 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site to cause least interference with work activities.

1.14 WARRANTY

.1 Warranty: Include coverage for each of 2 continuous growing seasons; replace dead or unhealthy plants after date of Substantial Performance.

.2 Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

Part 2 Products

2.1 FERTILIZER

.1 Approved high quality balanced organic fertilizer (N, P, K, pH) designed for region and local soils conforming to applicable state fertilizer laws.

.1 Uniform in composition, dry, free flowing, delivered to the site in original unopened containers, each bearing the manufacturer's guaranteed analysis.

.2 Fertilizer composition shall be based upon the required yearly soil test.

.2 Submit product literature for review by Departmental Representative.

2.2 PESTICIDES

.1 Pesticides approved by the Prince Edward Island environmental department and local jurisdiction. Submit product literature for review by the Departmental Representative.

.2 Apply at rate recommended by manufacturer.

2.3 HERBICIDES

.1 Post- and pre-emergent herbicides approved by the Province of the Work and local jurisdiction.

.2 Submit product literature for review by Departmental Representative. Apply at rate recommended by manufacturer.

2.4 MULCH

.1 Woodchip Mulch: locally sourced, as approved by Departmental Representative, and to Section 32 91 13.

Part 3 Execution

3.1 GENERAL MAINTENANCE

.1 The primary methods of promoting desirable maintenance outcomes include but are not limited to the following Methods:
- .1 Proper soil preparation.
- .2 Installing healthy plants using accepted horticultural methods.
- .3 Supplemental watering.
- .4 Weed control.
- .5 Insect and disease control as needed.
- .6 Replacing dead plants to fill in gaps.

.2 Methods 1-3 as noted above shall be completed as part of the installation phase, and Methods 4-6 shall be part of the maintenance program in accordance with the requirements of this Section.

.3 The Contractor is responsible to make sure that the property is not damaged during any maintenance activities and if damages do occur the Contractor shall pay for all repair costs.

3.2 WATERING

.1 Hand water as required to supplement natural rainfall and to maintain plantings in a healthy, stress-free condition. Watering amount and frequency should be based on the site conditions (i.e. how quickly the soil dries out, and weekly rainfall received). The contractor is responsible for monitoring to determine watering needs and to make sure plants receive adequate water, but are not overwatered. In general, 25 mm of surface water should be applied each week during the growing season – either via rainfall or supplemental watering. Depending on site conditions, more water may be needed in hot, dry weather; less in cool, wet weather.

.2 Use multiple-start times and short run times to prevent run-off. Do not allow runoff from any irrigation.

.3 Conserve water and ensure that all watering rules and regulations are followed. Any penalties, fines, or citations for watering ordinance violations shall be paid by the contractor.

3.3 WEED CONTROL

.1 Monitor planting areas for weeds every two weeks during the growing season and implement appropriate controls as needed.

.2 Controls include replacing/top dressing mulch, mechanical (such as hand pulling) or chemical (herbicide) methods.

.3 If mulch condition or depth is compromised such that weeds are starting to invade, mulch should be repaired to a depth of 75 mm, and to a condition that is weed free.

.4 Take care to remove the roots of the weed species when hand pulling, but with care to avoid getting soil on top of the mulch layer.

.5 Use herbicides only if hand pulling is not feasible (effective or cost effective), and only with the written approval of Department Representative. The method of application and product used should be selected to eliminate any negative impacts to desirable plant species. Pre-emergent and post-emergent herbicides may be used after one-year establishment period for new plantings has elapsed. After killing weeds with herbicide, any weeds over 50 mm tall must be removed from planting beds and disposed of properly off site.

.6 Select and apply herbicides using methods that preclude damage to surrounding plants, soils, or waters including:

.1 Notification: Notify the Departmental Representative at least 72-hours in advance of the application of pesticides or herbicides. Notification to include name of material, rate of application, and locations of proposed application. Failure to notify will be considered non-performance of work and payment may be withheld or reduced proportionately. Provide the Departmental Representative with invoice to verify purchase of pesticide.

.2 Perform spraying by or under the direction of an applicator possessing a valid Pesticide or Herbicide Applicator's license. Provide notice on site as required by law.

.3 Spot spray only as required to combat specific weeds, insect pests or infestations. No general broadcast spraying is permitted. Spray only during windless periods and do not contaminate surrounding areas.
No spraying to occur in or near wetlands or other sensitive areas.
No spraying shall be performed when vehicles or people are present near any areas sprayed.

.4 Re-spray within 2-weeks from original application any areas which still exhibit weeds, pests or infestations.

.7 Supply the Departmental Representative with a written copy of the spray application record, which shall contain the following information:

1. The name of the company and person who applied the pesticide.
2. The name of the person requesting the pesticide application.
3. The reason the pesticide was applied.
4. The location where the pesticide was applied.

5. The year, month, day and time the pesticide was applied.
6. The person or firm who supplied the pesticide that was applied.
7. The trade name of the pesticide that was applied.
8. The direction and estimated velocity of the wind at the time the pesticide was applied.
9. The name of the Pesticide or Herbicide Applicator's license holder.
10. Any other reasonable information required by the Departmental Representative.
11. Labour hour and rate.

3.4 TREE AND SHRUB MAINTENANCE

.1 Notify Departmental Representative 72-hours in advance of the application of fertilizer. Failure to notify will be considered non-performance of work and payment may be withheld or reduced proportionately. Provide The Departmental Representative with invoice to verify purchase of fertilizer.

.2 Apply fertilizer twice during the growing season at the rate specified. Fertilizer composition to be based on soil test results. Apply with spinner-type spreader such as the Ortho-Whirly bird or Cyclone spreaders. Do not use drop-type spreaders. Apply when leaves are dry, and water-in thoroughly after application.

.3 Delete fertilization of shrubs from contract when they have reached maturity and with Departmental Representative's prior approval.

.4 Prune plant material to repair minor damage caused by vandalism, traffic, acts of nature, or other causes.

.5 Accomplish minor pruning in accordance with standards of good practice and the intended function of the tree or shrub by or under the supervision of a licensed horticulturist. Remove all debris from the site. Prune deciduous trees during their dormant period and evergreen trees during late summer.

.6 Prune shrubs only to remove dead growth, or to remove growth encroaching over pathways, sidewalks or curbs. Allow shrubs to grow un-pruned to their natural size and shape. Shrubs should not be sheared or cut back to the ground unless necessary to remove dead material, or for insect and/or disease control.

.7 Initial planting densities were designed to allow an average of 5% shrub mortality per planting bed without the need for replacement. If shrub mortality exceeds 5% over all, shrubs should be replanted to fill the gap(s). Dead plants should be cut back and the above ground material removed from site.

.8 Repair any damage caused by contractor's work to walls, planting or lawns, curbs, utilities, lighting or paving, including any damage caused by the improper application of fertilizers, pesticides and herbicides (including burning, brownout, death).

.9 Remove and dispose of damaged or broken plant material off-site and in a legal manner.

3.5 EDGING AND MULCH CARE

.1 Protect the integrity of the bed edges and mulch during maintenance activities.

.2 Avoid damaging the edge of the planting beds During watering, weeding and other activities. Any damaged edges will need to be repaired by reshaping the soil so that the condition matches that at the time of installation.

.3 Take care when watering to avoid washing mulch away and leaving bare spots for weeds to colonize.

.4 Avoid getting soil on top of the mulch during weed pulling or replanting activities.

.5 If mulch is removed or damaged in areas, it should be replaced with the same type and depth of material used for the original installation.

.6 Top dress mulch as needed to maintain a 75 mm cover for the duration of the maintenance contract. Top dressing may not be required if proper care is taken during maintenance.

3.6 LITTER CONTROL

.1 Clean Up and Litter Removal:

.1 Sweep or blow-off all walks and curbs at each site visit.

.1 Do not use blowers prior to 6:00 A.M. or after 10:00 P.M. or at any other hours restricted by law or Parks Canada policy.

.2 Do not use blowers around parked vehicles to avoid scratching vehicle paint with blowing sand and debris.

.3 Where use of blowers is prohibited by law, use alternate methods.

.2 Remove litter from sidewalks, gutters, and all planted areas at each site visit. In no case shall trash, litter, or leaves be blown or swept onto the property of others.

.3 Collect trash, litter, leaves, etc., haul away, and dispose offsite in a legal manner.

3.7 ROUGH AND NATIVE GRASS

.1 Trim or mow areas designated as rough grass to a height of 50 to 100 mm once in late spring. Clippings may be left in rough grass areas provided mulching mowers are used and no obvious clumps of clippings are left on the lawn surface. Otherwise remove all clippings.

.2 Edging: All rough grass areas shall have established edges. Mechanically edge all borders at each mowing, with all clippings removed. Hand trim all rough grass areas where mowing could damage plants.

.3 Overseeding: Overseed as required to repair bare lawn areas. Stake and flag area as required to prevent pedestrian damage.

3.8 SNOW REMOVAL

.1 Snow removal is not required as part of this Contract.

.2 No salt shall be used on this site for de-icing.

3.9 MAINTENANCE TABLE

.1 An example of the Maintenance Table is attached, following this Section.

.2 Departmental Representative can provide a digital copy.

END OF SECTION

LANDSCAPE MAINTENANCE TABLE

Entrance Rehabilitation Project
Terra Nova National Park
Newfoundland and Labrador

DATE SUBMITTED: _____

SUBMITTED BY: _____

LANDSCAPE CONTRACTOR: _____

DATE OF VISIT																	
Start of Contract Tasks																	
Inventory existing conditions																	
Provide contract supervisor with contact information																	
Weekly Tasks																	
Review landscape for problems																	
Notify Owner of any hazardous conditions																	
Inventory site for missing plants																	
Replace missing plants - with authorization																	
Collect leaves																	
Trim grass around planting areas & trees																	
Remove litter																	
Remove weeds																	

DATE OF VISIT																	
Sweep or blow clean pedestrian areas																	
Repair excluded damage-with authorization																	
List other tasks completed:																	
Monthly & Semi-Annual Tasks																	
Prune Trees																	
Prune Shrubs																	
Prune Groundcovers																	
Mow rough Grass																	
Edge Lawns																	
Overseed Bare Lawn Areas																	
Fertilizer Lawns																	
Fertilize Shrubs																	
Apply Pesticides or Herbicides																	
Apply Herbicides																	
Clean out rain gardens of gravel and debris																	
List other tasks completed																	

DATE OF VISIT																	
Annual Tasks																	
Perform soil testing																	
Lime lawns																	
Aerate Lawns																	
Top-dress mulched beds																	
Top-dress gravel trail and compact																	
Prune ornamental grasses																	
Remove tree stakes																	
Clean out catch basins																	
Apply sealant to masonry																	
List other tasks completed:																	
initials of person completing matrix																.	

1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 32 01 90.33 – Tree and Shrub Preservation.

.3 Section 32 93 10 – Tree, Shrub and Ground Cover Planting.

.4 Section 32 93 11 – Landscape Maintenance and Warranty.

1.2 REFERENCE STANDARDS

.1 American National Standard Institute (ANSI) / Trees Care Industry Association
- .1 ANSI A300 National Tree Care Standards:
  - .1 ANSI A300 (Part 1) - 2008 (R2014) Pruning.
  - .2 ANSI A300 (Part 2) - 2011 Soil Management: a. Modification, b. Fertilization, and c. Drainage.
  - .3 ANSI A300 (Part 3) -2013 Supplemental Support Systems (includes Cabling, Bracing, Guying, and Propping).
  - .4 ANSI A300 (Part 5)-2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction.
  - .5 ANSI A300 (Part 6)-2012 Planting and Transplanting.
  - .6 ANSI A300 (Part 7)-2012 Integrated Vegetation Management (IVM).
  - .7 ANSI A300 (Part 9) - 2011 Tree Risk Assessment.
  - .8 ANSI A300 (Part 10)-2016: IPM.

.2 Canadian Nursery Landscape Association (CNLA)

.3 International Society of Arboriculture (ISA)

1.3 DEFINITIONS

.1 Crown Cleaning: consists of selective removal of one or more of following items: dead, dying or diseased branches, weak branches and water sprouts.

.2 Crown Thinning: consists of selective removal of branches to increase light penetration, air movement and reduce weight.

.3 Crown Raising: consists of removal of lower tree branches to provide clearance.

.4 Crown Reduction or Crown Shaping: decreases tree height and/or spread.

.5 Vista Pruning: is selective thinning of framework limbs or specific crown areas to improve views.

.6 Crown Restoration: improves structure, form and appearance of trees that have been severely headed or vandalized.

1.4 QUALITY ASSURANCE

.1 Certification: provide International Society of Arboriculture or Canadian Nursery Landscape Association certification.

.2 Regulatory requirements: provide safety certificate as approved by local hydro utility.

.3 Field Samples: do sample pruning in manner to enable Departmental Representative to identify:
- .1 Knowledge of target areas including branch bark ridge and branch collars.
- .2 Technique for selection process and pruning used to establish desired form and shape for each species.

.4 Acceptance of Work will be determined by Departmental Representative from field sample.

.5 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 11 10 – General Requirements: Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic in designated containers.

.3 Dispose of unused disinfectant at official hazardous material collections site approved by Departmental Representative.

.4 Ensure emptied containers are sealed and stored safely.

.5 Divert wood materials from landfill to facility for recycling or composting as directed by Departmental Representative.

1.6 TOOL MAINTENANCE

.1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.

.2 Disinfect tools before each tree is pruned.

.3 On diseased plant material disinfect tools before each cut.

2 Products

2.1 DISINFECTANT

.1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

3 Execution

3.1 APPLICATION

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

3.2 GENERAL

.1 Prune in accordance with ANSI A300 National Tree Care Standards, and as directed by Departmental Representative. Where discrepancies occur between standard and specifications, specifications govern.

.2 Notify immediately Departmental Representative conditions detrimental to health of plant material or operations.

.3 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10 degrees C.

.4 Prune each species when in full leaf.

.5 Retain natural form and shape of plant species.

.6 Do not:
- .1 Flush cut branches.
- .2 Crush or tear bark.
- .3 Cut behind branch bark ridge.
- .4 Damage branch collars.
- .5 Damage branches to remain.

3.3 PRUNING

.1 Remove dead, dying, diseased and weak growth from plant material to provide crown cleaning, crown thinning, crown raising, crown reduction, vista pruning and/or crown restoration as designated by Departmental Representative in order to promote healthy growth.

.2 Remove live branches that:
- .1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.
- .2 Are of weak structure including narrow crotches.
- .3 Obstruct development of more important branches.
- .4 Are broken.

.3 Remove live branches to re-establish natural species form including:
- .1 One or more developing leaders.
- .2 Multiple growth due to previous topping.
- .3 Branches extending outward from natural form.
- .4 Undesirable sucker growth.

.4 Remove loose branches, twigs and other debris lodged in tree.

.5 Remove vines.

.6 For branches under 50 mm in diameter:
- .1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.
- .2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.
- .3 Do not cut lead branches unless directed by Departmental Representative.

.7 For branches greater than 50 mm in diameter:
- .1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.
- .2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.
- .3 Make final cut adjacent to and outside branch collar.

.8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal.
  .1 Repair areas which are damaged, or remove damaged area back to next branch collar.

.9 Remove additional growth designated by Departmental Representative.

3.4 ROOT GIRDLING

.1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.

.2 Remove exposed portion of girdling root as directed by Departmental Representative after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.5 CARE OF WOUNDS

.1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

3.6 CLEAN-UP

.1 Proceed in accordance with Section 01 11 10 – General Requirements: Cleaning.

.2 Collect and dispose of or compost/recycle whenever applicable pruned material daily and remove from site.

.3 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 99 – Common Work Results for Earthworks.

.2 Section 31 32 19.16 – Geotextiles.

.3 Section 32 11 16.01 – Granular Sub-Base.

.4 Section 32 11 23 – Aggregate Base Courses.

.5 Section 33 41 00 – Storm Utility Drainage Piping.

1.2 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM A48/A48M-03(2012), Standard Specification for Grey Iron Castings.
- .2 ASTM A 123/A 123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM C117-13, Standard Test Method for Materials Finer than 75-mm (No. 200) Sieve in Mineral Aggregates by Washing.
- .4 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .5 ASTM C139-14, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
- .6 ASTM C478-15a, Standard Specification for Precast Reinforced Concrete Manhole Sections.
- .7 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

.2 CSA Group
- .1 CSA A23.1/A23.2-14, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete, Includes Update No. 1 (2015).
- .2 CAN/CSA A165 Series-14, CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
- .3 CAN/CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .4 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.

.3 Ontario Provincial Standard Specifications (OPSS)
- .1 OPSS 407-November 2015, Construction Specification For Maintenance Hole, Catch Basin, Ditch Inlet And Valve Chamber Installation.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for catch basin structures and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of the Work, Canada.

1.4 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 11 10 – General Requirements: Quality Control.

.2 Certifications:
- .1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and 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 off ground, protected from the weather, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect catch basin structures from damage.
- .3 Replace defective or damaged materials with new.

2 Products

2.1 CAST-IN-PLACE CONCRETE

.1 In accordance with Cast-in-Place Concrete specifications.

.2 Cement: to CAN/CSA A3001, Type GU.

.3 Concrete mix design to produce 30 MPa minimum compressive strength at 28 days and containing 25 mm maximum size coarse aggregate, with water/cement ratio to CSA A23.1.
- .1 Air entrainment to CSA A23.1.

2.2 PRECAST CATCH BASINS

.1 All catch basins shall be precast concrete.

.2 Precast catch basin sections: to ASTM C478.

.3 Construct to the requirements of ASTM C478 with dimensions shown on the drawings and/or as designated by the Departmental Representative in the field.

.4 Cement shall be Type GU Portland Cement meeting CAN/CSA A3001.

.5 Minimum wall thickness shall be 90 mm.

2.3 JOINTS

.1 Joints: made watertight using rubber rings, bituminous compound, or epoxy resin cement.

2.4 MORTAR

.1 Aggregate: to CAN/CSA A3002.

.2 Masonry Cement: to CAN/CSA A3002.

.3 Sufficient water shall be added after mixing to give optimum consistency for placement.

.4 No additives shall be used.

2.5 ADJUSTING RINGS

.1 Catch basin adjustments shall be undertaken using precast adjusting rings.

.2 Adjusting rings to ASTM C478.

2.6 DROP MH PIPE

.1 Drop MH pipe: to Section 33 41 00 – Storm Utility Drainage Piping; diameters as required for proper flow in accordance with shop drawings.

2.7 FRAMES AND COVERS

.1 Close-grained grey cast iron meeting ASTM A48, Class 20 or cast steel conforming to ASTM A27, Grade 70-36.

.2 The substitution of ductile iron meeting ASTM.A445 for cast iron or cast steel shall be subject to the approval of the Departmental Representative.

.3 All frames and covers shall be true in form and dimension, free from faults, sponginess, cracks, blow holes, and other defects. Bearing surfaces shall be machined to prevent rocking.

.4 Frames and covers shall be hot dipped in asphaltic varnish.

.5 Frames, gratings, covers shall meet the following requirements:
- .1 Gratings: atrium grates.
- .2 Metal gratings and covers to bear evenly on frames.
  - .1 Frame with grating or cover to constitute one unit.
  - .2 Assemble and mark unit components before shipment.
- .3 Gray iron castings: to ASTM A48/A48M, strength class 30B.
- .4 Castings: sand blasted or cleaned and ground to eliminate surface imperfections, coated with two applications of asphalt varnish.
- .5 Catch basin frames and covers: manufacturer’s standard.
- .6 Size: 610 mm square.

2.8 GRANULAR BACKFILL

.1 Granular bedding and backfill: Class A and B fill as required, to Section 31 05 99 – Common Work Results for Earthworks, and the following:
- .1 Sub-Base: to Section 32 11 16.01 – Granular Sub-Base.
- .2 Base: to Section 32 11 23 – Aggregate Base Courses.
- .3 Unshrinkable fill: to Section 31 05 99 – Common Work Results for Earthworks.

3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's printed installation instructions, technical datasheets, details and specifications.

3.2 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for maintenance holes and catch basin structures 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.

3.3 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 05 99 – Common Work Results for Earthworks and as indicated.

.2 Obtain approval of Departmental Representative before installing catch basins.

3.4 CONCRETE WORK

.1 Do concrete work in accordance with Cast-in-Place Concrete specifications.

.2 Place concrete reinforcement in accordance with Concrete Reinforcing specifications.

.3 Position metal inserts in accordance with dimensions and details as indicated.

3.5 INSTALLATION

.1 The exact location of catch basins shall be indicated by Departmental Representative in the field.

.2 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.3 Complete units as pipe laying progresses.
- .1 Maximum of 3 units behind point of pipe laying will be allowed.

.4 Dewater excavation to approval of Departmental Representative and remove soft and foreign material before placing concrete base.

.5 Cast bottom slabs directly on undisturbed ground.

.6 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% maximum density to ASTM D698.

.7 Precast units:
- .1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base.
- .2 Make each successive joint watertight with Departmental Representative's approved rubber ring gaskets, bituminous compound, epoxy resin cement, or combination of these materials.
- .3 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
- .4 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.

.8 Compact granular backfill to 95% maximum density to ASTM D698.

.9 Place unshrinkable backfill in accordance with Section 31 05 99 – Common Work Results for Earthworks.

.10 Place frame and cover on top section to elevation as indicated. If adjustment required use concrete ring.

.11 Clean units of debris and foreign materials.
- .1 Remove fins and sharp projections.
- .2 Prevent debris from entering system.

.12 During construction, plug pipes at catch basins to prevent entry of backfill materials. Remove plugs immediately after construction is completed.

.13 Precast concrete lift rings shall be used in order to raise the catch basin cover to the finished grade.

3.6 ADJUSTING TOPS OF EXISTING UNITS

.1 Sectional units:
- .1 Raise or lower straight walled sectional units by adding or removing precast sections as required.
- .2 Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation, then replace cone section.
  - .1 When amount of raise is less than 600 mm use standard maintenance hole brick, moduloc or grade rings.

.2 Monolithic units:
- .1 Raise monolithic units by roughening existing top to ensure proper bond and extend to required elevation with [mortared brick course for 150 mm or less alteration] [cast-in-place concrete].
- .2 Lower monolithic units with straight wall by removing concrete to elevation indicated for rebuilding.

.3 When monolithic units with tapered upper section are lowered more than 150 mm, remove concrete for entire depth of taper plus as much straight wall as necessary, then rebuild upper section to required elevation with cast-in-place concrete.
.4 Install additional maintenance hole ladder rungs in adjusted portion of units as required.
.5 Re-use existing gratings, frames and I-beams.
.6 Re-set gratings and frames to required elevation on not more than 4 courses of brick.
.1 Make brick joints and join brick to frame with cement mortar, parge and trowel smooth.
.2 Re-set gratings and frames to required elevation on full bed of cement mortar, parge and trowel smooth.

3.7 SEALING OVER EXISTING UNITS

.1 Cut galvanized iron sheet to extend 50 mm beyond opening of existing maintenance hole or catch basin grating.
.1 Center iron sheet over existing grating and spot or stitch weld to grating.

.2 Fill with material approved by Departmental Representative.

3.8 FIELD QUALITY CONTROL

.1 Leakage Test:
.1 Install watertight plugs or seals on inlets and outlets of each new catch basin and fill with water.
.2 Leakage not to exceed 0.3% per hour of volume of catch basin.

.2 If permissible leakage is exceeded, correct defects.

.3 Repeat until approved by Departmental Representative.

.4 Departmental Representative will issue Test Certificate for each catch basin passing test.

1.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

1.3 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 31 05 99 - Common Work Results for Earthworks.

.2 Section 31 32 19.16 - Geotextiles.

.3 Section 32 11 16.01 - Granular Sub-Base.

.4 Section 32 11 23 - Aggregate Base Courses.

.5 Section 33 41 00 - Storm Utility Drainage Piping.

.6 Section 33 05 16.01 – Catch Basins.

1.2 REFERENCE STANDARDS

.1 ASTM International

- .1 ASTM C12-16, Standard Practice for Installing Vitrified Clay Pipe Lines.
- .2 ASTM C14-15a, Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe.
- .3 ASTM C76-15a, Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- .4 ASTM C117-13, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
- .5 ASTM C136/C136M-14 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .6 ASTM C425-04(2013), Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
- .7 ASTM C428/C428M-05(2011)e1, Standard Specification for Asbestos-Cement Nonpressure Sewer Pipe.
- .8 ASTM C443-12, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
- .9 ASTM C506-16a Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe.
- .10 ASTM C507-15 Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe.
- .11 ASTM C663-98(2014), Standard Specification for Asbestos-Cement Storm Drain Pipe.
- .12 ASTM C700-13 Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
- .13 ASTM C698-16, Standard Test Methods for Chemical, Mass Spectrometric, and Spectrochemical Analysis of Nuclear-Grade Mixed Oxides ((U, Pu)O2).
- .14 ASTM D1056-14, Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber1,2.
- .15 ASTM D1869-15 Standard Specification for Rubber Rings for Fiber-Reinforced Cement Pipe.
- .16 ASTM D2680-01(2014) Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping.
- .17 ASTM D3034-15e1 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .18 ASTM F667 / F667M - 16, Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings.

.19 ASTM F794-03(2014) Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

.2 CSA International
- .1 CSA-A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014), Update No. 3 (2014).
- .2 CSA A257 Series-14, Standards for Concrete Pipe and Manhole Sections.
- .3 CAN/CSA-B1800-15, Thermoplastic Nonpressure Piping Compendium, Update No. 1 (2015), Update No. 2 (2015).
- .4 CSA G401-14, Corrugated Steel Pipe Products.

.3 U.S. Environmental Protection Agency (EPA) / Office of Water
- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 SCHEDULING

.1 Schedule Work to minimize interruptions to existing services and to maintain existing flow during construction.

.2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Shop drawings to indicate proposed method for installing carrier pipe for undercrossings.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of the Work, Canada.

.4 Certification to be marked on pipe.

.5 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

.6 Manufacturer's Instructions: submit to Departmental Representative 1 copy of manufacturer's installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and 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.
.2 Store and protect pipes from damage.
.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 PLASTIC PIPE

.1 Type PSM Poly Vinyl Chloride (PVC): to ASTM D3034.
- .1 Standard Dimensional Ratio (SDR): 35.
- .2 Locked-in gasket and integral bell system.
- .3 Nominal lengths: 6 m.

.2 Large diameter, ribbed PVC pipe and fittings: to ASTM F794.

.3 Corrugated polyethylene pipe: high density to ASTM F405.

.4 Acrylonitrile - Butadiene - Styrene (ABS): to ASTM D2680.

2.2 PIPE BEDDING AND SURROUND MATERIAL

.1 Granular material in accordance with Section 32 11 23 - Aggregate Base Courses and following requirements:
- .1 Class A granular.
- .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117.

.2 Concrete mixes and materials for bedding, cradles, encasement, supports: in accordance with Cast-in-Place Concrete specifications.

2.3 BACKFILL MATERIAL

.1 Granular backfill: Class A and B fill as required, to Section 31 05 99 - Common Work Results for Earthworks, and the following:
- .1 Sub-Base: to Section 32 11 16.01 - Granular Sub-Base.
- .2 Base: to Section 32 11 23 - Aggregate Base Courses.
- .3 Unshrinkable fill: to Section 31 05 99 - Common Work Results for Earthworks.

2.4 JOINT MORTAR

.1 Portland cement: to CAN/CSA A3000, type GU.

.2 Mortar: one part Portland cement to two parts clean sharp masonry sand mixed with minimum amount of water to obtain optimum consistency for use intended. Do not use additives.

3 EXECUTION

3.1 PREPARATION

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

.2 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.

3.2 TRENCHING

.1 Do trenching Work in accordance with Section 31 05 99 - Common Work Results for Earthworks.

.2 Protect trench from contents of sewer.

.3 Trench alignment and depth to approval of Departmental Representative prior to placing bedding material and pipe.

.4 Water jetting of backfill under haunches of corrugated steel pipe may be permitted if recommended by manufacturer and approved by Departmental Representative.

3.3 CONCRETE BEDDING AND ENCASEMENT

.1 Do concrete Work in accordance with Cast-in-Place Concrete specifications. Place concrete to details as directed by Departmental Representative.

.2 Position pipe on concrete blocks to facilitate placing of concrete.
- .1 When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.3 Backfill over concrete once cured.

3.4 GRANULAR BEDDING

.1 Place bedding in unfrozen condition.

.2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth of 500 mm.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
- .1 Do not use blocks when bedding pipes.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95 % maximum density to ASTM D698.

.6 Fill excavation below bottom of specified bedding adjacent to catch basins with compacted bedding material.

3.5 INSTALLATION

.1 Lay and join pipes to ASTM C12.

.2 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Departmental Representative.

.3 Handle pipe using methods approved by Departmental Representative.
- .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.4 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.
- .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.5 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.6 Joint deflection permitted within limits recommended by pipe manufacturer.

.7 Water to flow through pipes during construction only as permitted by Departmental Representative.

.8 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.9 Install plastic pipe and fittings in accordance with CAN/CSA B1800.

.10 When any stoppage of Work occurs, restrain pipes to prevent "creep" during down time.

.11 Plug lifting holes with Departmental Representative approved prefabricated plugs, set in shrinkage compensating grout.

.12 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.

.13 Make watertight connections to catch basins.
- .1 Use shrinkage compensating grout when suitable gaskets are not available.

.14 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.
- .1 Joint to be structurally sound and watertight.

.15 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

3.6 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
  .1 Leave joints and fittings exposed until field testing is completed.

.3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
  .1 Do not dump material within 2 m of pipe.

.4 Place layers uniformly and simultaneously on each side of pipe.

.5 Compact each layer from pipe invert to mid-height of pipe to at least 95% maximum density to ASTM D698.

.6 Compact each layer from mid-height of pipe to underside of backfill to at least 90% maximum density to ASTM D698.

.7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.7 BACKFILL

.1 Place backfill material in unfrozen condition.

.2 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.

.3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D698. In other areas, compact backfill to at least 90% maximum density to ASTM D698.

.4 Place unshrinkable backfill in accordance with Section 31 05 99 - Common Work Results for Earthworks.

3.8 UNDERCROSSING

.1 Excavate working pit as required, outside right-of-way to be crossed.

.2 Excavate working pit to minimum of 0.5 m below lowest invert of encasing pipe.

.3 Dewater excavation.

.4 Dewater area of undercrossing.

.5 Install heavy timber backstop.

.6 Place encasing pipe to exact line and grade as indicated. Encasing pipe shall undercross obstruction at degree established by engineered shop drawings.

.7 Install encasing pipe by jacking, boring or tunnelling.

.8 Ensure encasing pipe is not in tension.

.9 Use welded type joints for encasing pipe.

.10 Place concrete grout levelling pad in encasing pipe. Carefully control level of grout during placing.

.11 Provide shop drawings showing proposed method of installation for storm sewer pipe.

.12 Insert storm sewer pipe into encasement pipe, in end with largest opening after placement of levelling pad.

.13 Use approved blocking method to guide storm sewer pipe in true alignment.

.14 Clearance between blocks and encasement pipe: maximum 12 mm when storm pipe is in position.

.15 Join storm sewer pipe one length at time outside encasement pipe. Push storm pipe into position.

.16 Couplings of storm sewer pipe: not to rest on levelling pad when carrier pipe is in position.

.17 Place 20 MPa concrete cradle around storm pipe after it is positioned.
- .1 Cradle to be minimum of 225 mm and maximum of 300 mm above levelling pad.

.18 Pressure grout remaining void with grout consisting of one part Portland cement and two parts clean washed sand with only sufficient amount of water added to allow placement.
- .1 Install pressure grout after storm sewer pipe is secure against flotation.
- .2 Do not use additives.

.19 Do field testing before placing concrete cradle and grouting.

3.9 FIELD TESTS AND INSPECTIONS

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 Draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction directed by Departmental Representative.

.3 Remove foreign material from catch basins and related appurtenances by flushing with water.

.4 Television and photographic inspections:
- .1 Carry out inspection of installed sewers by television camera, photographic camera or by other related means.
- .2 Provide means of access to permit Departmental Representative to do inspections.
- .3 Payment for inspection services in accordance with Price and Payment Procedures in PART 1.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION