Project Manual

City of Winnipeg

Bridgwater Forest
Parks Storage Garage

200 North Town Road

Winnipeg, Manitoba

Bid Opportunity No. 911-2019

Set No.:

Project:	**Bridgwater Forest Parks Storage Garage** 200 North Town Road Winnipeg, Manitoba
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PART 1 - GENERAL

.1 Included herein is the soil investigation report titled "Waverley West Garage, Winnipeg, MB Geotechnical Investigation", prepared for the City of Winnipeg, dated May 30, 2019 by Trek Geotechnical.

.2 The soils report gives properties of the soils prepared primarily for the use of the Engineer.

.3 The report, by its nature, cannot reveal all conditions that exist or can occur on the site. Should sub-surface conditions be found to vary substantially from those indicated in the Soils Report, changes in the design and construction of foundations will be made accordingly, with resulting credits or expenditures accruing to the City.

Quality Engineering | Valued Relationships

City of Winnipeg - Planning, Property and Development Department

Waverley West Garage, Winnipeg, MB
Geotechnical Investigation

Prepared for:

Mr. Greg Kucel
Project Officer
Planning, Property and Development Department
City of Winnipeg
4th Floor, 185 King Street
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Project Number:
0015-032-00

Date:
May 30, 2019

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TREK GEOTECHNICAL Quality Engineering | Valued Relationships

May 30, 2019 Our File No. 0015-032-00

Mr. Greg Kucel
Project Officer
Planning, Property and Development Department City of Winnipeg
4th Floor, 185 King Street
Winnipeg, MB R3B 1J1

RE: Waverley West Garage, Winnipeg, MB
Geotechnical Investigation

TREK Geotechnical Inc. is pleased to submit our Geotechnical Investigation Report for the above noted project located in Winnipeg, MB.

Please contact Ryan Belbas of our office if you have any questions. Thank you for the opportunity to work with you on this assignment.

Sincerely

TREK Geotechnical Inc.
Per:

Ryan Belbas, M.Sc., P.Eng.
Geotechnical Engineer
Tel: 204.975.9433 ext. 113

Revision History

Revision No.	Author	Issue Date	Description
0	RB	May 30, 2019	Geotechnical Report

Authorization Signatures

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Certificate of Authorization
Trek Geotechnical Inc.
May 30, 2019 No. 4877

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1.0 Introduction

This report provides geotechnical design recommendations prepared by TREK Geotechnical Inc. (TREK) for the City of Winnipeg Planning, Property, and Development Department (The City). The terms of reference for this work are included in our contract dated March 19, 2019. TREK's scope of work for the proposed garage includes a sub-surface investigation, laboratory testing, recommendations for the design and construction of foundations, and a hydrogeological assessment of groundwater levels in the bedrock aquifer.

2.0 Background Information

TREK understands that The City requires a building permit to construct a storage garage at 200 North Town Road. The garage will be a wood-framed structure with a footprint of 7.3 m by 7.3 m (24 ft by 24 ft). The foundation loads are not known at this time but are anticipated to be relatively light.

3.0 Existing Information

A conceptual grading plan was provided by The City indicating the approximate location of the garage. The information was reviewed by TREK and used in preparation of our recommendations provided in this report.

4.0 Key Geotechnical Considerations

Key considerations presented within this report include, but are not limited to, the following:

- A thickened-edge slab or cast-in-place concrete friction piles with a grade-supported floor slab are suitable foundation and floor slab alternatives for the proposed garage.
- Thickened-edge slabs and grade-supported floor slabs are subject to seasonal movements.
- Silt and fill are present at the site and should be removed for construction of thickened-edge slabs and grade-supported floor slabs

This section should not be relied upon for a complete understanding of design considerations, for which a review of the full report is required.

5.0 Field Program

5.1 Sub-surface Investigation

A sub-surface investigation was completed on May 7, 2019 under the supervision of TREK personnel to determine the soil stratigraphy and groundwater conditions at the site. One test hole (TH19-01) was drilled and sampled as part of the investigation at the location shown on Figure 01. The test hole was

drilled by Subterranean Ltd. using a Soilmec STM-20, truck-mounted, piling rig equipped with a 508 mm diameter auger.

Sub-surface soils encountered during drilling were visually classified based on the Unified Soil Classification System (USCS). Disturbed auger cutting samples were taken at regular intervals and undisturbed Shelby tube samples were obtained at select depth. All samples retrieved during drilling were transported to TREK's testing laboratory in Winnipeg, MB. Laboratory testing consisted of moisture content determination on all samples, bulk unit weight measurements and unconfined compression tests on Shelby tube samples, and water-soluble sulphate tests on select samples.

The test hole location (shown on Figure 01) was determined by handheld GPS. The test hole elevation was surveyed using a rod and level relative to a temporary benchmark (TBM1) assigned an arbitrary elevation of 100.0 m. The temporary benchmark selected for this project was the top nut of a fire hydrant on North Town Road northwest of the test hole as shown on Figure 01. A test hole log is attached and includes a description of the soil units encountered and other pertinent information such as groundwater and sloughing conditions and a summary of the laboratory testing results. Laboratory test results are included in Appendix A.

5.2 Stratigraphy

Brief descriptions of the soil units encountered at the test hole location is provided below. All interpretations of soil stratigraphy for the purposes of design should refer to the detailed information provided on the attached test hole log.

The soil stratigraphy at the test hole location, in descending order, consists of clay fill, silt, silty clay, and silt till. The clay fill is 0.3 m thick, moist, firm to stiff, high plastic, and contains trace organics and trace sand. The silt is 0.2 m thick and extends to the underlying silty clay at 0.5 m depth. It is clayey, moist, firm and low to intermediate plasticity. The silty clay is 12.3 m thick and is highly plastic, moist, and stiff becoming firm with depth. The silt till was encountered at a depth of 12.8 m below ground surface and extended to the depth of exploration at 14.0 m. The silt till contains some sand, trace clay, trace gravel, and trace cobbles. It is also dry and dense to very dense. Based on published information, the bedrock in the area consists of dolomite and limestone of the Fort Garry Member and is generally encountered at a depth of about 18 to 21 m below ground surface.

5.3 Auger Refusal

Power auger refusal was observed within silt till at 14.0 m below ground surface.

5.4 Groundwater Conditions

No seepage or sloughing was observed during drilling. The test hole was dry and open to 14.0 m depth immediately after completion of drilling.

These observations are short-term and should not be considered reflective of (static) groundwater levels at the site which would require monitoring over an extended period of time to determine. It is important

to recognize that groundwater conditions may vary seasonally, annually, or as a result of construction activities.

6.0 Foundation Recommendations

Suitable foundations to support the proposed garage include a thickened-edge slab and cast-in-place concrete friction piles based on the observed sub-surface conditions and anticipated foundation loading. Recommendations according to the 2010 version of the NBCC are provided in the following sections.

6.1 Limit States Design (NBCC, 2010)

Limit states design recommendations for shallow and deep foundations in accordance with the National Building Code of Canada (2010) are provided below. Limit states design requires consideration of distinct loading scenarios comparing the structural loads to the foundation bearing capacity using resistance and load factors that are based on reliability criteria. Two general design scenarios are evaluated corresponding to the serviceability and ultimate capacity requirements.

The **Ultimate Limit State (ULS)** is concerned with ensuring that the maximum structural loads do not exceed the nominal (ultimate) capacity of the foundation units. The ULS foundation bearing capacity is obtained by multiplying the nominal (ultimate) bearing capacity by a resistance factor (reduction factor), which is then compared to the factored (increased) structural loads. The ULS bearing capacity must be greater or equal to the maximum factored load to provide an adequate margin of safety. Table 1 summarizes the resistance factors that can be used for the design of deep foundations as per the NBCC (2010) depending upon the method of analysis and verification testing completed during construction.

The **Service Limit State (SLS)** is concerned with limiting deformation or settlement of the foundation under service loading conditions such that the integrity of the structure will not be impacted. The Service Limit State should generally be analysed by calculating the settlement resulting from applied service loads and comparing this to the settlement tolerance of the structure. However, the settlement tolerance of the structure is typically not yet defined at the preliminary design stage. As such, SLS bearing capacities are often provided that are developed on the basis of limiting settlement to 25 mm or less. A more detailed settlement analysis should be conducted to refine the estimated settlement and/or adjust the SLS capacity if a more stringent settlement tolerance is required or if large groups of piles are used.

Table 1. ULS Resistance Factors for Foundations (NBCC, 2010)

Resistance to Vertical Loads for Shallow Foundations (Analysis Methods)	ϕ
Semi-empirical analysis using laboratory and in-situ test data	0.5
Resistance to Axial Loads for Deep Foundations (Analysis Methods)	**ϕ**
Semi-empirical analysis using laboratory and in-situ test data	0.4
Uplift resistance by semi-empirical analysis	0.3

6.2 Thickened-Edge Slab

Provided some seasonal movement is acceptable, a thickened-edge slab bearing on undisturbed, stiff, silty clay is a suitable foundation alternative for the observed sub-surface conditions and the anticipated loads. This foundation type will derive a majority of its resistance at the bottom of the thickened-edges. Thickened-edge slabs can be designed using a SLS bearing resistance of 85 kPa and a factored ULS bearing resistance of 130 kPa. The unit bearing resistances are only applicable to the thickened edges. The SLS bearing resistance is based on limiting settlement to 25 mm or less and the factored ULS bearing resistance was calculated using a resistance factor of 0.5.

Shallow foundations in the Winnipeg area are subject to vertical movements associated with moisture and volume changes of the underlying silty clay soils. Although difficult to predict, these movements could be in the order of 25 mm or more. If these movements are considered unacceptable, a piled foundation will be required to support the proposed garage. It should be understood that these movements are independent of displacement required to mobilize bearing capacity.

The foundation soils at the site (*i.e.* clay and underlying silt) are also frost susceptible, which refers to the propensity of the soil to grow ice lenses and heave during freezing. Although difficult to predict, these movements could be in the order of 25 mm or more. These movements are independent of displacement required to mobilize bearing capacity. If these movements are considered unacceptable, insulation such as Styrofoam Highload could be incorporated into the design of the thickened-edge slab to provide frost protection to an equivalent depth of 2.4 m for protection against seasonal frost related (*i.e.* freeze/thaw) movements. An insulation manufacturer / supplier should be contacted to verify the insulation design. It is important that thickened-edges are not placed on a frozen bearing surface during construction. Alternatively, thickened edges could be designed to extend below the depth of frost penetration (2.4 m) or a piled foundation with a grade-supported floor slab could be used.

Additional Design Recommendations:

1. Thickened edges should have a minimum width of 0.6 m. The Manitoba Building Code or NBCC may require a larger minimum thickened edge width, which should be verified by the structural engineer/designer.
2. The thickened-edge slab should be designed by a qualified structural engineer to resist all vertical (compressive and uplift), lateral and eccentric loading conditions.
3. Sliding is not expected to be a concern for design; however, Limit States Design values can be provided if necessary, once lateral and eccentric loads are known.
4. To minimize changes in moisture levels and potential volumetric changes within the bearing soils, water discharge from roof leaders and run-off should be directed away from the structure.
5. A filter-protected drainage system (weeping tile) should be installed around the perimeter of the thickened-edge slab and connected to a collection (sump) pit and pumped away from the structure to reduce water infiltration into the bearing soils and minimize slab movements associated with swelling of the underlying silty clay soils.

Additional Construction Recommendations:

1. All organics, fill soils, silt, debris, and any other deleterious material should be completely removed such that the bearing surface for the thickened edges and slab consists of undisturbed, stiff, silty clay. If silt is present at the bearing surface it should be removed in its entirety.
2. Excavations for thickened-edges and the slab should be completed by an excavator equipped with a smooth-bladed bucket operating from the edge of the excavation. The contractor should work carefully to prevent disturbance to the bearing surface at all times.
3. After excavation, the bearing surface should be inspected by TREK personnel. Soft areas identified should be repaired as per directions provided by TREK. This will likely consist of over-excavation of the bearing surface to remove the soft areas.
4. Granular fill can be used to level or raise the bearing surfaces. Granular fill should consist of granular base course (20 mm down crushed limestone) in accordance with the City of Winnipeg Specification No. CW 3110. The granular fill should be placed in lifts no greater than 150 mm and compacted to 100% of the Standard Proctor Maximum Dry Density (SPMDD).
5. The bearing surface should be protected from freezing, drying, or inundation with water at all times. If any of these conditions occur, the disturbed zone must be over-excavated and such that the bearing surface consists of undisturbed, stiff, silty clay.
6. Recommendations for construction of the grade-supported floor slab between the thickened edges are provided in Section 7.0.
7. Non-frost susceptible soils (clean, granular fill) should be used to backfill around the outside of the thickened-edge slab. The fill should be placed in lifts nor greater than 150 mm and compacted to 98% of the SPMDD.

6.3 Friction Piles

Cast-in-place concrete (CIPC) friction piles are a suitable foundation alternative for the observed sub-surface conditions and anticipated loads. This pile type will derive a majority of its resistance in shaft friction (adhesion) with a relatively small contribution from end bearing. Table 2 provides the recommended axial (compressive and uplift) unit resistances for shaft adhesion and end bearing. Piles designed based on the SLS resistances are expected to exhibit less than 10 mm of settlement at the pile toe.

Table 1. Factored ULS and SLS Resistances for CIPC Friction Piles

Pile Depth Below Existing Site Grade (m approx.)	SLS Unit Resistance (kPa)	Factored ULS Unit Resistance (kPa)		
		Compression $\phi = 0.4$		Uplift $\phi = 0.3$
		Shaft Adhesion	End Bearing[1]	Shaft Adhesion
0 to X[2]	0	0	0	0
X to 11	15.0	15.0	110	11

1. *For piles with a diameter of less than 1.0 m. If larger pile diameters are required TREK should be contacted to provide revised end bearing values.*
2. *X=1.5 m for interior piles or piles not be subjected to freezing conditions. For perimeter piles in heated structures or piles subject to freezing conditions X=2.4 m.*

Additional Design Recommendations:

1. The weight of the embedded portion of the pile may be neglected.
2. Piles should be designed with a maximum depth of 11 m below existing site grade to avoid penetration into the underlying silt till and to protect against heaving at the base of the pile hole. In the event the silt till is encountered at a shallower depth, the pile design may have to be re-evaluated by the structural engineer.
3. For piles supporting heated structures (excluding perimeter piles), shaft adhesion in compression and uplift within the upper 1.5 m below final grade should be neglected. For piles subjected to freezing conditions or perimeter piles in heated structures, shaft adhesion in compression and uplift within the upper 2.4 m below final grade should be neglected.
4. Piles should have a minimum spacing of 3 pile diameters measured centre to centre. If a closer spacing is required, TREK should be contacted to provide an efficiency (reduction) factor to account for potential group effects.
5. Piles require steel reinforcement designed by a qualified structural engineer for the anticipated axial (compression and tension), lateral and bending loads induced from the structure. Piles subject to frost jacking forces should be reinforced for their entire length.

Additional Installation Recommendations:

1. Temporary steel casings (sleeves) should be available and used if sloughing of the pile hole occurs and/or to control groundwater seepage, if encountered. Care should be taken in removing sleeves to prevent sloughing (necking) of the pile hole walls and a reduction in the cross-sectional area of the pile.
2. Concrete should be placed in one continuous operation immediately after the completion of drilling the pile hole to avoid potential construction problems such as sloughing or caving of the pile hole and groundwater seepage. Concrete placed by free-fall methods should be poured under dry conditions. If groundwater is encountered, it should be controlled or removed. If water cannot be controlled or removed, the concrete should be placed using tremie methods.
3. Concrete placed by free-fall methods should be directed through the middle of the pile hole and steel reinforcing cage to prevent striking of the pile hole walls to protect against soil contamination of the concrete.

6.3.1 Lateral Capacity

Lateral capacity is not expected to be a concern for design; however, limit states design values can be provided if necessary, once lateral loads are known.

6.4 Ad-freezing Effects

Concrete piles, pile caps, and thickened-edge slabs subjected to freezing conditions should be designed to resist ad-freeze and uplift forces related to frost action acting along the vertical face of the member within the depth of frost penetration (2.4 m). In this regard, concrete piles, pile caps, and thickened-edge slabs may be subject to an ad-freeze bond stress of 65 kPa within the depth of frost penetration.

Ad-freeze forces will be resisted by structural dead loads and, for piles, uplift resistance provided by the length of pile below the depth of frost penetration. The following design recommendations apply to piles and thickened-edge slabs subject to ad-freeze forces:

1. An ad-freeze bond stress of 65 kPa within the depth of frost penetration.
2. Resistance to ad-freezing within the depth of frost penetration should be neglected.
3. A load factor (α) of 1.2 may be used in the calculation of ad-freezing forces.
4. A reduction factor of 0.8 may be used in calculation of the geotechnical resistance for the factored ULS condition. For piles, an ultimate (nominal) uplift resistance of 37.5 kPa below 2.5 m depth can be used for design.
5. The calculated geotechnical resistance plus the structural dead loads must be greater than the factored ad-freezing forces.
6. Piles should have a minimum embedment of 8.0 m or as calculated by the method above, whichever is greater.
7. Measures such as flat lying rigid polystyrene insulation could be considered to reduce frost penetration depths and thereby ad-freezing and uplift forces.

6.5 Pile Caps and Grade Beams

A minimum void of 150 mm should be provided underneath all pile caps and grade beams to minimize uplift pressures acting on the underside of the pile cap or grade beam as a result of swelling or frost action. Void forms should be selected such that they can deform a minimum of 150 mm with minimal stress transfer to the structure. Excavations for pile caps and grade beams should be backfilled with granular fill compacted to a minimum of 95% of the SPMDD.

7.0 Grade-Supported Floor Slabs

Movement and cracking of grade-supported slabs should be expected due to seasonal movements associated with moisture and volume changes of the underlying silty clay. Although difficult to predict, these movements could be in the order of 25 mm or more. Slabs in unheated areas will be subject to additional movements from freeze/thaw of the sub-grade soils.

Additional Recommendations:

1. All organics, fill soils, silt, debris, and any other deleterious material should be completely removed such that the sub-grade consists of undisturbed, stiff, silty clay. If silt is present at the sub-grade it should be removed in its entirety.
2. Stripping for grade-supported slabs should be completed by an excavator equipped with a smooth-bladed bucket operating from the edge of the sub-grade. The contractor should work carefully to minimize disturbance to the sub-grade at all times.
3. After excavation, the sub-grade should be inspected by TREK personnel (proof roll inspected if accessible). Soft areas identified should be repaired as per directions provided by TREK. This will likely consist of over-excavation of the sub-grade by an additional 300 mm and backfilling with a

50 mm down granular fill placed in lifts no greater than 150 mm and compacted to a minimum of 95% of the SPMDD.

4. The sub-grade should be protected from freezing, drying, or inundation with water at all times. If any of these conditions occur, the disturbed zone must be over-excavated and such that the sub-grade consists of undisturbed, stiff, silty clay.
5. In heated areas, the concrete slabs should be placed on a 150 mm thick granular sub-base layer consisting of 50 mm down, durable, crushed rock underlying a 150 mm thick base layer consisting of 20 mm down, durable, crushed rock. In unheated areas, the thickness of the sub-base layer should be increased to 250 mm. The granular should be placed in lifts no greater than 150 mm and compacted to 98% of the SPMDD.
6. A vapour barrier should be placed above sub-grade and beneath the floor slab to minimize moisture changes within the sub-grade soils

8.0 Foundation Concrete

All foundation concrete should be designed by a qualified structural engineer for the anticipated axial (compression and uplift), lateral, and bending loads from the structure. Based on local experience gathered through previous work in Winnipeg, the degree of exposure for concrete subjected to sulphate attack is classified as severe according to Table 3, CSA A23.1-14 (Concrete Materials and Methods of Concrete Construction). Accordingly, all concrete in contact with the native soil should be made with high sulphate-resistant cement (HS or HSb). Furthermore, the concrete should have a minimum specified 56-day compressive strength of 32 MPa and have a maximum water to cement ratio of 0.45 in accordance with Table 2, CSA A23.1-14 for concrete with severe sulphate exposure (S2). Concrete that may be exposed to freezing and thawing should be adequately air entrained to improve freeze-thaw durability in accordance with Table 4, CSA A23.1-14.

9.0 Hydrogeological Assessment

Groundwater seepage is commonly encountered within near surface silt layers and confined aquifers within the bedrock. Relative to construction at this site, any seepage from the near surface silt layer (if present) can typically be handled with standard construction dewatering techniques (sump pits and pumping). The deeper groundwater within the limestone bedrock is not anticipated to have impacts on this project as significant excavation is not anticipated. Seepage into holes during drilling can cause complications for piling, however, based on the depth to till at this location this is not anticipated to be a significant concern at this location.

The review of the available groundwater information indicates that the surface elevation at the site is approximately 233 meters. The review of the provincial groundwater level monitoring records indicates that the piezometric head in the bedrock has ranged ranges from 223 to 228 meters with a historic high of approximately 228 meters, or approximately 5 meters below grade. Therefore, it is reasonable to expect that any foundations less than 5 meters in depth will not encounter issues with bedrock groundwater. Deeper excavations may encounter problems with bedrock groundwater pressure and would need to be reviewed in more detail based on the proposed design.

10.0 Site Drainage

Positive site drainage around the perimeter of the structure should be provided at a gradient of at least 2%. A minimum gradient of about 2% should be used for both landscaped and paved areas and maintained throughout the life of the structures.

11.0 Inspection Requirements

In accordance with Section *4.2.2.3 Field Review* of the NBCC (2010), the designer or other suitably qualified person shall carry out a field review on:

1. a continuous basis during:
    i. the construction of all deep foundation units with all pertinent information recorded for each foundation unit,
    ii. the installation and removal of retaining structures and related backfilling operations, and
    iii. during the placement of engineered fills that are to be used to support the foundation units.
2. on an as-required basis for the construction of shallow foundation units and in excavating, dewatering and other related works.

12.0 Closure

The geotechnical information provided in this report is in accordance with current engineering principles and practices (Standard of Practice). The findings of this report were based on information provided (field investigation and laboratory testing). Soil conditions are natural deposits that can be highly variable across a site. If subsurface conditions are different than the conditions previously encountered on-site or those presented here, we should be notified to adjust our findings if necessary.

All information provided in this report is subject to our standard terms and conditions for engineering services, a copy of which is provided to each of our clients with the original scope of work or standard engineering services agreement. If these conditions are not attached, and you are not already in possession of such terms and conditions, contact our office and you will be promptly provided with a copy.

This report has been prepared by TREK Geotechnical Inc. (the Consultant) for the exclusive use of The City of Winnipeg Planning, Property, and Development Department. (the Client) and their agents for the work product presented in the report. Any findings or recommendations provided in this report are not to be used or relied upon by any third parties, except as agreed to in writing by the Client and Consultant prior to use.

Figure

LOCATION PLAN
SCALE : N.T.S.

LEGEND:

- TEST HOLE (TREK, MAY, 2019)
- TEMPORARY BENCHMARK TBM1

NOTES:

1. TEMPORARY BENCHMARK (TBM1) LOCATED ON TOP NUT OF FIRE HYDRANT
2. AERIAL IMAGE FROM CITY OF WINNIPEG 2016.

0 5 10 15 20 25 m
SCALE = 1 : 500 (216 mm x 279 mm)

Figure 01
TEST HOLE LOCATION PLAN

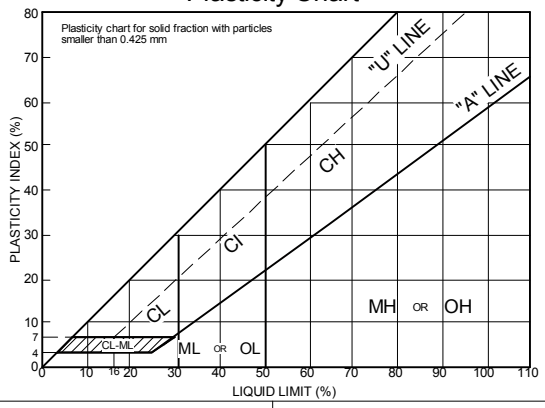
Test Hole Log

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
2. Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
3. When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions			USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	Clean gravel (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP; More than 12 percent..... GM, GC, SM, SC; 6 to 12 percent..... Borderline case4s requiring dual symbols*
			GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
		Gravel with fines (Appreciable amount of fines)	GM		Silty gravels, gravel-sand-silt mixtures	Not meeting all gradation requirements for GW
			GC		Clayey gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures	
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	Plasticity Chart
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL		Organic silts and organic silty clays of low plasticity	
	Silts and Clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts	
			CH		Inorganic clays of high plasticity, fat clays	
			OH		Organic clays of medium to high plasticity, organic silts	
	Highly Organic Soils		Pt		Peat and other highly organic soils	Von Post Classification Limit: Strong colour or odour, and often fibrous texture



Particle Size			Material
ASTM Sieve sizes	mm		
#10 to #4	2.00 to 4.75		Sand
#40 to #10	0.425 to 2.00		Coarse
#200 to #40	0.075 to 0.425		Medium
< #200	< 0.075		Fine
			Silt or Clay

Particle Size			Material
ASTM Sieve Sizes	mm		
> 12 in.	> 300		Boulders
3 in. to 12 in.	75 to 300		Cobbles
3/4 in. to 3 in.	19 to 75		Gravel
#4 to 3/4 in.	4.75 to 19		Coarse
			Fine

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

EXPLANATION OF FIELD AND LABORATORY TESTING

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)
PL - Plastic Limit (%)
PI - Plasticity Index (%)
MC - Moisture Content (%)
SPT - Standard Penetration Test
RQD - Rock Quality Designation
Qu - Unconfined Compression
Su - Undrained Shear Strength
VW - Vibrating Wire Piezometer
SI - Slope Inclinometer

▽ Water Level at Time of Drilling

▼ Water Level at End of Drilling

▼ Water Level After Drilling as Indicated on Test Hole Logs

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	Undrained Shear Strength (kPa)
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200

Sub-Surface Log

Test Hole TH19-01

Client:	City of Winnipeg	**Project Number:**	0015-032-00
Project Name:	Waverley West Garage	**Location:**	UTM N-5517889, E-630193
Contractor:	Subterranean Ltd.	**Ground Elevation:**	99.10 m
Method:	508 mm Auger, Soilmec STM-20 Truck Mount	**Date Drilled:**	May 7, 2019

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
98.8	0.0		CLAY (FILL) - silty, trace gravel, trace organics, trace rootlets, black, moist, firm to stiff, high plasticity		G01
98.6	0.2		SILT - clayey, light brown, frozen to 1.5 m, moist and firm when thawed, intermediate plasticity		G02
	0.5		CLAY - silty, trace silt inclusions (<15 mm diam.) - brown and grey - moist, stiff - high plasticity		
	1.5				G03
	2.5				T04
	2.7		- trace sand inclusions below 2.7 m		G05
	4.5				T06
	5.5		- grey, firm below 5.5 m		G07
	7.5				G08

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa)

Test Type: △ Torvane △ | ✤ Pocket Pen. ✤ | ☒ Qu ☒ | ○ Field Vane ○

0 50 100 150 200 250

Logged By: Micha Roemer **Reviewed By:** Kent Bannister **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-05-29 WAVERLEY WEST GARAGE 0_E_MR 0015-032-00.GPJ TREK GEOTECHNICAL.GDT 5/29/19

Sub-Surface Log

Test Hole TH19-01
2 of 2

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
	8.5				
	9.0				
	9.5				T09
	10.0				
	10.5				G10
	11.0				
	11.5		- trace silt (till) inclusions (<75 mm diam.) below 11.3 m		
	12.0				G11
	12.5				T12
86.3					
	13.0		SILT (TILL) - some sand, trace clay, trace gravel, trace cobbles - light grey - dry to moist, dense to very dense - non-plastic		G13
	13.5				G14
85.1	14.0				G15

Bulk Unit Wt (kN/m^3): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL

0 20 40 60 80 100

Undrained Shear Strength (kPa)

Test Type
△ Torvane △
✤ Pocket Pen. ✤
☒ Qu ☒
○ Field Vane ○

0 50 100 150 200 250

END OF TEST HOLE AT 14.0 m IN SILT (TILL)

Notes:
1) Power auger refusal at 14.0 m depth.
2) No seepage or sloughing observed.
3) Test hole open to 14.0 m and dry immediately after completion of drilling.
4) Test hole backfilled with auger cuttings to ground surface.
5) Temporary benchmark (TBM) is assumed elevation 100.00 m (local datum). TBM is top of the fire hydrant along North Town Road northwest of the test hole location.

Logged By: Micha Roemer **Reviewed By:** Kent Bannister **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-05-29 WAVERLEY WEST GARAGE 0_E_MR 0015-032-00.GPJ TREK GEOTECHNICAL.GDT 5/29/19

Appendix A

Laboratory Testing Results

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Moisture Content Report
ASTM D2216-10

Project No. 0015-032-00
Client City of Winnipeg
Project Waverley West Garage

Sample Date 7-May-19
Test Date 8-May-19
Technician SA

Test Hole	TH19-01	TH19-01	TH19-01	TH19-01	TH19-01	TH19-01
Depth (m)	0.0 - 0.2	0.3 - 0.5	1.4 - 1.5	2.9 - 3.0	5.9 - 6.1	7.5 - 7.6
Sample #	G01	G02	G03	G05	G07	G08
Tare ID	Z63	AA20	P33	AC38	N03	AB28
Mass of tare	8.6	6.7	8.5	6.7	8.6	6.8
Mass wet + tare	191.7	159.8	184.9	157.6	158.9	157.9
Mass dry + tare	155.6	122.7	131.0	101.9	110.2	109.5
Mass water	36.1	37.1	53.9	55.7	48.7	48.4
Mass dry soil	147.0	116.0	122.5	95.2	101.6	102.7
Moisture %	24.6%	32.0%	44.0%	58.5%	47.9%	47.1%

Test Hole	TH19-01	TH19-01	TH19-01	TH19-01	TH19-01	TH19-01
Depth (m)	10.5 - 10.7	12.0 - 12.2	12.8 - 13.0	13.3 - 13.4	13.9 - 14.0	12.2 - 12.8
Sample #	G10	G11	G13	G14	G15	T12
Tare ID	W72	F54	W19	AC24	AC27	H15
Mass of tare	8.6	8.5	8.8	6.7	6.7	8.7
Mass wet + tare	151.2	216.5	184.9	182.3	337.2	357.7
Mass dry + tare	96.1	163.8	172.5	173.9	316.9	278.6
Mass water	55.1	52.7	12.4	8.4	20.3	79.1
Mass dry soil	87.5	155.3	163.7	167.2	310.2	269.9
Moisture %	63.0%	33.9%	7.6%	5.0%	6.5%	29.3%

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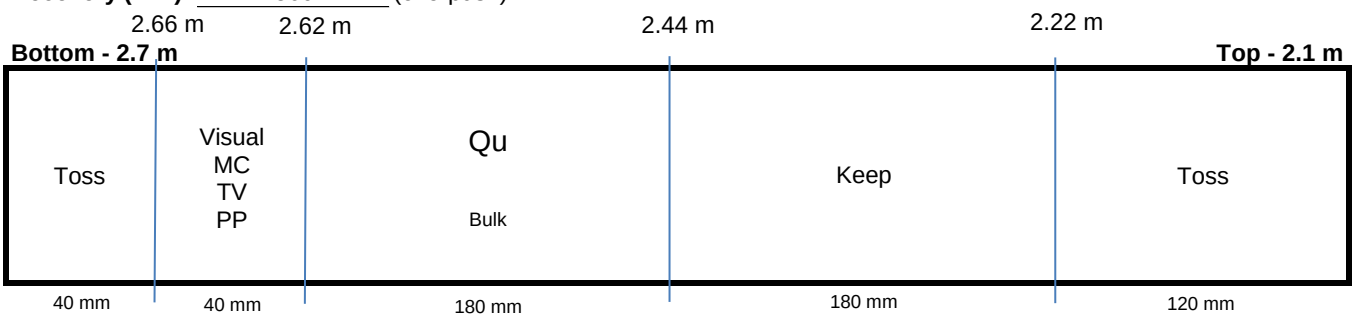
Shelby Tube Visual

Project No.	0015-032-00
Client	City of Winnipeg
Project	Waverley West Garage
Test Hole	TH19-01
Sample #	T04
Depth (m)	2.1 - 2.7
Sample Date	7-May-19
Test Date	8-May-19
Technician	SA

Tube Extraction

Recovery (mm) 560 (overpush)



Visual Classification

Material	CLAY
Composition	silty
trace precipitates (sulphate)	
trace oxidization	
Color	mottled grey and brown
Moisture	moist
Consistency	firm to stiff
Plasticity	high plasticity
Structure	laminated silt and clay (<2 mm thick)
Gradation	

Torvane

Reading	0.55
Vane Size (s,m,l)	m
Undrained Shear Strength (kPa)	53.9

Pocket Penetrometer

Reading	**1**	1.10
	2	1.00
	3	1.00
	Average	1.03
Undrained Shear Strength (kPa)		50.7

Moisture Content

Tare ID	K34
Mass tare (g)	8.7
Mass wet + tare (g)	242.6
Mass dry + tare (g)	158.2
Moisture %	56.5%

Unit Weight

Bulk Weight (g)		1092.9
Length (mm)	**1**	153.58
	2	154.29
	3	154.35
	4	153.68
Average Length (m)		0.154
Diam. (mm)	**1**	71.64
	2	71.04
	3	70.74
	4	71.50
Average Diameter (m)		0.071
Volume (m^3)		6.14E-04
Bulk Unit Weight (kN/m^3)		17.5
Bulk Unit Weight (pcf)		111.2
Dry Unit Weight (kN/m^3)		11.2
Dry Unit Weight (pcf)		71.1

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Unconfined Compressive Strength

ASTM D2166

Project No.	0015-032-00
Client	City of Winnipeg
Project	Waverley West Garage
Test Hole	TH19-01
Sample #	T04
Depth (m)	2.1 - 2.7
Sample Date	7-May-19
Test Date	8-May-19
Technician	SA

Unconfined Strength

	kPa	ksf
Max q_u	39.7	0.8
Max S_u	19.9	0.4

Specimen Data

Description CLAY - silty, trace precipitates (sulphate), trace oxidization , mottled grey and brown, moist, firm to stiff, high plasticity, laminated silt and clay (<2 mm thick)

Length	154.0	(mm)	**Moisture %**	56%	
Diameter	71.2	(mm)	**Bulk Unit Wt.**	17.5	(kN/m^3)
L/D Ratio	2.2		**Dry Unit Wt.**	11.2	(kN/m^3)
Initial Area	0.00398	(m^2)	**Liquid Limit**	-	
Load Rate	1.00	(%/min)	**Plastic Limit**	-	
			Plasticity Index	-	

Undrained Shear Strength Tests

Torvane

trace precipita	**Undrained Shear Strength**	
tsf	**kPa**	**ksf**
0.55	53.9	1.13

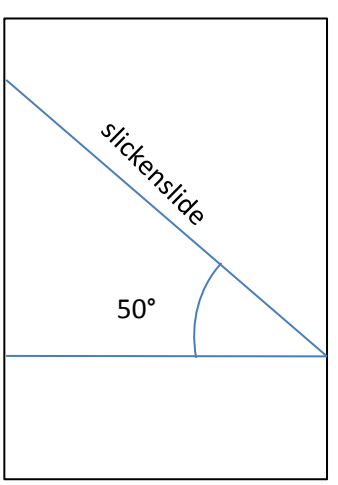
Vane Size
m

Pocket Penetrometer

	Reading	**Undrained Shear Strength**	
	tsf	**kPa**	**ksf**
	1.10	54.0	1.13
	1.00	49.1	1.02
	1.00	49.1	1.02
Average	**1.03**	**50.7**	**1.06**

Failure Geometry

Sketch:



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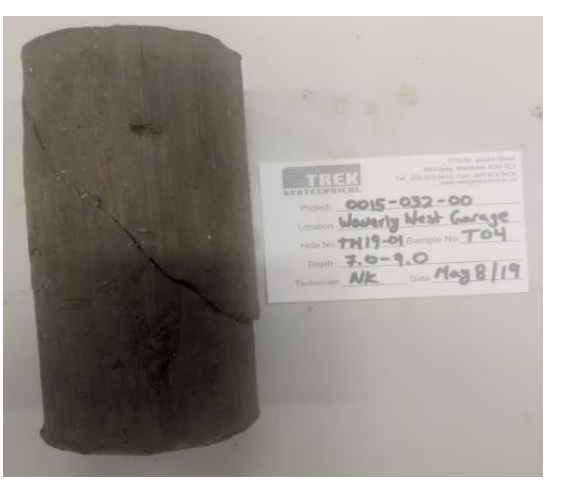

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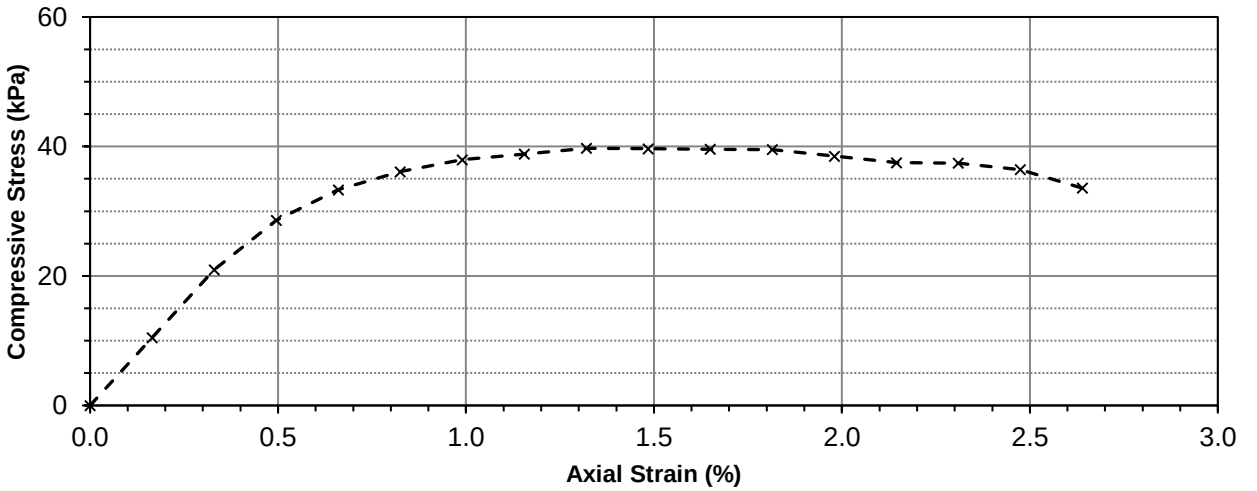
Unconfined Compressive Strength

ASTM D2166

Project No. 0015-032-00
Client City of Winnipeg
Project Waverley West Garage

Unconfined Compression Test Graph



Unconfined Compression Test Data

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
0	0	0.0000	0.00	0.003985	0.0	0.00	0.00
10	11	0.2540	0.16	0.003991	41.7	10.45	5.22
20	22	0.5080	0.33	0.003998	83.8	20.96	10.48
30	30	0.7620	0.49	0.004005	114.4	28.58	14.29
40	35	1.0160	0.66	0.004011	133.6	33.30	16.65
50	38	1.2700	0.82	0.004018	145.1	36.10	18.05
60	40	1.5240	0.99	0.004025	152.7	37.95	18.97
70	41	1.7780	1.15	0.004031	156.5	38.83	19.42
80	42	2.0320	1.32	0.004038	160.4	39.71	19.86
90	42	2.2860	1.48	0.004045	160.4	39.65	19.82
100	42	2.5400	1.65	0.004052	160.4	39.58	19.79
110	42	2.7940	1.81	0.004059	160.4	39.52	19.76
120	41	3.0480	1.98	0.004065	156.5	38.51	19.25
130	40	3.3020	2.14	0.004072	152.7	37.50	18.75
140	40	3.5560	2.31	0.004079	152.7	37.44	18.72
150	39	3.8100	2.47	0.004086	148.9	36.44	18.22
160	36	4.0640	2.64	0.004093	137.4	33.57	16.79

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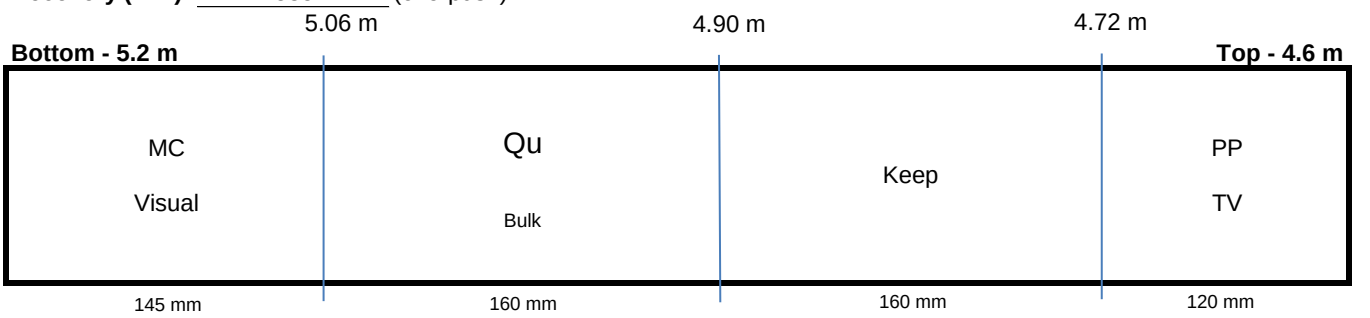
Shelby Tube Visual

Project No.	0015-032-00
Client	City of Winnipeg
Project	Waverley West Garage
Test Hole	TH19-01
Sample #	T06
Depth (m)	4.6 - 5.2
Sample Date	7-May-19
Test Date	8-May-19
Technician	SA

Tube Extraction

Recovery (mm) 585 (overpush)



Visual Classification

Material	CLAY
Composition	silty
trace sand	
silt inclusions (<10 mm diam.)	
Color	brown
Moisture	moist
Consistency	firm to stiff
Plasticity	high plasticity
Structure	homogeneous
Gradation	

Torvane

Reading	0.52
Vane Size (s,m,l)	m
Undrained Shear Strength (kPa)	51.0

Pocket Penetrometer

Reading	**1**	0.90
	2	1.10
	3	1.00
	Average	1.00
Undrained Shear Strength (kPa)		49.0

Moisture Content

Tare ID	AB06
Mass tare (g)	7.0
Mass wet + tare (g)	300.4
Mass dry + tare (g)	197.4
Moisture %	54.1%

Unit Weight

Bulk Weight (g)		1055.8
Length (mm)	**1**	147.24
	2	147.09
	3	146.03
	4	146.57
Average Length (m)		0.147
Diam. (mm)	**1**	71.97
	2	71.43
	3	72.42
	4	72.78
Average Diameter (m)		0.072
Volume (m^3)		6.00E-04
Bulk Unit Weight (kN/m^3)		17.3
Bulk Unit Weight (pcf)		109.9
Dry Unit Weight (kN/m^3)		11.2
Dry Unit Weight (pcf)		71.3

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Unconfined Compressive Strength

ASTM D2166

Project No.	0015-032-00
Client	City of Winnipeg
Project	Waverley West Garage
Test Hole	TH19-01
Sample #	T06
Depth (m)	4.6 - 5.2
Sample Date	7-May-19
Test Date	8-May-19
Technician	SA

Unconfined Strength

	kPa	ksf
Max q_u	104.7	2.2
Max S_u	52.3	1.1

Specimen Data

Description CLAY - silty, trace sand, silt inclusions (<10 mm diam.), brown, moist, firm to stiff, high plasticity, homogeneous

Length	146.7	(mm)	**Moisture %**	54%	
Diameter	72.2	(mm)	**Bulk Unit Wt.**	17.3	(kN/m^3)
L/D Ratio	2.0		**Dry Unit Wt.**	11.2	(kN/m^3)
Initial Area	0.00409	(m^2)	**Liquid Limit**	-	
Load Rate	1.00	(%/min)	**Plastic Limit**	-	
			Plasticity Index	-	

Undrained Shear Strength Tests

Torvane

Reading	Undrained Shear Strength	
tsf	**kPa**	**ksf**
0.52	51.0	1.07

Vane Size
m

Pocket Penetrometer

	Reading	Undrained Shear Strength	
	tsf	**kPa**	**ksf**
	0.90	44.1	0.92
	1.10	54.0	1.13
	1.00	49.1	1.02
Average	**1.00**	**49.1**	**1.02**

Failure Geometry

Sketch:

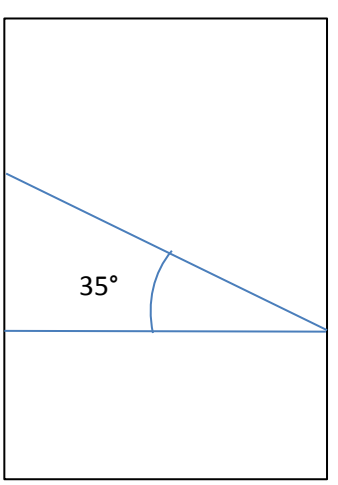

Photo:

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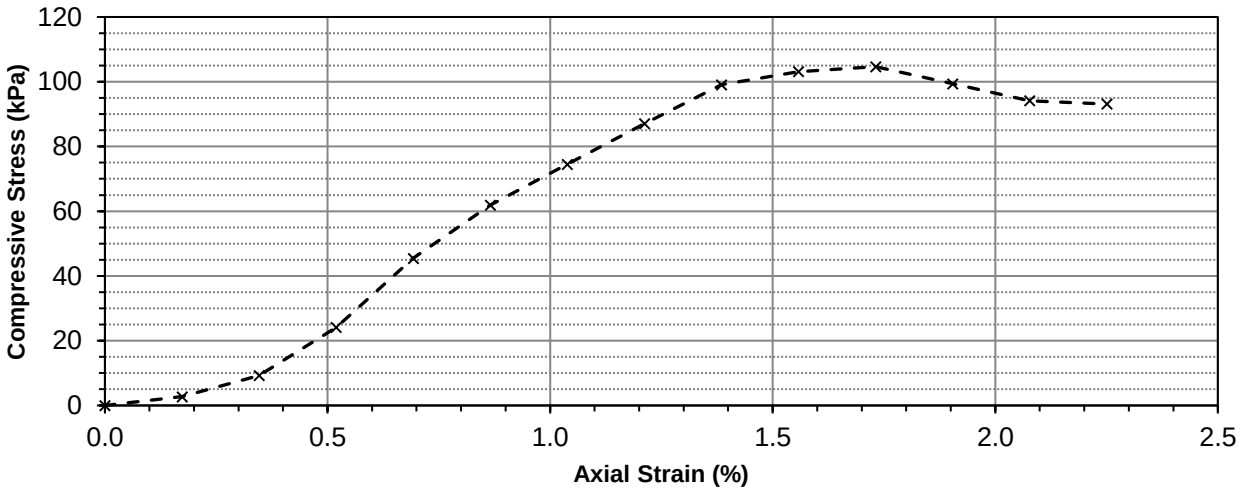
Unconfined Compressive Strength

ASTM D2166

Project No. 0015-032-00
Client City of Winnipeg
Project Waverley West Garage

Unconfined Compression Test Graph



Unconfined Compression Test Data

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
0	0	0.0000	0.00	0.004088	0.0	0.00	0.00
10	3	0.2540	0.17	0.004096	11.1	2.71	1.35
20	10	0.5080	0.35	0.004103	37.9	9.23	4.62
30	26	0.7620	0.52	0.004110	99.1	24.12	12.06
40	49	1.0160	0.69	0.004117	187.2	45.46	22.73
50	67	1.2700	0.87	0.004124	255.2	61.88	30.94
60	81	1.5240	1.04	0.004131	307.8	74.51	37.26
70	95	1.7780	1.21	0.004139	360.2	87.03	43.52
80	109	2.0320	1.38	0.004146	410.7	99.06	49.53
90	114	2.2860	1.56	0.004153	428.3	103.14	51.57
100	116	2.5400	1.73	0.004161	435.4	104.65	52.33
110	110	2.7940	1.90	0.004168	414.2	99.38	49.69
120	104	3.0480	2.08	0.004175	393.0	94.13	47.07
130	103	3.3020	2.25	0.004183	389.5	93.12	46.56

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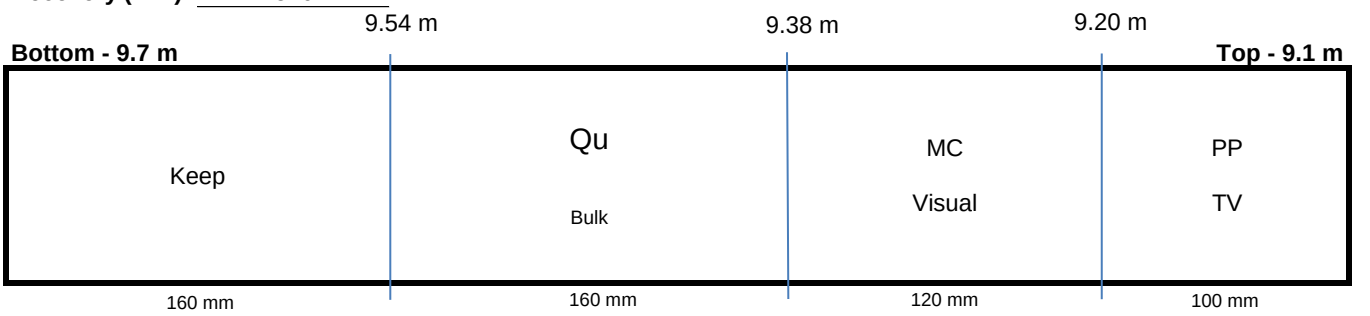
Shelby Tube Visual

Project No.	0015-032-00
Client	City of Winnipeg
Project	Waverley West Garage
Test Hole	TH19-01
Sample #	T09
Depth (m)	9.1 - 9.8
Sample Date	7-May-19
Test Date	8-May-19
Technician	SA

Tube Extraction

Recovery (mm) 540



Visual Classification

Material	CLAY
Composition	silty

silt inclusions (<15 mm diam.)

trace gravel (<10 mm diam.)

Color	grey
Moisture	moist
Consistency	firm
Plasticity	high plasticity
Structure	homogeneous
Gradation	

Torvane

Reading	0.35
Vane Size (s,m,l)	m
Undrained Shear Strength (kPa)	34.3

Pocket Penetrometer

Reading	**1**	0.60
	2	0.60
	3	0.50
	Average	0.57
Undrained Shear Strength (kPa)		27.8

Moisture Content

Tare ID	P31
Mass tare (g)	8.6
Mass wet + tare (g)	173.7
Mass dry + tare (g)	121.8
Moisture %	45.8%

Unit Weight

Bulk Weight (g)		1085.4
Length (mm)	**1**	148.30
	2	148.56
	3	148.47
	4	148.86
Average Length (m)		0.149
Diam. (mm)	**1**	73.07
	2	72.32
	3	72.58
	4	72.68
Average Diameter (m)		0.073
Volume (m^3)		6.16E-04
Bulk Unit Weight (kN/m^3)		17.3
Bulk Unit Weight (pcf)		110.0
Dry Unit Weight (kN/m^3)		11.8
Dry Unit Weight (pcf)		75.4

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Unconfined Compressive Strength

ASTM D2166

Project No.	0015-032-00
Client	City of Winnipeg
Project	Waverley West Garage
Test Hole	TH19-01
Sample #	T09
Depth (m)	9.1 - 9.8
Sample Date	7-May-19
Test Date	8-May-19
Technician	SA

Unconfined Strength

	kPa	ksf
Max q_u	95.7	2.0
Max S_u	47.8	1.0

Specimen Data

Description CLAY - silty, silt inclusions (<15 mm diam.), trace gravel (<10 mm diam.), grey, moist, firm, high plasticity, homogeneous

Length	148.5	(mm)	**Moisture %**	46%	
Diameter	72.7	(mm)	**Bulk Unit Wt.**	17.3	(kN/m^3)
L/D Ratio	2.0		**Dry Unit Wt.**	11.8	(kN/m^3)
Initial Area	0.00415	(m^2)	**Liquid Limit**	-	
Load Rate	1.00	(%/min)	**Plastic Limit**	-	
			Plasticity Index	-	

Undrained Shear Strength Tests

Torvane

Reading	Undrained Shear Strength	
tsf	**kPa**	**ksf**
0.35	34.3	0.72

Vane Size
m

Pocket Penetrometer

	Reading	Undrained Shear Strength	
	tsf	**kPa**	**ksf**
	0.60	29.4	0.61
	0.60	29.4	0.61
	0.50	24.5	0.51
Average	**0.57**	**27.8**	**0.58**

Failure Geometry

Sketch:

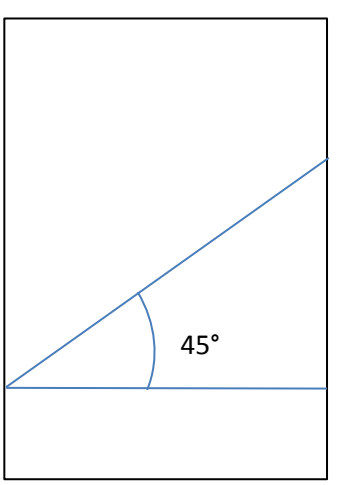


Photo:

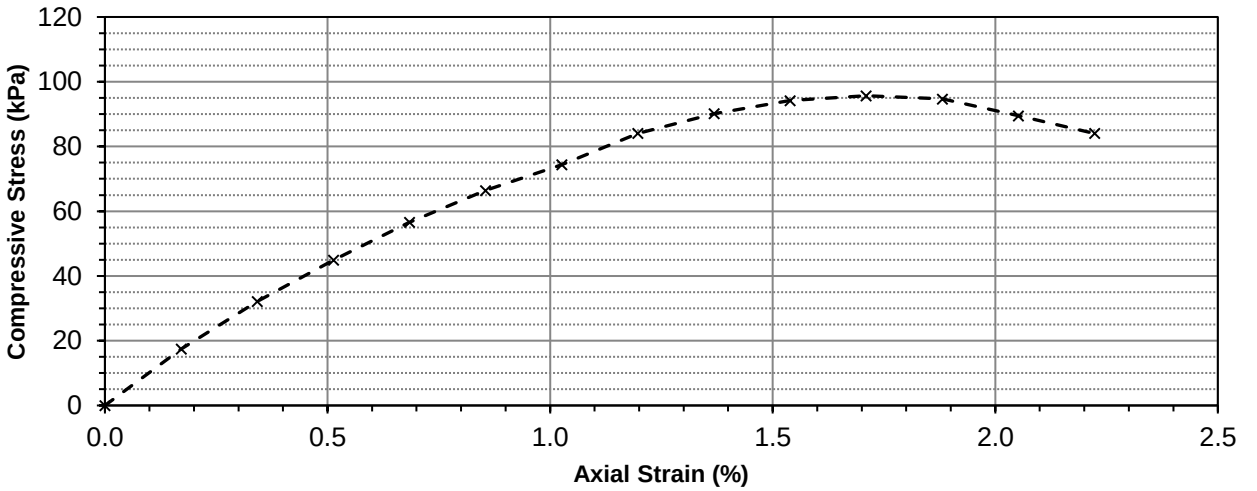
www.trekgeotechnical.ca
1712 St. James Street
Winnipeg, MB R3H 0L3
Tel: 204.975.9433 Fax: 204.975.9435

Unconfined Compressive Strength

ASTM D2166

Project No. 0015-032-00
Client City of Winnipeg
Project Waverley West Garage

Unconfined Compression Test Graph



Unconfined Compression Test Data

Deformation Dial Reading	Load Ring Dial Reading	Deflection (mm)	Axial Strain (%)	Corrected Area (m^2)	Axial Load (N)	Compressive Stress, q_u (kPa)	Shear Stress, S_u (kPa)
0	0	0.0000	0.00	0.004147	0.0	0.00	0.00
10	19	0.2540	0.17	0.004154	72.3	17.41	8.71
20	35	0.5080	0.34	0.004161	133.6	32.10	16.05
30	49	0.7620	0.51	0.004168	187.2	44.91	22.45
40	62	1.0160	0.68	0.004175	236.3	56.60	28.30
50	73	1.2700	0.85	0.004183	277.8	66.43	33.22
60	82	1.5240	1.03	0.004190	311.6	74.37	37.18
70	93	1.7780	1.20	0.004197	352.7	84.04	42.02
80	100	2.0320	1.37	0.004204	378.9	90.12	45.06
90	105	2.2860	1.54	0.004212	396.6	94.16	47.08
100	107	2.5400	1.71	0.004219	403.6	95.67	47.84
110	106	2.7940	1.88	0.004226	400.1	94.67	47.33
120	100	3.0480	2.05	0.004234	378.9	89.50	44.75
130	94	3.3020	2.22	0.004241	356.5	84.05	42.02

CW 3010 – CLEARING AND GRUBBING

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CW 3010 - CLEARING AND GRUBBING

1. GENERAL CONDITIONS

The General Conditions and Standard Provisions attached hereto shall apply to and be a part of this Specification.

3. DESCRIPTION

This Specification shall cover the removal from the site of trees, stumps, roots, logs, brush, rubbish and all other surface litter within the full limits of the works, and the disposal of same in a manner hereinafter specified.

The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

9. CONSTRUCTION METHODS

Before commencement of any work, the Contractor shall consult with the Contract Administrator as to which trees and/or shrubs shall remain on site and be protected, if any. Those so designated shall be protected against damage from all construction activity.

The Contractor shall restrict his activities strictly to within the limits of the works, unless receiving prior written approval from the Contract Administrator. Trees are to be felled so as to land within the limits of the works. The Contractor shall take all precautions to prevent damage to traffic, structures, pole lines, adjacent property and to trees and shrubs designated to be saved, and he shall be liable for any damages occurring in the performance of this work.

The Contractor shall cut down all trees and shrubs, except those designated by the Contract Administrator to be saved, and grub out all stumps and roots. The Contractor shall load and haul all trees, stumps, roots, logs, brush, rubbish and all other surface litter from the site and dispose of these materials at dumps located by the Contractor and approved by the Contract Administrator. Any materials dropped or spilled on any streets during the hauling operations shall be promptly cleaned up by and at the expense of the Contractor, to the satisfaction of the Contract Administrator.

The Contractor shall ensure that upon completion of the clearing and grubbing operations the site shall be left free of any hazardous depressions and in a neat condition.

12. METHOD OF MEASUREMENT

Clearing and grubbing will be measured on an area basis. The area to be paid for shall be the total number of hectares within the limits of the works that are cleared and grubbed in accordance with this Specification acceptable to the Contract Administrator, as computed from measurements made by the Contract Administrator.

13. BASIS OF PAYMENT

Clearing and grubbing will be paid for at the Contract Unit Price per hectare for "Clearing and Grubbing", measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

CW 3110 – SUB-GRADE, SUB-BASE AND BASE COURSE CONSTRUCTION

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CW 3110 - SUB-GRADE, SUB-BASE AND BASE COURSE CONSTRUCTION

1. DESCRIPTION

1.1 General

.1 This specification covers pavement removal, excavation, preparation of sub-grade, supply and placement of sub-base and base course materials, ditch grading and boulevard grading for pavements, slab renewals, curbs, miscellaneous concrete slabs, sidewalks and other related works.

1.2 Definitions

.1 Sub-grade – the natural in-situ material.

.2 Sub-base – where required, the layer of material provided between the sub-grade and the base course.

.3 Base course – the layer of base course material, greater than 50mm in depth, immediately underlying the pavement wearing surface.

.4 Leveling course – a non-structural layer of base course material, up to 50mm in depth, placed immediately underlying the pavement wearing surface.

.5 Crushed Aggregate – Crushed aggregate from glacial till pits.

.6 Crushed Limestone - Crushed limestone from a limestone quarry.

.7 Crushed Granite – Crushed granite from a granite quarry.

.8 Crushed Recycled Concrete – Crushed Portland Cement Concrete that has been crushed into pieces that are a group of aggregate particles cemented together which may or may not include the host (dominant) particle.

.10 Deleterious Material - soft material that would decay or disintegrate from weathering, porcelain, vegetation, organic material, wood, glass, plastic, metal, reinforcing steel, building rubble, brick, shale, and friable particles.

.11 Friable - the condition of being friable, describes the ability of a solid substance to be reduced to smaller pieces with little effort, especially by rubbing.

1.3 Referenced Standard Construction Specifications

.1 CW 1130 – Work Site Requirements.
.2 CW 3130 – Supply and Installation of Geotextile Fabrics.
.3 CW 3450 – Planing of Pavement.

2. MATERIALS

2.1 Sub-Base Materials

.1 Sub-base material of the type(s) shown on the Drawings or indicated in the Specifications will be supplied in accordance with the following requirements:

.1 Suitable site sub-base material will be of a type approved by the Contract Administrator.

.2 Clay borrow sub-base material will be of a type approved by the Contract Administrator.

.3 Crushed sub-base material will be crushed aggregate, crushed granite, crushed limestone or crushed concrete pavement.

.4 Crushed sub-base material will be well-graded and conform to the following grading requirements:

TABLE CW 3110.1 - Crushed Sub-Base Material Grading Requirements

CANADIAN METRIC SIEVE SIZE	PERCENT OF TOTAL DRY WEIGHT PASSING EACH SIEVE		
	50 mm MAX.	100mm	150 mm
200 000			100%
150 000			90% - 100%
100 000		97% - 100%	65% - 85%
50 000	100%		
25 000		30% - 50%	0% - 40%
5 000	25% - 60%		
80	4% - 15%	8% max.	

The content composition of crushed concrete pavement shall be based on weight as follows :
- minimum of 85% Crushed Recycled Concrete
- maximum of 15% of recycled asphaltic concrete
- maximum of 3% clay
- maximum of 1% deleterious material

150 and 100 millimetre crushed sub-base material when subjected to the abrasion test will have a loss of not more than 40% when tested in accordance with grading 1 of ASTM C535, Test for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

50 millimetre crushed sub-base material when subjected to the abrasion test will have a loss of not more than 40% when tested in accordance with grading A of ASTM C131, Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

2.2 Base Course Materials

.1 Base course material will be approved by the Contract Administrator.

.2 Base course material will consist of sound, hard, crushed rock, crushed gravel, or crushed concrete.

.3 Crushed rock and crushed gravel will be free from organic or soft material that would disintegrate through decay or weathering.

.4 Base course material will consist of sound durable particles produced by crushing, screening and grading of recovered materials, free from soft material that would decay or disintegrate from weathering.

.5 Crushed concrete base course material is limited to a maximum of two percent of the total dry weight of deleterious material.

.6 The base course material will be well graded and conform to the following grading requirements:

TABLE CW 3110.2 – Base Course Material Grading Requirements

CANADIAN METRIC SIEVE SIZE	PERCENT OF TOTAL DRY WEIGHT PASSING EACH SIEVE		
	Granular	Crushed Concrete	Crushed Limestone
25 000	100%		
20 000	80% - 100%	100%	100%
5 000	40% - 70%	40% - 70%	40% - 70%
2 500	25% - 55%	25% - 60%	25% - 60%
315	13% - 30%	8% - 25%	8% - 25%
80	5% - 15%	6% - 17%	6% - 17%

Base course material when subjected to the abrasion test will have a loss of not more than 35% when tested in accordance with grading B of ASTM C131, Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

Test base course material using an Atterberg Limits Test in accordance with ASTM D4318. The material passing the 315 sieve will have a liquid limit not greater than 25 and a plasticity index not greater than 6.

Where base course is being placed under an asphaltic concrete pavement, the aggregate retained on a No. 5 000 sieve will contain not less than 35% crushed aggregate as determined by actual particle count. Crushed aggregate will be considered as that aggregate having at least one fractured face.

2.3 Asphalt Cuttings for Base Course Material

.1 Asphalt cuttings produced from planing of asphalt pavements or overlays in accordance with CW 3450 may be used as a base course material where indicated in the Specifications or as approved by the Contract Administrator.

.2 Asphalt cuttings will be well graded and have a maximum particle size of 40 millimetres.

2.4 Lime or Portland Cement

.1 Use either Lime or Type 10 normal Portland Cement for drying the sub-grade.

.2 Supply Lime in accordance with CSA A82.43.

.3 Supply Portland Cement in accordance with CSA A5.

2.5 Imported Fill Material

.1 Imported fill material will consist of low to medium plastic clays or mixtures of sand and clay, uniform in texture.

.2 The fill material shall be free of wood, vegetation, concrete rubble or stones larger than 25 millimetres in diameter.

2.6 Quality Assurance Testing

.1 The Contract Administrator shall ensure that a minimum of one sample shall be tested for gradation and LA abrasion for sub-base and base course materials prior to starting construction for every contract. The materials shall be sampled from stockpiles designated to be used for the contract and shall be tested in accordance with this Specification.

.2 The materials shall be sampled from stockpiles designated to be used for the contract and shall be tested in accordance with this Specification.

.3 If one test fails to meet the requirements of this Specification, the material shall be re-tested. If the material fails a second test, the Contract Administrator shall designate a new source for supply of the material.

.4 Testing in addition to the requirements of this Specification shall be as directed by the Contract Administrator.

.5 Copies of all test results shall be sent to the Research and Standards Engineer for the Public Works Department and to the Contract Administrator prior to the supply and placement of the material.

3. CONSTRUCTION METHODS

3.1 Pavement Removal

.1 Remove existing concrete pavement, including curbs and asphalt overlays at locations as shown on the Drawings or as directed by the Contract Administrator. Remove all pavements to a combined thickness of 300 millimetres, unless otherwise indicated in the Specifications.

.2 Remove existing asphalt pavement including asphalt curbs at locations as shown on the Drawings or as directed by the Contract Administrator. Remove pavement to a maximum thickness of 150 millimetres, unless otherwise indicated in the Specifications.

.3 Saw-cut the existing pavement full-depth along the limits designated for removal.

.4 Utilize backhoe type equipment unless approved otherwise by the Contract Administrator.

.5 Dispose of material in accordance with Section 3.4 of CW 1130.

3.2 Excavation

.1 Excavate in-situ material to the depth to accommodate the pavement structure as shown on the Drawings or as directed by the Contract Administrator.

.2 Stockpile suitable in-situ material and suitable site sub-base material at locations on site as directed by the Contract Administrator.

.3 Dispose of surplus suitable site material and unsuitable material such as frost heaving clays, silts, rocks and rubble in accordance with Section 3.4 of CW 1130.

.4 Strip and stockpile topsoil from the site in a manner which will prevent contamination of topsoil with underlying soil materials. Stockpile the stripped topsoil at locations on site for later use.

.5 The limits of excavation will be taken as a vertical plane 450 millimetres beyond the limits of the proposed pavement except when slip form paving equipment is specified for placement of the concrete pavement, the limits of excavation will be increased to a vertical plane 750 millimetres beyond the limits of the proposed pavement.

.6 During excavation, the Contractor will be advised by the Contract Administrator as to which areas have an unsuitable sub-grade. Extend the excavation either to the lower limit of the unsuitable material or to a depth as directed by the Contract Administrator.

.7 Remove wooden poles, concrete bases, or tree stumps encountered under pavements to the top of subgrade or 1 metre below the bottom of the pavement surface, whichever depth is greater.

.8 Backfill and compact over-excavated areas with sub-base material approved by the Contract Administrator.

.9 Excavate additional material beyond the boulevard grading and ditch grading limits as directed by the Contract Administrator.

3.3 Preparation of Sub-grade and Placement of Sub-Base Material

.1 Compact the sub-grade after the bottom of the excavation has been approved by the Contract Administrator.

.2 Compact areas of suitable sub-grade material, the full width of the excavation, to a minimum of 95% Standard Proctor Density.

.3 Sub-base material shall not be placed over frozen subsoil.

.4 Place and compact suitable site sub-base material before placing any new sub-base material, as directed by the Contract Administrator.

.5 Place and compact crushed sub-base material with or without geogrid as directed by the Contract Administrator in accordance with CW 3135.

.6 Place and compact sub-base materials in layers to a depth of 3 times the maximum aggregate size or as directed by the Contract Administrator. Compact to a minimum of 100% Standard Proctor Density, for the full width of the excavation, and each layer must be levelled and approved by the Contract Administrator before the succeeding layer may be placed.

.7 Layering, mixing or blending of crushed concrete with crushed aggregate or crushed limestone sub-base materials is not allowed.

.8 Recompact or replace any layer, which has been rejected as directed by the Contract Administrator.

.9 When excess water has been applied, either by sprinkling operations or by precipitation, to cause local or continuous pondage, soil compaction will not be permitted until sufficient soil drying has occurred, creating a condition lending itself favourably to compacting operations. Exercise necessary precautions to protect compacted areas against excess wetting from any natural or artificial sources of water application.

.10 Should excess moisture from continuous or heavy precipitation threaten to unduly delay the completion of the Contract. Apply in writing to the Contract Administrator requesting permission to use Lime or Portland Cement to dry out the clay sub-grade or sub-base material at specific location(s).

3.4 Placement of Sub-Base Material With Geotextile Fabric

.1 Install separation or separation/reinforcement geotextile fabric in accordance with CW 3130.

.2 For stable sub-grades, place and compact sub-base material to a minimum depth of 150 millimetres.

.3 For unstable sub-grades, place and compact sub-base material to a minimum depth of 300 millimetres or greater thickness as directed by the Contract Administrator.

.4 Place sub-base material by end-dumping methods and level with front-end loader type of equipment as approved by the Contract Administrator to avoid damage to the geotextile fabric and minimize sub-grade failures.

.5 Layering, mixing or blending of crushed concrete with crushed aggregate or crushed limestone sub-base materials is not allowed.

.6 Avoid sudden stops or sharp turns by construction equipment during placement of sub-base materials.

.7 Construction traffic will not be allowed to travel on the placed sub-base material until approved by the Contract Administrator.

3.5 Placement of Crushed Sub-base Material with Geotextile Fabric and Geogrid For Unstable Sub-grades

.1 Prepare the subgrade in accordance with Section 3.3 of this Specification.

.2 Supply and install separation (non-woven) geotextile fabric over the subgrade in accordance with CW 3130.

.3 Supply and install geogrid over the separation (non-woven) fabric in accordance with CW 3135.

.4 Supply crushed sub-base material in accordance with Section 2.1 of CW 3110.

.5 Compacted sub-base sections using size and depth as directed by the Contract Administrator or or as shown on the Drawings. For residential pavements, optimum performance of approved geogrid may be achieved using 300-450mm in thickness of 100mm crushed subbase material.

.6 Place crushed sub-base material by end dumping down the centre of the excavation. The sub-base shall be pushed forward and levelled using a track type dozer where possible, to build a thickened section to support the hauling operations and avoid damage to the subgrade, geotextile fabric or geogrid. This procedure shall continue until all sub-base material has been placed down the centre of the excavation.

.7 Spread the crushed sub-base material to facilitate final grades utilizing a track type dozer.

.8 Initial compaction of the crushed sub-base material shall consist of two complete passes utilizing vibratory type equipment capable of compacting the material. Each pass shall be over lapped by half the width of the roller. All additional compaction shall be completed utilizing static type equipment. No trucks, rubber tire loaders or graders will be allowed to travel on the sub-base material until the Contract Administrator has approved the compaction of the sub-base.

3.6 Placement of Base Course Material

.1 Place and compact base course material to a minimum 75 millimetres thickness for pavement and approaches to a minimum of 100% Standard Proctor Density for the full width of the excavation unless otherwise shown on the Drawings or as directed by the Contract Administrator.

.2 Level the compacted base course to the finished base course elevation.

.3 Maintain the finished base course until the pavement is placed.

.4 Spread base course material uniformly to avoid segregation, free of pockets of fine and coarse material.

.5 Place and compact leveling course to a maximum thickness of 50 millimetres for sidewalks, renewal of existing curbs and miscellaneous concrete slabs, to 95% Standard Proctor Density.

.6 Place and compact base course material immediately beneath pavement and forms to provide firm support.

3.7 Placement of Imported Fill

.1 Place fill materials to satisfy the grading requirements of boulevard and ditches.

.2 Supply material in accordance with Section 2.5 of this specification.

.3 Compact to a minimum of 90% Standard Proctor Density.

.4 Imported fill shall be free of frozen lumps and shall be placed and compacted in an unfrozen state. Imported fill shall not be placed over frozen subsoil.

3.8 Grading of Boulevards

.1 Grading of the boulevards and medians to receive sod will be understood to mean the required excavation or backfilling to a depth up to 150 millimetres so that the boulevards and medians, after compaction, are at a uniform depth of 100 millimetres below finished boulevard grade, as shown on the Drawings.

.2 Remove all debris, stones and concrete rubble from the boulevards and medians before commencing grading.

.3 Grade the boulevards and medians to receive sod, unless otherwise shown on the Drawings or as directed by the Contractor Administrator.

.3 Remove all debris, stones and concrete rubble from the boulevards and medians before commencing grading.

.4 Excavate to a depth of up to 150 millimetres to meet the final grade 100 millimetres below finished boulevard grade.

.5 Place and compact suitable backfill material as approved by the Contract Administrator to a depth of up to 150 millimetres to meet the final grade 100 millimetres below finished boulevard grade.

.6 Supply backfill material in accordance with Section 2.5 of this specification.

.7 Compact backfill materials to a minimum of 90% Standard Proctor Density.

3.9 Grading of Ditches

.1 Grading of ditches will be understood to mean the required excavation or backfilling to a depth up to 300 millimetres so that the ditches, after compaction are at finished grade where no sodding is required or at a uniform depth of 100 millimetres below finished grade where sodding is required.

.2 Grade ditches as shown on the Drawings or as directed by the Contract Administrator.

.3 Excavate to a depth of up to 300 millimetres to meet the final ditch grade requirements.

.4 Place and compact suitable backfill material as approved by the Contract Administrator to a depth of up to 300 millimetres to meet the final ditch grade requirements.

.5 Supply backfill material in accordance with Section 2.5 of this specification.

.6 Compact backfill materials to a minimum of 90% Standard Proctor Density.

3.10 Quality of Sub-grade, Sub-base and Base Course Layers

.1 Determine the Standard Proctor Density for the sub-grade, sub-base and base course materials at the optimum moisture content in accordance with ASTM Standard D698. The field density of each sub-grade, sub-base and base course layers will be a percentage of the applicable Standard Proctor Density, in Sections 3.3, 3.4, 3.5 and 3.6 of this specification.

.2 Utilize quality control tests to determine the acceptability of the sub-grade, sub-base and base course layers, as placed and compacted before the succeeding layer may be applied.

.3 Verify the field density of the compacted layers by Field Density Tests in accordance with ASTM Standard D1556, Test for Density of Soil in Place by the Sand-Cone Method, or ASTM Standard D2922, Test of Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

.4 The frequency and number of tests will be as directed by the Contract Administrator.

.5 Fill promptly, holes made by the removal of samples from the layers with appropriate material and thoroughly compact so as to conform in every way with the adjoining material.

3.11 Removal of Existing Concrete Bases

.1 Remove existing concrete bases as shown on the Drawings or as directed by the Contract Administrator.

.2 Remove to a depth of 1.0 metre below finished grade.

.3 Dispose of material in accordance with Section 3.4 of CW 1130.

.4 Backfill holes remaining with base course material and compact to the satisfaction of the Contract Administrator.

4. MEASUREMENT AND PAYMENT

4.1 Pavement Removal

.1 Pavement removal will be measured on an area basis and paid for at the Contract Unit Price per square meter for the ”Items of Work” listed here below. The area to be paid for will be the total number of square metres of existing pavement removed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Pavement Removal
- i.) Concrete Pavement
- ii.) Asphalt Pavement

.2 Disposal of material will be included in the payment for the “Items of Works” listed for pavement removal.

.3 Curb and asphalt overlay will be included in the payment for the Item of Work if both are removed in one operation with the pavement.

.4 Payment for pavement over 300mm in thickness will be paid in ratio to the thickness over 300mm.

4.2 Stripping and Stockpiling Topsoil

.1 Stripping and stockpiling topsoil will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for “Stripping and Stockpiling Topsoil”. The volume to be paid for will be the total number of cubic metres of existing topsoil stripped and stockpiled in accordance with this specification, accepted and measured by the Contract Administrator.

4.3 Excavation

.1 Excavation will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for “Excavation”. The volume to be paid for will be the total number of cubic metres excavated in accordance with this specification, accepted and measured by the Contract Administrator.

.2 The volume of excavation will be measured by cross-sections in its original position and computed by the method of Average End Areas.

.3 Only material excavated within the limits of excavation will be included in the payment for “Excavation”.

.4 Disposal of material, removal of miscellaneous trees, shrub and concrete bases unless otherwise indicated in the Specifications, will be included in payment for “Excavation”.

.5 Excavation of solid bedrock, glacial till, boulders, loose rock, concrete rubble and foundations which are located within the limits of excavation and which require the use of additional or unconventional excavation equipment will be measured and paid for in addition to the unit price for excavation.

4.4 Sub-grade Compaction

.1 Sub-grade compaction will be measured on an area basis and paid for at the Contract Unit Price per square metre for “Sub-Grade Compaction”. The area to be paid for will be the total number of square metres of sub-grade compacted in accordance with this specification, accepted and measured by the Contract Administrator.

4.5 Sub-base Material

.1 **Suitable Site Sub-base Material**

.1 The reloading, hauling, placing and compaction of suitable site sub-base material will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for “Placing Suitable Site Sub-base Material". The volume to be paid for will be the total number of cubic metres of suitable site sub-base material placed in accordance with this specification, accepted and measured by the Contract Administrator.

.2 The volume of suitable sub-base material will be measured by cross-sections and computed by the method of Average End Areas.

.3 Only material placed within the limits of excavation will be included in the payment for “Placing Suitable Site Sub-base Material”.

.4 No measurement or payment will be made for materials rejected by the Contract Administrator.

.2 **Clay Borrow Sub-base Material**

.1 The supplying, placing and compaction of clay borrow sub-base material will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for "Supplying and Placing Clay Borrow Sub-base Material". The volume to be paid for will be the total number of cubic metres of material compacted in place in accordance with this specification, accepted and measured by the Contract Administrator.

.2 The volume of clay borrow sub-base material will be measured by cross-sections and computed by the method of Average End Areas.

.3 Only material placed within the limits of excavation will be included in the payment for "Supplying and Placing Clay Borrow Sub-base Material".

.4 No measurement or payment will be made for materials rejected by the Contract Administrator.

.3 **Crushed Sub-base Material**

.1 The supplying, placing and compaction of crushed sub-base material will be measured on a weight basis and paid for at the Contract Unit Price per tonne for the "Items of Work" listed here below. The weight to be paid for will be the total number of tonnes of crushed sub-base material supplied and placed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Crushed Sub-Base Material
i.) 50 mm*
ii.) 100mm*
iii.) 150 mm*

*Limestone, Granular or Crushed Concrete Material may be specified.

.2 The weight to be paid for will be the total number of tonnes of crushed sub-base material as measured on a certified weigh scale.

.3 Only material placed within the limits of excavation will be included in the payment for the "Items of Work" listed for crushed sub-base material.

.4 No measurement or payment will be made for materials rejected by the Contract Administrator.

4.6 <u>Base Course Material</u>

.1 The supplying, placing and compaction of base course material will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for the "Supplying and Placing Base Course Material *". The volume to be paid for will be the total number of cubic metres of base course material supplied and placed in accordance with this specification, accepted and measured by the Contract Administrator.

* Limestone, Granular or Crushed Concrete Material may be specified.

.2 The placing and compaction of asphalt cuttings will be measured on a volume basis and paid for at the Contract Unit price per cubic metre for "Asphalt Cuttings Base Course Material". The volume to be paid for will be the total number of cubic metres of asphalt cuttings placed in accordance with this specification, accepted and measured by the Contract Administrator.

.3 The volume of base course material will be measured by cross-sections and computed by the method of Average End Areas.

.4 Only material placed within the limits of excavation will be included in payment for "Supplying and Placing Base Course Material" or "Asphalt Cuttings Base Course Material".

.5 No measurement or payment will be made for materials rejected by the Contract Administrator.

4.7 Leveling Course

.1 No payment will be made for leveling course.

4.8 Grading of Boulevards

.1 The grading of boulevards will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Grading of Boulevards". The area to be paid for will be the total number of square metres of boulevards graded in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Additional excavation over 150 millimetres in depth required to complete boulevard grading will be paid for as "Boulevard Excavation".

.3 Additional placement of backfill material over 150 millimetres in depth required to complete boulevard grading will be paid as "Imported Fill Material".

4.9 Ditch Grading

.1 Ditch grading will be measured on an area basis and paid for at the Contract Unit Price per square metre for "Ditch Grading". The area to be paid for will be the total number of square metres of ditch graded in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Additional excavation over 300 millimetres in depth required to complete the ditch grading will be paid for as "Ditch Excavation".

.3 Additional placement of backfill material over 300 millimetres in depth required to complete the ditch grading will be paid as "Imported Fill Material".

4.10 Boulevard Excavation

.1 Boulevard excavation will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for "Boulevard Excavation". The volume to be paid for will be the total number of cubic metres of boulevard excavated in accordance with this specification, accepted and measured by the Contract Administrator.

.2 The volume of excavation will be as measured by cross-sections in its original position and computed by the method of Average End Areas.

4.11 Ditch Excavation

.1 Ditch excavation will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for "Ditch Excavation". The volume to be paid for will be the total number of cubic metres of ditches excavated in accordance with this specification, accepted and measured by the Contract Administrator.

.2 The volume of excavation will be as measured by cross-sections in its original position and computed by the method of Average End Areas.

4.12 Removal of Existing Concrete Bases

.1 Removal of existing concrete bases will be measured on a unit basis and paid for at the Contract Unit Price per unit for the "Items of Work" listed here below. The number of units to be paid for will be the total number of existing concrete bases removed in accordance with this specification, accepted and measured by the Contract Administrator.

Items of Work:

Removal of Existing Concrete Bases
- i.) 600 mm Diameter or Less
- ii.) Greater than 600 mm Diameter

.2 No measurement or payment will be made for concrete bases removed for parking metres and precast concrete bases for traffic signs.

4.13 Imported Fill Material

.1 Imported material fill will be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for "Imported Fill Material". The volume to be paid for will be the total number of cubic metres of imported fill material supplied and placed in accordance with this specification, accepted and measured by the Contract Administrator.

.2 The volume of imported fill material will be computed from cross-sections by the method of Average End Areas.

4.14 Lime or Portland Cement

.1 Lime for drying the sub-grade will be measured on a weight basis and paid for at the Contract Unit Price per tonne for "Supplying and Placing Lime". The weight to be paid for will be the total number of tonnes of Lime supplied and placed in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Portland Cement for drying the sub-grade will be measured on a weight basis and paid for at the Contract Unit Price per tonne for "Supplying and Placing Portland Cement". The weight to be paid for will be the total number of tonnes of Portland Cement supplied and placed in accordance with this specification, accepted and measured by the Contract Administrator.

.3 The weight to be paid for will be the total number of tonnes of Lime or Portland Cement as measured on a certified weigh scale.

CW 3170 – EARTHWORK AND GRADING

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CW 3170 - EARTHWORK AND GRADING

1. GENERAL CONDITIONS

The General Conditions and Standard Provisions attached hereto shall apply to and be a part of this Specification.

3. DESCRIPTION

This Specification shall cover all phases of removal and/or placement of all materials necessary for the construction and preparation of embankments, slopes, drainage works, and approaches.

The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

5. MATERIALS

5.1 General

The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification.

5.2 Handling and Storage of Materials

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

5.3 Testing and Approval

All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.

The Contract Administrator shall approve all materials at least ten (10) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specification detailed herein or are found to be defective in manufacture or have become damaged in transit, storage or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

5.4 Fill Material

Fill material for embankment construction shall be obtained from site excavation, from borrow sites as specified in the Specifications for the Work or shall be imported material, of a type approved by the Contract Administrator.

Approved clay fill material shall consist of low to medium plastic clays or of mixtures of sand and clay, uniform in texture and suitable for compaction.

5.5 Sub-base Material

Sub-base material shall conform to Section 5.4 of Specification CW 3110.

8. EQUIPMENT

All equipment shall be of a size and type as required to complete the work in reasonable time as approved by the Contract Administrator, and shall be kept in good working order.

9. CONSTRUCTION METHODS

9.1 Clearing and Grubbing

No earthwork and grading shall commence until clearing and grubbing operations have been completed in accordance with Specification CW 3010 and the Drawings, and have been approved by the Contract Administrator.

9.2 Excavation

Excavation shall consist of topsoil excavation, common excavation and borrow excavation, which shall be understood to mean the following:

a) Topsoil Excavation

The excavation of surface soil, organic growth, or other material designated by the Contract Administrator as overburden, the stockpiling of topsoil for re-use on site, and the satisfactory disposal of unsuitable material such as brush, grass, weeds and all other organic growth and any surface topsoil, unless otherwise specified herein or in the Specifications for the Work.

b) Common Excavation

The excavation of all material encountered within the limits of grading following topsoil excavation, the on-site placement or the stockpiling of suitable site material, and the satisfactory disposal of unsuitable site material such as frost heaving clays, silts, rock, rubble, rubbish and any surplus suitable site material, unless otherwise specified herein or in the Specifications for the Work.

c) Borrow Excavation

The excavation and placing of excavated material, obtained from designated borrow locations. The widening of roadway cuts and ditches will not be considered as borrow.

The excavation procedure shall be subject to the approval of the Contract Administrator. Excavation shall continue in as nearly a continuous manner as possible. Excavation at multiple locations at the same time shall be subject to the approval of the Contract Administrator.

The Contractor shall conduct his excavation procedure in such a manner as to enable the Contract Administrator to inspect the separation of materials and determine which materials are to be disposed of and which materials are to be used.

The Contractor shall excavate as required to reach sub-grade levels of pavement and landscaping, and rough grade levels for areas to be graded only.

During the course of common excavation, the Contractor will be advised by the Contract

Administrator as to which areas have an unsuitable sub-grade. In the areas of unsuitable sub-grade, whether in a homogeneous mass or in isolated pockets, the excavation shall be extended either to the lower limit of the unsuitable material or to a depth of one metre below the elevation of the bottom of base course for a Portland cement concrete pavement, or to a depth of 600 mm below the elevation of the bottom of sub-base for an asphaltic concrete pavement, whichever is lesser, unless otherwise specified on the Drawings or in the Specifications for the Work. Additional excavation of unsuitable material may be required as specified by the Contract Administrator.

In areas of excavation of unsuitable material, the side of the excavation may be sloped into the excavation provided that the sides remain at least 150 mm outside of the limits of the proposed pavement at the bottom of the excavation. The longitudinal slope shall not be steeper than 1:1.

Excavation of solid bedrock, glacial till, boulders, loose rock, concrete rubble and foundations which are located within the limits of excavation and which require the use of additional or unconventional excavation equipment shall be measured and paid for in addition to the unit prices for excavation.

9.3 Removal of Existing Pavement

Removal of existing pavement shall conform to the requirements of Specification CW 3110.

9.4 Disposal of Material

Disposal of material shall be understood to mean the removal of a material from the site, hauling of the material along a route approved by the Contract Administrator, and the unloading and grading of the material in a manner satisfactory to the Contract Administrator at a legal disposal site.

If a disposal site is not otherwise indicated in the Specifications for the Work, the Contractor shall locate a legal disposal site and identify a haul route to be approved by the Contract Administrator.

Any material dropped or spilled on any streets during the hauling operation shall be promptly cleaned up by and at the expense of the Contractor, to the satisfaction of the Contract Administrator.

9.5 Preparation of Existing Ground Surface

Before any embankment is placed on original ground having a smooth firm surface, the existing ground shall be scarified or ploughed so as to permit bonding with the new material.

Where the existing ground surface is sloped sufficiently to affect the bond between the old and new materials the original ground on which the embankment is to be placed shall be ploughed deeply or stepped before embankment construction is commenced, as directed by the Contract Administrator.

When embankment is being placed on an existing roadbed, the side slopes of the existing roadbed shall have vegetation removed and then be scarified or ploughed, as directed by the Contract Administrator, to ensure adequate bonding between the new embankment and the existing material.

Following the excavation and disposal of unsuitable material and the preparation of the side slopes, as described above, the surface of the existing roadbed shall be scarified to a depth of 150 mm, and compacted to the proper density, at the optimum moisture content.

Where existing roadbeds are being widened and existing embankments extended, the existing slopes shall be denuded of all vegetation and either stepped or ploughed so as to form a medium of contact with the new embankment. Vertical cuts for the full depths of embankment shall not be permitted.

9.6 Embankment

Embankment construction shall be understood to mean the placing of suitable earth fill to obtain the required lines, grades and cross-sections shown on the drawings.

Materials shall be deposited and spread in uniform layers of specified thickness, for the full width of the embankment. Each layer shall be shaped to line and cross-section and thoroughly compacted before the succeeding layer is placed.

Where embankment is being placed on side fill or sloping sections, the lower portion shall be constructed as above, until a full width surface of the specified cross-section is obtained. The embankment shall be completed thereafter with full width layers.

Flood protection embankment fill materials shall be clay fill material as specified in Clause 5.4.

9.7 Compaction

All material placed in embankments shall be spread and bladed smooth in successive layers not exceeding 150 mm in compacted thickness to the full width of the cross-section, unless otherwise directed by the Contract Administrator.

Each layer, including the existing sub-grade, shall be compacted to a minimum of ninety-five (95%) percent of Standard Proctor Density. The material shall be compacted at the optimum moisture content, or up to two (2%) percent higher than optimum, as directed by the Contract Administrator.

Where the grade line is in cut, the sub-grade shall be excavated to a minimum depth of 500 mm below the sub-grade line, or as directed by the Contract Administrator. The sub-grade shall then be reconstructed in layers as specified and compacted to ninety-five (95%) percent of Standard Proctor Density.

Where the moisture content of the embankment material is too high, the material shall be thoroughly worked until the optimum moisture content is achieved.

Where the moisture content of the embankment material is too low, the material shall be thoroughly disced and broken down, water added as required and the material thoroughly worked to mix the water throughout the material, prior to commencing compaction operations.

9.8 Finishing and Maintaining

The Contractor shall, as soon as practicable, bring the excavations and embankments to the correct widths, lines and grades as shown on the Drawings.

All surfaces shall be maintained to the specified grade and cross-section and to the specified density until the project or that portion of the project is accepted.

9.9 Boulevard Grading

Boulevard grading shall be done and paid for in accordance with Specification CW 3110.

10. QUALITY CONTROL

10.1 Inspection

All workmanship and all materials furnished and supplied under this Specification are subject to close

and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works that are not in accordance with the requirements of this Specification.

10.2 Access

The Contract Administrator shall be afforded full access for the inspection and control testing of materials, both at the site of work and at any plant or borrow pit used for the supply of the materials, to determine whether the material is being supplied in accordance with this Specification.

10.3 Materials

All materials supplied under this Specification shall be subject to testing and approval by the Contract Administrator in accordance with Section 5.3 of this Specification.

10.4 Quality of Sub-grade and Embankment Materials

The Standard Proctor Density for the sub-grade and embankment materials shall be determined at the optimum moisture content in accordance with ASTM Standard D698. The field density of each layer shall be a percentage of the Standard Proctor Density, as specified in Section 9.7 of this Specification.

Quality control tests will be used to determine the acceptability of each layer, as placed and compacted by the Contractor, before the succeeding layer may be applied.

The field density of the compacted layers shall be verified by Field Density Tests in accordance with ASTM Standard D1556, Test for Density of Soil in Place by the Sand-Cone Method, or ASTM Standard D2922, Test of Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

The frequency and number of tests to be made shall be as determined by the Contract Administrator.

Holes made by the removal of samples from the layers shall be promptly filled by the Contractor with appropriate material and thoroughly compacted so as to conform in every way with the adjoining compacted material.

10.5 Corrective Action

The Contractor shall, at his own expense, correct such work or replace such materials found to be defective under this Specification in an approved manner to the satisfaction of the Contract Administrator.

12. METHOD OF MEASUREMENT

12.1 Excavation

Excavation will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres that are excavated in accordance with this Specification acceptable to the Contract Administrator, as computed from measurements made by the Contract Administrator. No payment will be made for material removed outside of the limits of excavation.

The volume of the various types of excavation shall be as measured in its original position, and as determined by the method of Average End Areas.

12.2 Fill Material

a) Suitable Site Material

Suitable site material will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres compacted in place in accordance with this Specification acceptable to the Contract Administrator, as computed from cross-sections taken by the Contract Administrator using the method of Average End Areas. No payment will be made for material placed outside of the limits of placement as directed by the Contract Administrator.

b) Clay Borrow Material

Clay borrow material will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres compacted in place in accordance with this Specification acceptable to the Contract Administrator, as computed from cross-sections taken by the Contract Administrator using the method of Average End Areas. No payment will be made for material placed outside of the limits of placement as directed by the Contract Administrator.

c) Imported Material

Imported material will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres compacted in place in accordance with this Specification acceptable to the Contract Administrator, as computed from cross-sections taken by the Contract Administrator using the method of Average End Areas. No payment will be made for material placed outside of the limits of placement as directed by the Contract Administrator.

12.3 Preparation of Existing Ground Surface

Preparation of the existing ground surface will be measured on an area basis. The area to be paid for shall be the total number of square metres that are prepared in accordance with this Specification acceptable to the Contract Administrator, as computed from measurements made by the Contract Administrator.

13. BASIS OF PAYMENT

13.1 Topsoil Excavation

Topsoil excavation will be paid for at the Contract Unit Price per cubic metre for "Topsoil Excavation", measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

13.2 Common Excavation

Common excavation will be paid for at the Contract Unit Price per cubic metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work:

i. Common Excavation – Suitable Site Material
ii. Common Excavation – Unsuitable Site Material

13.3 Fill Material

a) Suitable Site Material

The loading, hauling, placing and compaction of suitable site sub-base material will be paid for at the Contract Unit Price per cubic metre for “Placing Suitable Site Material”, measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

b) Clay Borrow Material

The supplying, placing and compaction of clay borrow sub-base material will be paid for at the Contract Unit Price per cubic metre for “Supplying and Placing Clay Borrow Material”, measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

c) Imported Material

The supplying, placing and compaction of imported material will be paid for at the Contract Unit Price per cubic metre for “Supplying and Placing Imported Material”, measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

13.4 Preparation of Existing Ground Surface

Preparation of the existing ground surface will be paid for at the Contract Unit Price per square metre for "Preparation of Existing Ground Surface", measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

CW 3310 - PORTLAND CEMENT CONCRETE PAVEMENT WORKS

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CW 3310 - PORTLAND CEMENT CONCRETE PAVEMENT WORKS

1. DESCRIPTION

CW 3310 shall cover the preparation of Portland Cement Concrete for, and all concreting operations relating to, the construction of Portland Cement Concrete pavements, curbs, gutters, private approaches, bull-noses, median slabs, median, safety median and boulevard splash strips, sidewalk and other related concrete works. This Specification is applicable to both reinforced and non-reinforced concrete construction, but not pre-stressed concrete.

The work to be done by the contractor under this Specification shall include the supply of all materials, and the furnishing of all superintendence, overhead, labour, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

2. DEFINITIONS

2.1 Reinforced Concrete Pavement

A Portland Cement Concrete pavement with distributed steel reinforcement in the pavement slab and with deformed tie bars across longitudinal joints. Distributed steel reinforcement consists of smooth or deformed bars, with the longitudinal smooth dowels extended across the transverse contraction joints. Contraction joint spacing is typically 5 metres.

2.2 Plain-Dowelled Pavement

A Portland Cement Concrete pavement with no reinforcing steel in the pavement slab and with deformed tie bars across longitudinal joints and smooth dowels across transverse contraction joints. Contraction joint spacing is typically 5 metres.

2.3 Coarseness Factor

A measure of the coarseness of the combined aggregate materials being incorporated into the concrete mix, defined as the percentage of all plus 2 500 sieve particles, which are also retained on the 10 000 sieve.

Coarseness Factor = 100 (cumulative % retained on 10 000 Sieve divided by the cumulative % retained on 2 500 Sieve).

5. MATERIALS

5.1 Handling and Storage of Materials

Storage of materials shall be in accordance with the requirements of CSA-A23.1, Clause 9, Storage of Materials, except as otherwise specified herein.

5.2 Testing and Approval

All materials supplied under this Specification shall be subject to inspection and testing by a Testing Laboratory designated by the City of Winnipeg, Research and Standards Engineer or the Contract Administrator. There shall be no charge for any materials taken for testing purposes.

All materials shall conform to CSA-A23.1.

5.3 Portland Cement Concrete Constituent Materials

5.3.1 Aggregates

The Concrete Supplier shall provide in writing to the City of Winnipeg, Research and Standard Engineer, the location of the sources where aggregate will be obtained. Changes in the source of aggregate supply will not be permitted without approval of the City of Winnipeg, Research and Standards Engineer.

Aggregates shall conform to CSA-A23.1, Section 5, Aggregates. The following tests shall be conducted on each aggregate and the test results shall be provided with the mix design submittal.

Material	Parameter	Test Method	Specifications Limit	Frequency of Test
coarse aggregate	petrographic examination – PN	ASTM C295 MTO LS 609	125 max	1 year
	LA abrasion loss	CSA A23.2-16A	35% max	1 year
	unconfined freeze-thaw	CSA A23.2 24A	6% max	1 year
	Micro-Deval	CSA A23.2-29A	17% max	1 year
	clay lumps	CSA A23.2-3A	0.25% max	2 years
	low density granular material	CSA A23.2-4A	0.5% max	2 years
	alkali-silica reactivity	CSA A23.2-25A	0.15% max	2 years
fine aggregate	petrographic examination	ASTM C295	see note	1 year
	Micro-Deval	CSA A23.2-23A	20% max	1 year
	clay lumps	CSA A23.2-3A	1% max	2 years
	low density granular material	CSA A23.2-4A	0.5% max	2 years
	alkali-silica reactivity	CSA A23.2-25A	0.15% max	2 years
	organic impurities	CSA A23.2-7A	free from injurious amounts	2 years

NOTE:

The petrographic report for the fine aggregate shall include a comment on the suitability of the material for use in the production of concrete paving mix.

For concrete mix designs that will utilize two coarse aggregates and both coarse aggregates are from the same source, only the larger nominal maximum size coarse aggregate shall be tested for the parameters shown in the table above. If the coarse aggregates are from different sources, both materials shall be tested for the parameters shown in the table above.

The Coarseness Factor of the combined aggregate shall be between 45 and 65.

Quarried limestone and dolomite shall not be acceptable as aggregate materials.

The combined grading for the concrete aggregates shall comply with the following requirements:

TABLE 1
CW 3310-R6.1

TABLE 1 Design Combined Aggregate Gradation Limits		
Sieve Size	**Type 1 - All Portland Cement Concrete, except for Sidewalks**	**Type 2 - Portland Cement Concrete Sidewalks**
28 000	100%	100%
20 000	90% - 100%	90% - 100%
14 000	75% - 95%	75% - 95%
10 000	60% - 75%	60% - 75%
5 000	35% - 50%	35% - 55%
2 500	27% - 35%	27% - 40%
1 250	20% - 30%	20% - 35%
630	10% - 20%	10% - 20%
315	5% - 10%	5% - 10%
160	1% - 4%	1% - 4%
80	0% - 2%	0% - 2%

5.3.2 Cement

All cement shall be Type GU General Use Hydraulic conforming to the requirements of CSA A3001, Portland Cement. Cement shall be kept in weather tight storage that will protect it from moisture and contamination, and in such a manner as to permit inspection, sampling and identification, where required, of each lot.

Check tests of the cement may be undertaken by a Testing Laboratory designated by the City of Winnipeg, Research and Standards Engineer. Any cement which fails to comply with the requirements of CSA A3001 will be rejected, notwithstanding any certificate of acceptance that may have been previously given. Cement that has been rejected must be removed immediately by the Concrete Supplier.

5.3.3 Supplementary Cementing Materials

Fly ash for use in Portland Cement Concrete shall conform to the requirements of CSA A3001 for Class CI fly ash, except that the maximum allowable loss on ignition shall be three (3%) percent.

Fly ash shall be sampled and tested with copies of test results submitted to the City of Winnipeg, Research and Standards Engineer.

Fly ash shall be added to concrete mixtures as a separate constituent material. The use of blended hydraulic cement is not permitted.

5.3.4 Water

Water used for concrete mixing water shall conform to ASTM C1602M, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete. The concrete supplier shall maintain documentation on the characteristics of the mixing water in compliance with the

requirements of Tables 1 and 2 in ASTM C1602M. Testing to verify compliance with the requirements in Table 1 shall be conducted on the Type 1 hand placement paving mix with fly ash. The testing frequency for mixing water shall be in accordance with Appendix X1 of ASTM C1602M. Information on the testing frequency of the concrete mixing water shall be included in the concrete suppliers' quality control program. The source(s) of concrete mixing water and test data indicating compliance with ASTM C1602M shall be provided with the Mix Design Statement submitted to the City of Winnipeg Research and Standards Engineer.

5.3.5 Admixtures

No admixture, other than Air-Entraining Agent and Type WN Water-Reducing Agent shall be used without the written authorization of the City of Winnipeg, Research and Standards Engineer, unless otherwise specified in the Specifications for the Work.

a) Air-Entraining Admixture

The air-entraining admixture shall conform to the requirements of ASTM C260.

b) Chemical Admixtures

Chemical admixtures shall conform to the requirements of ASTM C494. Chloride-based chemical admixtures will not be permitted under any circumstances.

5.4 Incidental Materials

5.4.1 Hot Poured Joint Sealer

Hot poured joint sealer shall be low modulus Type IV Material Conforming to the requirements of ASTM Standard D 6690-01, Specification for Joint and Crack Sealants, Hot-poured, for Concrete and Asphalt Pavements.

Use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at: http://www.winnipeg.ca/matmgt/info.stm

5.4.2 Preformed Neoprene Compression Joint Seals

Use of preformed neoprene joint seals are subject to the approval of the Contract Administrator. Preformed neoprene compression joint seals are to be used on transverse joints only and are to be installed according to the manufacturer's recommendations. Preformed neoprene compression joint seals must meet ASTM Standard D2628.

5.4.3 Expansion / Isolation Joint Filler

a) Fibre Joint Filler

Fibre joint filler shall be rot-proof and of the preformed, non-extruding, resilient type made with a bituminous fibre and shall conform to the requirements of ASTM Standard D1751, Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

b) Plastic Joint Filler

Plastic Expansion Joint Filler is to be the fluted polypropylene type and 6 mm in thickness.

5.4.4 Reinforcing Steel

Reinforcing steel shall be deemed to include all reinforcing bars, tie bars, dowel bars and bar mat reinforcement, including all bar accessories.

All reinforcing steel shall be supplied according to the type and dimensions as shown on the Contract Drawings or the Standard Details.

All reinforcing steel shall conform to the requirement of CSA Standard G30.12, Billet-Steel Bars for Concrete Reinforcement. If, in the opinion of the Contract Administrator, any reinforcing steel provided for the concrete works exhibits flaws in manufacture or fabrication, such material shall be immediately removed from the site and replaced with acceptable reinforcing steel.

a) Bar Mat Reinforcement shall be Grade 300 bars with all bar intersections welded by an electric resistance spot welder, Welding shall be done in such a manner that the minimum requirements for tensile strength and yield point of the reinforcing steel shall be met when a specimen is tested across points of weld.

   Longitudinal bars shall be plain bars. Transverse bars may be plain bars or deformed bars.

   Bar mats with defective spot welds or with spot welds that have been broken while in transit, or during handling or placing operations, shall be replaced or repaired to the satisfaction of the Contract Administrator prior to installation.

b) Deformed Reinforcing Bars and Tie Bars shall be Grade 300 deformed bars.

c) Dowel Bars shall be Grade 300 plain bars.

d) Bar Accessories shall be of a type approved by the Contract Administrator.

All reinforcing steel shall be straight and free from paint, oil, mill scale and injurious defects. Rust, surface seams, or surface irregularities will not be cause for rejection provided that the minimum dimensions, cross-sectional area and tensile properties of a hand wire-brushed specimen are not less than the requirements of CSA Standard G30.12M.

5.4.5 Epoxy-Coating

For all new construction, or where specified; tie bars, dowels and stirrups (for separate curbs) shall be shop-coated with epoxy conforming to the requirements of ASTM Standard D3963. All bar ends shall be free of burs and distortions. All visible defects in the epoxy coating shall be field-coated with epoxy.

5.4.6 Liquid Membrane-Forming Curing Compound

Curing compound shall be Type 2, white-pigmented, and water based liquid membrane-forming curing compound conforming to the requirements of ASTM Standard C309.

5.4.7 Polyethylene Film

Polyethylene film shall be clear or white opaque and conform to the requirements of ASTM Standard C171.

5.4.8 Bonding Agent

Epoxy resin shall be of a type listed in the approved products list conforming to the requirements of ASTM Standard C881. Type 1, Grade 3 epoxy shall be used for bonding tie bars and dowels into hardened concrete.

Bonding agents for bonding tie bars and dowels into holes in hardened concrete other than epoxy resin may be permitted provided that they develop a minimum pullout resistance of 50 kN within two days (48 hours) after installation. Alternative bonding agents are listed in the approved products list.

5.4.9 Form Coating

Form coating shall be of a type approved by the Contract Administrator.

5.4.10 Evaporation Retardant

Evaporation retardant shall be water based, the monomolecular type and shall be applied in accordance with the manufacturer's recommendations.

If the evaporation retardant application film is broken by brooming, tinning or other finishing procedures, the application film shall be reapplied.

5.4.11 Backer Rod

Backer rod shall be Type 1, heat-resistant, round foam rod sized to approximately 25% larger than joint width so as to employ wall tension to allow backer rod installation at required depth in accordance with ASTM D5249.

Acceptable Products will be:

- HBR XL as manufactured by NOMACO Inc. supplied by Road Products Manitoba Inc.
- Hot Rod XL as manufactured by Industrial Thermo Polymers Limited supplied by Brock White Canada, Johnson Construction Materials and Wearing Williams Limited.

or an approved equal.

5.4.12 Bonding Grout

.1 Bonding agent shall be Acryl-stix or approved equal as accepted by the Contract Administrator. Polyvinyl acetate-based latexes will not be permitted.

.2 The bonding grout shall be well mixed and will consist of the following constituents, by weight:

- 1 part water
- 1 part bonding agent
- 2 parts Type 10 Normal Portland Cement

.3 The consistency of the bonding grout shall be such that it can be applied in a thin, even coating on the slab so that it will not run or puddle in low spots.

6. DESIGN REQUIREMENTS

6.1 Mix Design Statement

6.1.1 General

The City of Winnipeg, Research and Standards Engineer will maintain a list of approved concrete suppliers. All submissions to The City of Winnipeg, Research and Standards Engineer must include a cover letter. The cover letter will clearly outline the purpose of the submission in the first paragraph (i.e., initial, annual, revised). The second paragraph must include a list of the documentation attached to the submission along with comments on test data and any other information. The comments should indicate whether the materials comply with the requirements of CW 3310. Standard forms available from The City of Winnipeg, Research and Standards Engineer must be used when submitting the following information:

- Constituent material list (aggregates, cement, fly ash, admixtures, water)
- Aggregate test data
- Concrete mix design list

6.1.2 Initial Submission

To obtain approval, concrete suppliers must submit the following information to the Research and Standards Engineer:

- Names of suppliers and sources for aggregates, cement and fly ash
- Names of manufacturers and products for admixtures with letter certifying that the admixtures comply with the relevant ASTM standards
- Concrete mix designs with unique mix design codes signed and dated by person selecting the mix proportions
- Copy of MRMCA certificate for concrete batch plant
- Copies of most recent scale calibration reports for the concrete batch plant
- Test data for aggregates (in accordance with clause 5.3.1)
- Test reports for the cement and fly ash that are representative of the materials to be used during concrete production.
- A minimum of five (5) sets of concrete compressive strength tests for the hand placement paving (Type 1) mix with and without fly ash and the sidewalk (Type 2) mix with and without fly ash to demonstrate the concrete mix will achieve the required strength level. The strength test data may be obtained from either Quality Control testing during production or trial batches.
- Air-void parameters for the Type 1 slipform paving mix. If fly ash is to be used in the concrete mix, air-void parameters shall be submitted for the Type 1 slipform paving mix with and without fly ash. The concrete will be considered to have a satisfactory air-void system if the spacing factor does not exceed 260 µm. In no case shall the tests be more than twelve (12) months old.
- Sieve analysis test reports for the individual aggregates and the combined aggregate gradations to be used in the Portland Cement Concrete. The sieve analysis test reports shall be representative of the material to be used during concrete production.
- Quality control program for all constituent materials and concrete mix.

6.1.3 Annual Submission

If a concrete supplier is on the approved concrete suppliers list and there are no changes in the sources of constituent materials and the concrete mix designs, the following information must be submitted prior to January 1:

- List of suppliers and sources of constituent materials
- List of concrete mix designs with unique mix design codes
- Summary of Aggregate Test Results (in accordance with clause 5.3.1)

- Current scale calibrations
- Air-void parameters for the Type 1 slipform paving mix. If fly ash is to be used in the concrete mix, air-void parameters shall be submitted for the Type 1 slipform paving mix with and without fly ash.
- Quality control program for all constituent materials and concrete mix

Updates for aggregate test data and MRMCA certificates must be provided prior to their expiry date to ensure the concrete supplier is maintained on the approved concrete suppliers list.

6.1.4 Revised Submission

If a concrete supplier is on the approved concrete suppliers list and there are changes in sources of the constituent materials, concrete mix designs or concrete plants, the relevant information must be forwarded for review and approval in accordance with the initial submission requirements. The following information is required for any change in constituent materials (cement, fly ash, aggregate or admixtures):

- For cement, fly ash and aggregates, name of new supplier and source.
- For admixtures, name of new manufacturer and product with a letter certifying that the admixtures comply with the relevant ASTM standards.
- A minimum of five (5) sets of concrete compressive strength tests for the hand placement paving (Type 1) mix with fly ash to demonstrate the concrete mix will achieve the required strength level. The strength test data may be obtained from either Quality Control testing during production or trial batches.
- Air-void parameters for the Type 1 slipform paving mix. If fly ash is to be used in the concrete mix, air-void parameters shall be submitted for the paving mix with and without fly ash.

In addition, the following information shall be submitted:

- For a change in cement or fly ash, test reports from suppliers that are representative of the materials to be used during concrete production.
- For a change in aggregate, test data for aggregates (in accordance with clause 5.3.1) and sieve analysis test reports for the individual and combined aggregates gradations to be used in the concrete.
- For a modification to an existing batch plant, a copy of the new MRMCA certificate and new scale calibrations.
- For a new batch plant that will use the same constituent materials as an existing batch plant, a copy of the MRMCA certificate and scale calibrations. A test report on the quality of the mixing water shall also be submitted if the source is not the City of Winnipeg water supply.

Once the design gradation has been approved, allowable deviations in gradation shall be as follows:

TABLE 2
CW 3310 – R6.2

Allowable Deviation From The Job Mix Formula	
Sieve Size	**Deviation in % By Mass Passing Sieve**
20 000	± 3%
14 000	± 4%
10 000	± 5%
5 000	± 5%
2 500	± 4%
1 250	± 4%
630	± 3%
315	± 3%
160	± 2%
80	± 1%

Once approved, all concrete shall be supplied in accordance with this Mix Design Statement.

No changes in the concrete mix designs will be permitted without following the above procedure.

6.2 Concrete Strength and Workability

In accordance with CSA A23.1, Alternative (1) for specifying concrete, the concrete mix shall be proportioned such as to yield concrete having the required strength and workability, as follows:

a) Type 1 - Concrete for Pavements, Commercial Approaches, Curb and Gutter Sections, Curbs, Monolithic Curb and Sidewalks, Splash Strips and Bull-noses:

i. Class of Exposure: C-2
ii. Minimum Specified Compressive Strength @ 28 days = 32 MPa
iii. Minimum Cementitious Content = 340 kg/m^3
iv. Maximum Water/Cementitious Ratio = 0.45
v. Slump = 50 ± 20 mm (for slip form paving)
= 70 ± 20 mm (for hand placement)
vi. Aggregate Size = 20 mm Nominal
vii. Air Content = 5.0% to 8.0%

* includes Plain Dowelled Pavements

b) Type 2 - Concrete for Sidewalks, Residential Approaches, Median Slabs and Other Related Concrete Works:

i. Minimum Specified Compressive Strength @ 28 days = 30 MPa
ii. Minimum Cementitious Content = 300 kg/m^3
iii. Maximum Water/Cement Ratio = 0.49
iv. Slump = 80 ± 20 mm
v. Aggregate Size = 20 mm Nominal
vi. Air Content = 5% to 8%

6.3 Restrictions on the Use of Fly Ash in Concrete

Class CI fly ash shall not replace Portland Cement by more than fifteen (15%) percent by mass of total cementitious content in the mix.

The use of fly ash as a partial replacement for Portland cement shall not be permitted between October 1 and May 15, unless authorized in writing by the City of Winnipeg, Research and Standards Engineer.

6.4 Concrete for Early Opening of Pavements

The Concrete Supplier shall modify the mix design, as required, in order to ensure that the minimum compressive strength of the concrete pavement is 20 MPa and is achieved within the following early opening requirements:

- 24 hours early opening after placement
- 72 hours early opening after placement

The Mix Design Statements for this concrete shall be submitted to the City of Winnipeg, Research and Standards Engineer for approval in accordance with Clause 6.1 of this Specification.

The requirements of Clause 6.2 shall also apply to concrete for early opening pavement.

6.5 Plant Quality Control

The Concrete Supplier shall provide quality control at the plant to ensure all materials meet the approved mix designs. The proposed quality control program shall be submitted with the Mix Design Statement for approval. This information shall be submitted weekly and will be monitored by the City of Winnipeg, Research and Standards Engineer.

6.6 Concrete For Temporary Restoration of Utility Pavement Cuts

The Concrete Supplier shall provide a mix design to be utilized for the temporary restoration of utility pavement cuts. The concrete placed shall be capable of supporting vehicular traffic loading within 24 hours of placement. The mix design requirements are as follows:

i. Minimum cement content = 300 kg/m3
ii. Slump = 120 ± 20 mm
iii. Air Content = 5% to 8%
iv. Aggregate Size = 20 mm

The grading for the concrete aggregate shall comply with the limits for Type 1 mix shown in Table 1 CW 3310-R6.1 in section 5.3.1. A calcium chloride based admixture meeting the requirements of ASTM C494 shall be used in the concrete mix to ensure adequate early age strengths are achieved.

The admixture dosage shall be adjusted during the year to accommodate changes in air temperatures. The admixture dosage will be dependent upon the Environment Canada minimum forecast temperature during the 24 hour period after concrete placement and will be as follows:

Minimum Curing Temperature after Concrete Placement	Calcium Chloride (based upon mass of cement)
Greater than 0^{0} C	1%
0 to -5^{0}C	2%
Less than -5 to -10^{0}C	3%
Less than -10^{0}C	4%

The Mix Design Statement for this concrete shall be submitted to the City of Winnipeg, Research and Standards Engineer for approval in accordance with Clause 6.1 of this Specification.

7. SUPPLY OF MATERIALS

7.1 Concrete Supply

All concrete supplied for Portland Cement Concrete pavement works shall be supplied by a concrete supplier that has been approved by the city. A list of approved concrete suppliers will be maintained by the City of Winnipeg, Research and Standards Engineer.

Unless otherwise specified in the Specifications for the Work, the use of a ready-mixed concrete plant only will be permitted. Concrete shall be proportioned, mixed and delivered in accordance with the requirements of CSA A23.1, Clause 18, Production of Concrete, except that the transporting of ready-mixed concrete in non-agitating equipment is not permitted without the written permission of the Contract Administrator.

The discharge of ready-mixed concrete from the transit mixer shall be completed within 1½ hours after the introduction of the mixing water to the cement and aggregates, unless the Contract Administrator authorizes an extension of time.

Transit mixers supplying concrete under this specification shall have a MRMCA certification sticker affixed to the rear window of the driver's cab. All delivery tickets shall indicate the time of batching.

8. EQUIPMENT

8.1 Ready Mixed Concrete Production Facilities

Commercial ready-mixed concrete plants and batch plants supplying Portland Cement Concrete under this Specification shall be certified in accordance with the Manitoba Ready Mix Concrete Association's "Certification of Ready Mixed Concrete Production Facilities". Proof of certification shall be submitted with the Mix Design Statement.

Batch plants must be equipped with batch weight recorders and the results made available to the Contract Administrator upon request.

8.2 Paving Equipment

The Contractor shall use a self-propelled slip form paver with a minimum gross weight of 25 000 kg driven by an engine having a minimum 150 kW to construct pavements with widths between 5.0 m and 8.0 m.

The Contractor shall use a self-propelled slip form paver with a minimum gross weight of 15 000 kg and driven by an engine having a minimum 100 kW, to construct pavements with widths less than 5.0 m.

If a slip form paving machine is used for concrete placement, it shall be of a size and type adequate to handle the width and thickness of the concrete pavement to be constructed. The slip form paver shall distribute the fresh concrete evenly to the required grade without segregation and without disturbing the reinforcing steel. The concrete shall be thoroughly consolidated by means of vibrators, struck off to exact grade, and given a float finish, all automatically and continuously by the machine and with a minimum of hand finishing. The machine shall be equipped with automatic controls capable of controlling both the elevation and direction of the machine within a tolerance of 5 mm from the specified grade and alignment. Slip forms shall extend the full depth of the pavement and shall be of sufficient length that the concrete will not deform at the edges by the time the forms have passed. If a slip form paver is not being used, the paving equipment used for placing concrete shall have a

demonstrated ability to meet the specified tolerances for concrete pavement. The Contract Administrator shall reject any paving equipment should the paving equipment not field perform within the specified tolerances.

8.3 Paving Equipment Vibratory Devices

When called for by the Contract Specifications, the paving equipment vibratory devices shall be checked by the Contractor in the presence of the Contract Administrator, by use of a vibrating reed tachometer prior to commencement and during the paving operations.
Performance and checking of the vibrators shall conform to the paving equipment manufacturer's specifications.

8.4 Moveable Work Bridges

Where more than one lane is being paved at a time, two moveable work bridges independent of the paving machine shall be required, one for finishing and one for curing operations.

8.5 Bull Floats

Bull floats used for initial finishing of the in-place concrete pavement, shall be constructed of wood and shall be approved for use by the Contract Administrator prior to construction. The use of magnesium floats is not permitted.

9. CONSTRUCTION METHODS

9.1 Forms

Forms for concrete shall be constructed of steel or wood and shall be sufficiently rigid to prevent lateral or vertical distortion from the loading environment to which the forms will be subjected. All forms shall be set to the design grades, lines and radii as shown on the Drawings. Forms shall be adequately anchored and firmly set over bearing areas to prevent displacement during concrete placement. All formwork in place shall be subject to inspection and correction of grade and alignment prior to, and at any time during concrete placement.

The surfaces of all formwork to come in contact with the concrete shall be thoroughly cleaned and treated with form coating before concrete placement. The form coating shall be applied by brush or spray so as to give the forms an even coating without excess or drip, and shall not be allowed to get on any reinforcing steel. The form coating shall not cause a softening or permanent staining of the concrete surface and, further, it shall not impede the proper functioning of the curing compound.

Forms shall not be removed for a period of at least twenty-four (24) hours after the concrete placement has been completed. Removal of forms shall be done in a manner in order to avoid damage to, or spalling of, the concrete.

9.2 Placing Reinforcing Steel

9.2.1 Reinforced Concrete Pavement

All reinforcing steel shall be positioned as shown on the Drawings and shall be held in place by positive and satisfactory means so that the correct position of the reinforcing steel will be maintained after the concrete has been placed, vibrated and finished. If reinforcing steel is displaced during concrete placing operations, concrete placement shall cease and shall not resume until the displaced reinforcing steel has been reset to its true design position.

Field lap joints shall be securely wired or clipped. Splices, other than those shown on the Drawings or

approved by the Contract Administrator, will not be permitted. Splices shall have a length sufficient to develop the full strength in bond of the bar and shall be well distributed and only located in areas of low tensile stress. Reinforcing steel shall be securely fastened at all laps, intersections and splices.

Longitudinal steel bars which cross transverse joints shall be aligned parallel to the centreline and surface of the slab with a maximum allowable tolerance of ± 6 mm from the transverse joint to the end of the bar.

Once all reinforcing steel is in position, it shall be inspected and approved by the Contract Administrator before any concrete is placed. Otherwise the concrete will be rejected by the Contract Administrator and shall be removed by the Contractor at his own expense.

9.2.2 Plain-Dowelled Concrete Pavement

Dowels shall be located at all transverse contraction joints by means of an approved dowel assembly positioned as shown on the drawings. The methods for fastening the dowel assembly to the base shall be subject to the approval of the Contract Administrator. The dowels shall be aligned parallel to the centreline and surface of the slab with a maximum allowable tolerance of ± 12 mm. The dowel assemblies shall be fabricated sufficiently rigid so the dowels are held in alignment within the specified tolerance, both horizontally and vertically, until the concrete placing and setting cycle is complete.

For dowel assemblies with side members and ties, the dowels shall be securely fastened at alternate ends to the side members to prevent any movement of the dowels.

All dowels shall be thoroughly coated at the site with a thin uniform coating of MC-250 cut-back asphalt or approved equal bond breaker for the length of the dowel. The bond breaker coating shall be smooth and free of voids.

The position of the dowel assembly shall be clearly marked by the Contractor on the forms or by stakes so that the location of the transverse joint can be accurately located for joint construction.

Tie bars shall be positioned as shown on the Drawings. They shall be placed at mid-depth of the pavement and parallel to the pavement surface and the transverse joints. The use of 90^0 bent tie bars will not be allowed.

If dowels or tie bars are displaced during concrete placing operations, concrete placement shall cease and shall not resume until the displaced dowels or tie bars have been reset to the true design position.

Once dowels and tie bars are in position, they shall be inspected and approved by the Contract Administrator before any concrete is placed. Otherwise the concrete will be rejected by the Contract Administrator and shall be removed by the Contractor at his own expense.

9.2.3 Tying Into Existing Pavement

Where the Drawings call for a new slab to be tied into an existing slab along a longitudinal joint, the Supplier shall install tie bars into the existing slab. Tie bars in drilled holes shall be installed and paid for in accordance with Specification CW 3230.

Where the Drawings call for a new slab to be tied into an existing slab along a transverse joint, the Supplier shall install dowels into the existing slab. Dowels in drilled holes shall be installed and paid for in accordance with Specification CW 3230.

9.3 Joints

Contraction, longitudinal and construction joints shall be constructed, where required, in accordance with the details shown on the Drawings or as directed by the Contract Administrator. The joints shall be vertical and shall not deviate more than 15 mm from the horizontal alignment shown on the Drawings. All joints in pavement slabs shall be continuous through the curbs, median slabs, bull-noses, safety medians and boulevard or median splash strips.

Expansion joints shall be constructed only where new concrete is being placed up against existing non-pavement structures, where directed by the Contract Administrator. A 15 mm thick fibre joint filler shall be installed in expansion joints. The fibre joint filler shall extend from the base of the concrete slab up to the concrete surface, but no higher.

Where concrete is to be placed against an existing pavement structure, the joint shall be constructed as shown on the Drawings, or as directed by the Contract Administrator.

The Contractor shall obtain the Contract Administrator's approval on all placement of reinforcing steel in odd shaped installations to ensure proper alignment with saw-cut joints.

Contraction joints shall be saw-cut in succession by a single cut, 3 mm wide to the depths and alignments as shown on the Drawings, as soon as the concrete is sufficiently hard so that it will not be ravelled or damaged by the blade. The time at which all such saw-cutting is to be undertaken shall be determined by the Contractor.

When construction joints are to be sealed; the joint must be second cut to a width and depth as shown on the drawings.

Longitudinal joints shall be saw-cut as per contraction joints. When sawing longitudinal joints, the Contractor shall ensure that any residue cleaned from the longitudinal joint does not go into the previously cleaned contraction joints. For lane-at-a-time paving only, the longitudinal joint may be constructed by initially depressing an approved tool into the plastic concrete or by installing a filler strip which shall remain in place until the concrete has attained it's initial set and shall then be removed without disturbing adjacent concrete. The joint shall then be saw-cut to the width of 3 mm and depth *as* shown on the Drawings. The longitudinal joints shall be second cut and filled with joint sealer as shown on the drawings.

For late in season construction, second cut shall not be completed if ambient temperature is below 4^0C. Second cut shall be completed the next season when temperature requirements can be met.

9.4 Concrete Placement

No concrete shall be placed until the Contract Administrator has examined and approved the layout of the forms, reinforcing steel, dowels, tie bars and joints and the condition and grade of the compacted base course.

The placing of concrete on a base course which is too wet or too dry, or which is frozen, will not be permitted. The prepared grade shall be sufficiently moist to prevent absorption of water from the freshly placed concrete, but must be free from mire or water pondage. The temperature of the fresh concrete shall not be less than 10.0°C nor greater than 30.0°C, as measured at time of placing.

Concrete shall be deposited as nearly as practicable to its final position in a rapid and continuous operation in such a manner as to require as little rehandling as possible and to avoid segregation and separation of the materials.

The sequence of concrete placement shall be arranged so that no concrete, which has partially hardened, will be subjected to injurious vibration or shock.

Concrete shall be placed while fresh and before it has taken its initial set. Retempering of partially hardened concrete with additional water will not be permitted.

The deposited concrete shall be spread by means of a mechanical spreader or by an approved hand method. The surface of the concrete shall then be struck off by mechanical means in a manner such that when the concrete is vibrated and screeded the finished concrete will conform to the cross-section and elevation shown on the Drawings.

In areas inaccessible to mechanical equipment, after the concrete has been vibrated, the surface of the concrete shall be struck-off manually with appropriate tools and in an approved manner so that the concrete will conform to the cross-section and elevation shown on the Drawings. Neat cement or mortar shall not be used to facilitate the finishing surfaces.

Mechanical vibrators only shall be used to consolidate the concrete. Spading, hand tamping, using puddling rods, or using other similar methods will not be permitted in place of vibration.

Vibration shall be applied at the point of deposit and in areas of freshly deposited concrete. Vibrators shall be inserted vertically into and withdrawn vertically out of the concrete slowly. Vibrations shall be of sufficient duration and intensity to thoroughly consolidate the concrete, but shall not be continued so as to cause segregation. Vibrators shall not be used for flowing the concrete or spreading it into place.

Concrete shall be worked thoroughly around any reinforcement, dowels, tie bars and around embedded fixtures and into the angles and corners of the forms. During placement, concrete shall be sufficiently vibrated with suitable equipment to ensure a secure bond with the reinforcement, dowels and tie bars, to eliminate entrapped air voids, and to ensure a homogeneous structure and adequate consolidation. Particular care shall be given to placing and vibrating the concrete along the faces of the forms to ensure a dense, smooth surface devoid of imperfections.

No persons shall be permitted to walk in the screeded concrete. Any remedial work shall be done from the sides of the concrete pour or from work bridges.

Once the placing and vibrating of the concrete has been completed, the forms shall not be jarred, and any projecting reinforcing steel shall not be disturbed, for a period of at least twenty-four (24) hours. At the end of a slip form paving pour, concrete shall be sawcut full-depth and removed. There shall be no measurement or pavement for the saw cutting, removal or concrete lost.

Bonding grout shall be applied to the surface of the slab immediately prior to placement of plastic concrete for separate curb. Use compressed air that has an oil free air jet having sufficient volume and pressure to remove dust and loose particles immediately prior to applying bonding grout. Apply in a thin, even coating so that the bonding grout does not run or puddle.

Bonding grout shall be applied where the concrete pavement will not be overlayed with asphalt.

9.5 Concrete Finishing

Finishing shall be regulated in order that quality of the surface is not impaired by overworking or by bringing excessive fines and water to the surface. The use of steel trowels is not permitted.

Prior to final finishing, the surface grade of concrete slabs shall be checked to an accuracy of plus or minus 5 mm, with a rounded shape 3.0 metre long metal straight edge, unless otherwise specified in the Specifications for the Work. The straight edge shall be drawn across the pavement in a scraping motion to identify deviations for immediate correction. The straight edge shall be advanced one-half of its length for successive checks.

Where placement of the concrete pavement is facilitated by use of a slip form paving machine, additional floating of the surface by hand methods shall only be done if required to correct surface

imperfections identified by checking with the 3.0 metre long metal straight edge, or as directed by the Contract Administrator.

When drying conditions are greater than or equal to 0.75 kg/m^2/hr as estimated by use of Figure D1, Appendix D, Guidelines for Curing and Protection, of CSA A23.1, the plastic concrete surface shall be protected from drying by application of an evaporation retardant according to clause 5.4.10. The evaporation retardant shall be applied immediately after checking the surface with the 3.0 m long metal straight edge and shall be reapplied between finishing operations.
Following completion of floating operations, but prior to initial set of the concrete, the edges of all formed concrete slabs shall be carefully finished with an appropriate edging tool.

Upon completion of finishing operations, and when excessive moisture has evaporated, the plastic surface of the entire pavement shall be given a textured finish by means of broom finishing with a steel or fibre broom of a type approved by the Contract Administrator at right angles to the direction of traffic. Surface depressions introduced by the broom strands in the brooming operations shall not be more than 3 mm deep. Broom finishing will similarly be required for surfaces of private approaches, gutters, bull-nose slabs, boulevard and median slabs, and other related slabs. Broom finishing will not be required when the concrete does not form the finished surface.

When specified by the Contract Administrator, for pavements with high design speeds, the concrete surface shall be given a transverse tine texture. The finish shall be constructed by using a single transverse pass of an artificial turf or burlap followed by a transverse tine texturing device. The device shall consist of a single line of flat, slightly flexible, tempered steel tines, spaced 15 mm apart. The tine width shall be 3.2 mm. Texturing is to be applied while the concrete is still plastic enough to obtain a depth of at least 3.2 mm but not more than 6.4 mm. The tine texture shall be obtained by one continuous pass of the device for the full width of pavement being textured.

Where indicated in the Contract Specifications, the finished surface of the hardened concrete slabs shall be measured for roughness by the Contract Administrator. The roughness data will be reduced to an International Roughness Index, IRI. An acceptable IRI will be less than or equal to two (2), based on test sections approximately 100 metres long, measured along the wheel paths. No tests will be performed across designed grade breaks. Random testing by the City will be completed within 18 hours after the pavement has been placed. The Supplier will be informed of test results within 48 hours after the pavement has been placed. Sections of pavement that fail in roughness shall be corrected at the Contractor's expense to produce an acceptable IRI.

9.6 Concrete Curing

Immediately following concrete finishing and after excess moisture due to bleeding has evaporated. The surface of the concrete shall be completely treated with a white-pigmented water based liquid membrane-forming curing compound, in accordance with the manufacturer's recommendations. The minimum rate of application shall not be less than that recommended by the manufacturer. As soon as the side forms are stripped, the edges of all concrete slabs shall be completely sprayed white. In the case of slip form paving, the edges shall be completely sprayed white at the same time as the pavement surface.

After application, the white-pigmented liquid membrane-forming curing compound shall be protected as per the manufacturer's recommendations from rain or snow.

Curing compound shall not be used when the pavement is otherwise protected from cold weather by polyethylene film for a period of not less than five days.

9.7 Joint Sealing

The joints shall be thoroughly cleaned of all dirt, loose mortar particles and other foreign material lodged in the joints.

Joints and the pavement surface shall be cleaned of all residue left by the sawing operation. Initial cleaning shall be done by water jet having sufficient volume and pressure to remove the residue. Alternative methods of cleaning joints, must be approved by the Contract Administrator. The joint shall be blown out with an air jet having sufficient volume and pressure to remove the residue. Joints shall be allowed sufficient time to thoroughly dry before the application of the joint sealer.

Install backer rods immediately after cleaning and before sealant installation. Backer rods shall be inserted uniformly to the required depth to achieve the required shape factor. Backer rods shall be inserted using a double wheel steel roller and shall not be punctured or stretched during the installation process.

The joint shall then be filled with low modulus joint sealer to the depth shown on the Drawings using an approved mechanical pressure joint filling system. Overfilling of joints shall not be permitted. Overfilled joints shall have excess material removed to the satisfaction of the Contract Administrator. The joint must be surface dry at the time of filling, and the ambient temperature must be at least 4°C and rising.

Where Neoprene seals are used, Neoprene seals are to be installed in transverse concrete pavement joints only. All longitudinal joints are to be sealed in accordance with CW 3310. The seals are to be installed in accordance with the manufacturer's specifications. The seals shall be installed on the basis of a maximum joint spacing of 5000 mm. The joints shall be constructed in accordance with Standard Detail SD-212 for sawn joints, except that the reservoir cut shall be a minimum of 38 mm in depth.

9.8 Weather Conditions

The Contractor shall be responsible for taking all necessary measures to protect freshly laid concrete from adverse weather conditions, including hot weather, wind, rain, sleet, snow and cold weather, to the satisfaction of the Contract Administrator.

Concrete shall be adequately protected from freezing for a minimum of five (5) days after completion of placing operations, or longer as required to ensure that the pavement opening requirements of Clause 9.9 of this Specification are met. A minimum requirement for protection shall be provided as follows when the air temperature as forecast by Environment Canada is:

0°C to -3°C The concrete shall be covered with polyethylene film.

-3°C to -5°C Insulated tarp(s) or two sheets of polyethylene film covering, separated by 300 mm of dry straw.

Concrete damaged as a result of inadequate protection against weather conditions shall be removed and replaced by the Contractor at his own expense.

When air temperature is at or will be above 27°C during the basic curing period, curing shall be accomplished in accordance with the requirements of CSA A23.1.

9.9 Opening to Traffic

In no case shall traffic or construction equipment be allowed on the pavement until the concrete has reached a minimum compressive strength of 20 MPa, as determined by additional field cured cylinders.

If an early opening requirement is included in the Contract, a compressive strength of 20 MPa shall be attained within the specified opening time.

The Contract Administrator's decision as to when the pavement will be opened to traffic shall be final. Prior to opening to traffic, the pavement shall be swept clean.

9.10 Temporary Restoration of Utility Pavement Cuts

Prior to the placement of concrete for temporary restoration of utility pavement cuts, stabilized fill material shall be placed to within 150 mm (minimum) to 250 mm (maximum) of the top of the existing pavement surface in accordance with CW2160.
Upon acceptance of the placed stabilized fill by the Contract Administrator, the contractor shall place concrete supplied in accordance with the requirements of Clause 6.6 of this specification.

All snow, ice and loose concrete or asphalt along the edges shall be removed before placement of concrete.

The concrete shall be placed by hand methods and finished to match the existing pavement surface.

When air temperatures at time of concrete placement are less than 0°C, the concrete shall be covered with insulated tarps for a minimum of 24 hours prior to opening to traffic.

10. QUALITY ASSURANCE

10.1 Testing Frequency

The Contract Administrator shall ensure the number and frequency of quality assurance tests as follows:

One concrete test shall consist of:
Slump test
Air test
One lab cure cylinder – 7 day break
Two lab cure cylinders – 28 day break

Slip Form or Hand Pour:

<100 cu.m. per day – The minimum testing frequency per day for each mix design shall be one test on the first truck, then one test every 30 cu.m. or part thereof.

> 100 cu.m. per day - The minimum testing frequency per day for each mix design, shall be one test on the first truck, then one test every 100 cu.m. or part thereof.

If any air or slump test fails for any concrete load in the day's pour, continue to test slump and air on succeeding trucks until consistency is established.

Additional testing shall be as directed by the Contract Administrator. To establish the field strength for early opening of pavement, take additional field cure cylinders with a break time to match the concrete mix.

Copies of all test results shall be sent to the Research and Standards Engineer for the Public Works Department and to the Contract Administrator.

Copies of Plant Batch tickets shall be sent to the Research and Standards Engineer for the Public Works Department upon request by the Research and Standards Engineer.

10.2 Concrete Quality

Slump tests shall be made in accordance with CSA A23.2-5C, Slump of Concrete. If the measured slump falls outside the limits specified in Clause 6 of this Specification, a second test shall be made.

In the event of a second failure, the Contract Administrator reserves the right to refuse the use of the batch of concrete represented.

Air content determinations shall be made in accordance with CSA A23.2-4C, Air Content of Plastic Concrete by the Pressure Method. If the measured air content falls outside the specified limits, a second test shall be made at any time within the specified discharge time limit for the mix. In the event of a second failure, the Contract Administrator reserves the right to reject the batch of concrete represented.

Samples of concrete for all slump, air, and strength tests shall be taken in accordance with CSA A23.2-1C, Sampling Plastic Concrete.

Test specimens shall be made and cured in accordance with CSA A23.2-3C, Making and Curing Concrete Compression and Flexure Test Specimens.

Compressive strength tests of concrete cylinders shall be conducted in accordance with CSA A23.2-9C. Compressive Strength of Cylindrical Concrete Specimens.

Compressive strength tests on specimens cured under the same conditions as the concrete works shall be made to check the strength of the concrete so as to determine if the pavement may be opened to traffic, and also to check the adequacy of curing and/or cold weather protection.

Where compressive strengths do not meet the specifications, the City shall require actions be taken in accordance with CSA A23.1. Cost of additional testing including core removal, core testing and repair of core holes shall be paid for by the contractor.

Where scaling of the concrete surface occurs during the Warranty Period, as determined by the Contract Administrator, the Contractor shall solely, at his expense, retexture the scaled areas by mechanical means acceptable to the Contract Administrator or replace the full thickness of pavement for those areas.

10.2 Concrete Pavement Roughness

As a basis for acceptance, the surface of the finished concrete pavement shall be checked with a 3 metre long metal straight edge and be within plus or minus 5 mm. Areas of pavement that do not meet these tolerances shall be corrected to the satisfaction of the Contract Administrator.

10.3 Addition of Water and/or Air Entraining Admixture

After initial mixing no water and/or air entraining admixture may be added except if, at the start of discharge the measured slump of the concrete or the measured air content of the concrete is less than that specified and no more than 60 minutes have elapsed from the time of batching to the start of discharge. Water added shall not exceed 12 litres per cubic metre as measured by an approved measuring device.

Air entraining admixture shall be added as required to meet specified allowable air content ranges. The mixer drum shall be turned a minimum of 30 revolutions at mixing speed and the slump and air content shall be retested.

10.4 Acceptance Criteria

Acceptance criteria for compressive strengths of laboratory cured cylinders shall conform to CSA A23.1.

12. METHOD OF MEASUREMENT

12.1 Concrete Pavements, Median Slabs, Bull-noses and Safety Medians

Construction of concrete pavements, median slabs, bull-noses and safety medians will be measured on a surface area basis. The surface area to be paid for shall be the total number of square metres constructed in accordance with this Specification and accepted by the Contract Administrator, as computed from measurements made by the Contract Administrator.

12.2 Concrete Pavements for Early Opening

Construction of concrete pavements for early opening will be measured on a surface area basis. The surface area to be paid for shall be the total number of square metres constructed in accordance with this Specification and accepted by the Contract Administrator, as computed from measurements made by the Contract Administrator.

12.3 Concrete Curbs, Curb and Gutter, and Splash Strips

Construction of concrete curbs, curb and gutter, and splash strips will be measured on a linear measure basis. The length to be paid for shall be the total number of metres constructed in accordance with this Specification and accepted by the Contract Administrator, as computed from measurements made by the Contract Administrator.

12.4 Dowel Assemblies

Supply and installation of dowel assemblies, including epoxy-coated dowels, will be measured on a linear measure basis. The length to be paid for shall be the total number of metres of transverse joints in which the dowel assemblies are supplied and installed in accordance with this Specification and accepted by the Contract Administrator, as computed from measurements made by the Contract Administrator.

12.5 Tie Bars

Supply and installation of tie bars, except for drilled tie bars, shall be incidental to the construction of Portland cement concrete pavements.

13. BASIS OF PAYMENT

13.1 Concrete Pavements, Median Slabs, Bull-noses and Safety Median

Construction of concrete pavements, median slabs, bull-noses and safety median will be paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification. The unit price shall be reduced for deficiencies in pavement thickness as per Clause 13.3 of this Specification.

Items of Work:

i. "Construction of 250 mm Concrete Pavement (**)(***)"
ii. “Construction of 230 mm Concrete Pavement (**)(***)”
iii. “Construction of 200 mm Concrete Pavement (**)(***)”
iv. “Construction of 150 mm Concrete Pavement (**)(***)”
v. “Construction of Concrete Median Slabs (*)”
vi. “Construction of Monolithic Concrete Median Slabs (*)”
vii. “Construction of Concrete Safety Medians (*)”
viii. “Construction of Monolithic Curb and Sidewalk (*)”
ix. “Construction of Monolithic Concrete Bull-noses”

* Specify referenced Standard Detail
** Specify either Reinforced or Plain-Dowelled
*** Specify Slip Form Paving if required.

13.2 Concrete Pavements for Early Opening

Construction of concrete pavements for early opening will be paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification. The unit price shall be reduced for deficiencies in pavement thickness as per Clause 13.3 of this Specification.

Items of Work:

i. "Construction of 250 mm Concrete Pavement for Early Opening (*)(**)(***)”
ii. “Construction of 230 mm Concrete Pavement for Early Opening (*)(**)(***)”
iii. “Construction of 200 mm Concrete Pavement for Early Opening (*)(**)(***)”
iv. “Construction of 150 mm Concrete Pavement for Early Opening (*)(**)(***)”

* Specify either 24 hour or 72 hour
** Specify either Reinforced or Plain-Dowelled
*** Specify Slip Form Paving if required.

13.3 Pavement Thickness Tolerances

At the option of the Contract Administrator, pavement thickness may be determined by coring pavement sections representing each day's pour and determining the pavement thickness by averaging the depth of the cores.

Pavement found deficient in thickness by more than five (5%) percent shall be paid for at the reduced price. The reduced price = P_R x contract price;

P_R is in % and T_D is in %

Where: $P_R = 100 - [(T_D - 5) / 5]$ x 25
Where: T_D = thickness deficiency greater than or equal to 5%, up to 10%.

When the pavement thickness is deficient by more than ten (10%) percent and the judgement of the Contract Administrator is that the area of such deficiency should not be removed and replaced, payment will be fifty (50%) percent of Contract Unit Price.

The cost of initial cores will not be paid for by the Contractor. Additional cores requested by the Contractor to determine the extent of areas deficient in thickness, shall be paid for by the Contractor.

13.4 Concrete Curbs, Curb and Gutter, and Splash Strips

.1 Construction of concrete curbs, curb and gutter, and splash strips will be paid for at the Contract Unit Price per metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work:

i. "Construction of Barrier Curb (*)"
ii. “Construction of Modified Barrier Curb (*)”
iii. “Construction of Curb and Gutter (*)”
iv. “Construction of Mountable Curb (*)”
v. “Construction of Lip Curb (*)”
vi. “Construction of Curb Ramp (*)”
vii. “Construction of Safety Curb (*)”
viii. “Construction of Splash Strips (**)”

* Specify height, type and Referenced Standard Detail
**Specify height, monolithic or separate, type, width, and referenced Standard Detail

.2 No measurement or payment shall be made for supply or placement of bonding grout for concrete curbs.

.3 Drilled curb ramp tie bars are to be paid in accordance with CW 3230.

13.5 Dowel Assemblies

Supply and installation of dowel assemblies will be paid for at the Contract unit Price per metre for "Supply and Installation of Dowel Assemblies", measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

13.6 Drilled Tie Bars and Dowels

Supply and installation shall be in accordance with 9.2.3 of this Specification.

CW 3410 – ASPHALTIC CONCRETE PAVEMENT WORKS

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CW 3410 - ASPHALTIC CONCRETE PAVEMENT WORKS

1. GENERAL CONDITIONS

The General Conditions and Standard Provisions attached hereto shall apply to and be a part of this Specification.

3. DESCRIPTION

This Specification shall cover the preparation of hot-mixed, hot-laid, asphaltic concrete paving mix for, and all placing operations relating to, the construction of asphaltic concrete base courses, pavements, overlays and other related pavement works.

The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

5. MATERIALS

5.1 General

The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification.

5.2 Handling and Storage of Materials

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

5.3 Testing and Approval

All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.

The Contract Administrator shall approve all materials before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specification detailed herein or are found to be defective in manufacture or have become damaged in transit, storage or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

5.4 Asphaltic Concrete Constituent Materials

5.4.1 Aggregates

The Contractor shall furnish in writing to the Contract Administrator the location of the sources where aggregate will be obtained in order that same may be inspected and tentatively approved by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract will not be permitted without notification in writing to and the express approval of the Contract Administrator.

(a) Fine Aggregate

Fine aggregate shall consist of sand having clean, hard, strong, durable, uncoated grains free from injurious amounts of dust, soft or flaking particles, shale, alkali, organic matter, loam or other deleterious substances.

(b) Coarse Aggregate

Coarse aggregate shall consist of natural gravel, crushed stone or other approved materials of similar characteristics having clean, hard, strong, durable, uncoated particles free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic or other deleterious matter.

Crushed stone shall consist of angular, cubical fragments of aggregate of uniform quality throughout. It shall be produced from rock formations or from boulders and stones and shall be from sources of approved nature and origin. Coarse aggregate will not be accepted from rock formations or from boulders and stones containing intrusions or stratifications of an undesirable nature or from source showing signs of disintegration from the elements or other causes.

Coarse aggregate shall conform to the following additional requirements:

(i) Soundness - Coarse aggregate when subjected to five cycles of the soundness test shall have a weighted loss of not more than twelve (12%) percent when sodium sulphate is used or not more than eighteen (18%) percent when magnesium sulphate is used, or have in the opinion of the Contract Administrator a satisfactory soundness record. The method of testing shall be in accordance with ASTM Standard C88, Test for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.

(ii) Abrasion - Coarse aggregate when subjected to the abrasion test shall have a loss of **not more than thirty-five (35%) percent** by weight, of any hand picked portion of a sample containing a minimum of one and a half (1.5%) percent by weight of the original sample. The method of testing shall be in accordance with ASTM Standard C131, Test for Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine.

(iii) Crushed Aggregate - Aggregate retained on a No. 5 000 sieve shall contain not less than the percent of crushed aggregate as determined by actual particle count and as shown in Table 1 CW 3410.R5.1.

5.4.2 Asphalt Cement

The asphalt cement shall be prepared by the refining of petroleum, it shall be uniform in character and shall not foam when heated to 175^{o}C.

150 - 200(A) Grade asphalt cement shall conform to the requirements specified in the following table:

Test Characteristics	A.S.T.M. TEST Methods	150-200 (A)
Kinematic Viscosity, 135°C, mm^2 /s	D2171	The viscosity and penetration values must fall within the area bounded by A to B to C to D to A, plotted as straight lines on a full logarithmic plot (log-log) as shown on Fig. CW 3410.1-R5, with the co-ordinates of the points as follows:
Penetration, 25°C, 100 g, 5 s in dmm	D5	Point A: Abs. Visc. 360, Pen. 150 Point B: Abs. Visc. 255, Pen. 150 Point C: Abs. Visc. 205, Pen. 200 Point D: Abs. Visc. 285, Pen. 200
Flash Point, Cleveland Open Cup, min. °C.	D92	205
Solubility in Trichloroethylene, min. %	D2042	99.5
Tests on Residue from Thin-Film Oven Test:	D1754	
Ratio of Absolute Viscosity of Residue from Thin-Film Oven Test to Original Absolute Viscosity, max.	D2171	4.0
Ductility, 25°C, 5 cm/min., min., cm	D113	100
15.56°C, 5 cm/min., min., cm		--

5.4.3 Mineral Filler

Mineral filler, when required, shall consist of finely divided mineral matter such as rock dust, slag dust, hydrated lime, hydraulic cement, fly ash, loess or other suitable mineral matter, and shall conform to the requirements of ASTM Standard D242, Standard Specification for Mineral Filler for Bituminous Paving Mixtures.

FIGURE CW 3410.1-R5

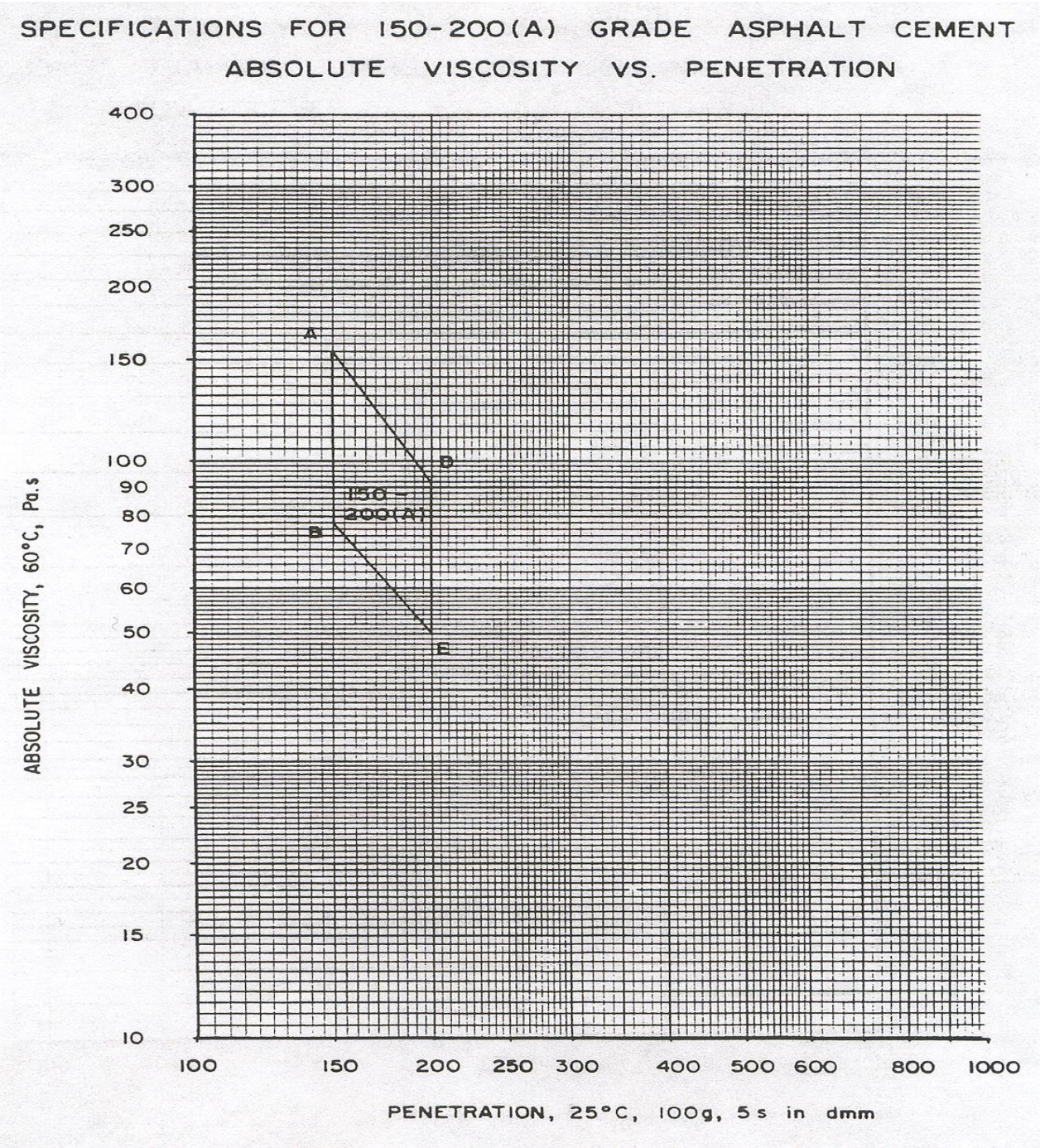
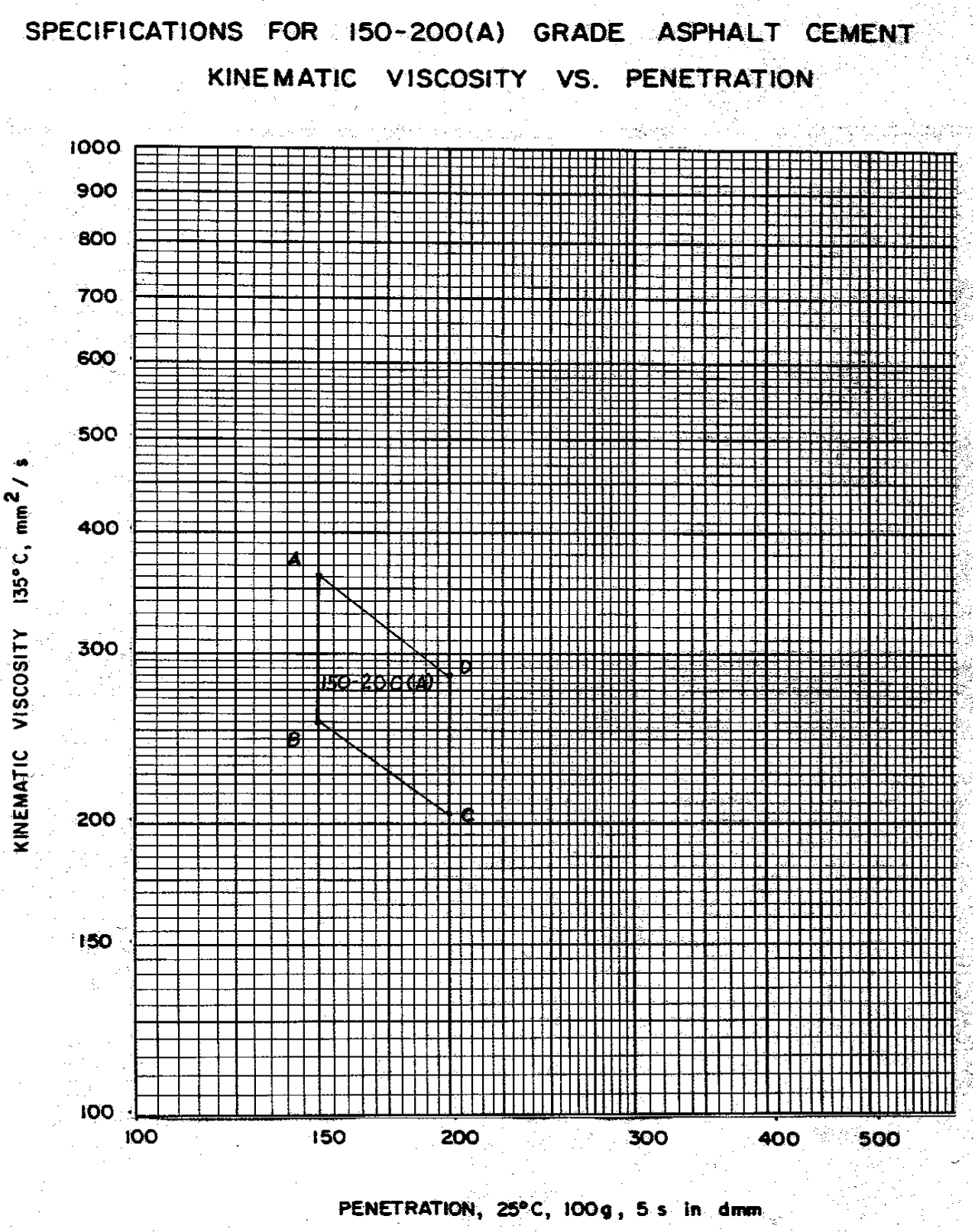


FIGURE CW 3410.2-R5



5.5 Incidental Materials

5.5.1 Prime Coat

Prime coat shall consist of either an emulsified or cutback asphalt. Selection shall be based upon existing field conditions and shall be subject to the approval of the Contract Administrator. Method of application shall conform to manufacturer's recommendations.

5.5.2 Tack Coat

Tack coat shall consist of either an emulsified or cutback asphalt. Selection shall be based upon existing field conditions and shall be subject to the approval of the Contract Administrator. Method of application shall conform to manufacturer's recommendations.

5.5.3 Miscellaneous Materials

Miscellaneous materials shall be of the type specified on the Drawings or approved by the Contract Administrator.

5.5.4 Reclaimed Asphalt Pavement

Reclaimed asphalt pavement (RAP) shall be processed hot mix asphaltic concrete material recovered from planing or full depth removal.

The reclaimed asphalt pavement material shall consist of sound durable particles produced by crushing and screening.

5.5.5 Recycled Asphalt Shingles

Blending of recycled asphalt shingles (RAS) material shall be during production of the asphalt and the mix produced shall consist of a uniform blend of all materials.

6. DESIGN REQUIREMENTS FOR ASPHALTIC CONCRETE PAVING MIX

6.1 Mix Design Statement

For each type of asphaltic paving mix to be used, the Contractor shall provide the Contract Administrator with a Mix Design Statement certifying the constituent materials and mix proportions that will be used in the asphaltic concrete paving mix. The Contractor shall also supply reasonable evidence to the Contract Administrator that the mix proportions selected will produce asphaltic concrete conforming to the requirements specified in Sections 6.2, 6.3 and 6.4 of this Specification.

One (1) week prior to the start of paving the Contractor shall provide the Contract Administrator with the results of three (3) separate sets of Marshall Tests to show that the requirements of the mix design statement have been met. Where a correction of the mix design statement is necessary to reflect actual production, the Contractor will submit to the Contract Administrator a minimum of five (5) separate sets of Marshall test results for approval of the corrected mix design statement. This mix design statement, or revised mix design statement, as necessary, will be called the Job Mix Formula.

Should a change occur in the Job Mix Formula during the course of the work, the Contractor shall re-submit to the Contract Administrator a minimum of five (5) separate sets of Marshall test results to support approval of the revision.

Should a lengthy break occur in the paving operation, the Contract Administrator may request that the Contractor submit the results of three (3) recent, separate sets of Marshall test results as evidence that the Job Mix Formula is being achieved.

No changes in the Job Mix Formula will be permitted without following the above procedure.

6.2 Aggregate Gradation Requirements

For each type of paving mixture, the mineral constituents shall be combined in such proportions so as to fall within the Gradation Limits shown in Table 1 - CW 3410-R5.1, unless the Contractor can conclusively show to the Contract Administrator that he can meet the physical requirements specified in Section 6.4 only by deviating from these gradation limits.

6.3 Allowable Deviation from Job Mix Formula

6.3.1 Aggregate Gradation

The aggregate gradation of the asphaltic concrete supplied by the Contractor shall not deviate from that of the Job Mix Formula by more than the Allowable Deviations shown hereafter and shall fall within the gradation limits shown in Clause 2.04 Table 1 - CW 3410-R5.1.

MAXIMUM ALLOWABLE DEVIATION FROM JOB MIX FORMULA	
CANADIAN METRIC SIEVE SIZE	**PERCENT OF TOTAL DRY WEIGHT PASSING EACH SIEVE**
10 000	± 5%
5 000	± 5%
2 500	± 4%
1 250	± 4%
630	± 4%
315	± 4%
160	± 2%
80	± 2%

6.3.2 Asphalt Cement Content

The asphalt cement content of the asphaltic concrete supplied by the Contractor shall not deviate from that of the Job Mix Formula by more than ± 0.4%, provided that the asphalt cement content requirements are maintained in accordance with Table 2 - CW 3410-R5.2 of this Specification.

6.4 Physical Requirements

For each type of paving mixture, the asphaltic concrete paving mix shall conform to the physical requirements shown in Table 2 - CW 3410-R5.2.

6.5 Method of Testing

The aggregate gradation and physical properties of asphaltic concrete paving mix shall be determined in accordance with the requirements of Sections 10.4 and 10.5 of this Specification.

6.6 Reclaimed Asphalt Pavement Content

Reclaimed asphalt pavement (RAP) material may be incorporated to a maximum of 10% by mass of total mix into the Type 1A mix design for asphalt pavements and overlays.

Blending of the reclaimed asphalt pavement material shall be during production and the mix produced shall consist of a uniform blend of all materials.

A mix design statement in accordance with section 6.1 shall be submitted to the Contract Administrator for approval.

All physical requirements and combined aggregate gradation limits shall met the requirements of Table 1 – CW 3410-R5.1 and Table 2 – CW 3410-R5.2.

6.7 Recycled Asphalt Shingles

RAS material shall consist of sound durable particles produced from recovered organic asphalt shingles, asphalt caps and asphalt rolled roofing. Fiberglass shingles are not allowed.

Recycled asphalt shingles (RAS) material shall be incorporated to a maximum 3% by weight of the total mix into Type 1A mix design asphalt.

RAS particles shall be a maximum size of 10mm and otherwise shall meet the grading limits in Table 3410-R5.1 and physical requirements in Table 3410-R5.2.

RAS shall be free of chemical contaminants. Deleterious substances shall be a maximum of 3% of RAS by weight. Deleterious substances include fiberglass shingles, metal, glass, rubber, nails, soil, brick, tars and asbestos.

A mix design statement in accordance with section 6.1 shall be submitted to the Contract Administrator for approval.

7. SUPPLY OF ASPHALTIC CONCRETE PAVING MIX

7.1 Mixing Plant

The asphaltic concrete paving mix shall be supplied from an approved mixing plant. The mixing plant shall be a batch mix plant, a continuous mix plant or a drum mix plant, conforming to the requirements of ASTM Standard D995, Specifications for Requirements for Mix Plants for Hot-Mixed, Hot-Laid, Bituminous Paving Mixtures.

Table 1
CW 3410-R5.1

COMBINED AGGREGATE GRADATION LIMITS				
Percent of Total Dry Weight Passing Each Sieve				
Canadian Metric Sieve Size	**Type 1A (Surface Course) %**	**Type I (Surface Course) %**	**Type II (Surface Course) %**	**Type III (Base Course) %**
40 000				100%
25 000				90% to 100%
16 000	99% to 100%	100%		60% to 90%
12 500	--	--		56% to 80%
10 000	70% to 88%	70% to 85%	100%	--
5 000	55% to 70%	45% to 70%	90% to 95%	29% to 59%
2 500	40% to 60%	25% to 55%	74% to 80%	20% to 50%
1 250	25% to 50%	20% to 40%	55% to 64%	--
630	15% to 40%	15% to 30%	35% to 46%	15% to 30%
315	5% to 28%	5% to 20%	22% to 30%	5% to 17%
160	4% to 11%	--	--	--
80	3% to 7%	3% to 6%	8% to 11%	1% to 7%
Crush Count: (Clause 5.4.1 (b) (iii)	60% min. (2 fractured faces)	50% min. (1 fractured face)	--	60% min. (2 fractured faces)

Table 2
CW 3410-R5.2

				PHYSICAL REQUIREMENTS
	Type 1A (Surface Course) %	**Type I (Surface Course) %**	**Type II (Surface Course) %**	**Type III (Base Course) %**
Asphalt Cement, % total sample weight	5.0% to 6.0%	5.0% to 6.0%	5.0% to 7.0%	4.0% to 5.5%
Voids in Mineral Aggregate, VMA	14.0% min.	14.5% min.	16.0% min.	12.0% min.
Air Voids	3.0% to 5.0%	2.5% to 5.0%	2.5% to 5.0%	2.5% to 5.0%
Marshall Stability, kN at 60°C	7 min.	5 min.	4 min.	5 min.
Flow Index, units of 250 µm	6.0 to 16.0	6.0 to 16.0	6.0 to 16.0	6.0 to 16.0

7.2 Batch Mix and Continuous Mix Plant Operations

7.2.1 Aggregate Storage

The different sizes of aggregate used shall be kept separate and adequate provision shall be made to keep them from becoming mixed or otherwise contaminated.

7.2.2 Preparation of Asphalt Cement

The asphalt cement shall be heated at the paving plant to a temperature of 135°C to 160°C before mixing with the aggregates. The temperature of the asphalt cement and aggregates immediately prior to mixing shall be approximately that of the completed batch. In no case shall the temperature of the asphalt and aggregates differ by more than l5°C when placed in the pug mill. The penetration of the asphalt cement shall be maintained within the limits of penetration specified.

7.2.3 Preparation of Mineral Aggregate

The coarse and fine aggregate shall be fed by feeders to the cold elevators in their proper proportions and at a rate to permit correct and uniform temperature control of the heating and drying operation. The aggregates shall be dried and delivered to the mixer at a temperature between 135°C and 160°C. The temperature between these limits shall be regulated according to the penetration grade of the asphalt, temperature of the atmosphere and workability of the mixture, but shall be as low as possible consistent with proper mixing and laying. Immediately after heating, the aggregates shall be screened into bins with separation on such coarse sieves as the number of bins permits. All aggregates in the bins that contain sufficient moisture to cause foaming in the mixture shall be removed and replaced in their respective stockpiles.

7.2.4 Preparation of Asphaltic Concrete Paving Mix

Each size of hot aggregate and the asphalt cement shall be measured separately and accurately to the proportions in which they are to be mixed. When the mixture is prepared in a twin pug mixer, the volume of mineral aggregate and asphalt cement shall not be so great as to extend above the tips of the mixer blades when these blades are in a vertical position. For batch mixing, the aggregates shall be mixed dry for a period of not less than 15 seconds, after which the asphalt cement shall be added and the mixing continued for a period of at least 30 seconds or longer if necessary to produce a uniform homogeneous mixture in which all particles of the mineral aggregate are thoroughly and uniformly coated. For continuous mixing, the total mixing time shall be not less than 45 seconds when calculated by the formula in Section 4.4 of ASTM Standard D995 or longer if necessary to produce a homogeneous mixture.

7.2.5 Mixing Plant Inspection

The Contract Administrator shall have access at any time to all parts of the mixing plant in order to ensure the manufacture of the mixture in strict accordance with this Specification.

7.3 Drum Mix Plant Operations

Drum mix plants, as approved by the Contract Administrator, shall conform to the requirements of Section 5.4 of Manitoba Highways and Transportation Specification Number 800 for Bituminous Pavement.

7.4 Transportation of Asphaltic Concrete Paving Mix

The mixture shall be transported from the mixing plant to the work in tight vehicles with metal bottoms previously cleaned of all foreign materials. The Contractor shall ensure that the vehicles are suitably insulated, as required. Each vehicle shall be equipped with a tarpaulin or other suitable covering material of sufficient size to overhang the truck box on three sides when the vehicle is fully loaded. Such tarpaulins shall be on the truck at all times and shall be used to cover the mixture completely as directed by the Contract Administrator. The inside surface of all vehicles used for hauling mixture may be lightly lubricated with thin fuel oil, paraffin oil, lime water or soap solution just before loading, but an excess of lubricant will not be permitted. No loads of mixture shall be dispatched from the plant after sunset or during hours of darkness unless loads can be placed and compacted in accordance with this Specification and suitable artificial illumination is provided, all of which shall be subject to approval of the Contract Administrator. In no case shall temperatures be increased above 165^{o}C at the plant to offset long distance hauling.

8. EQUIPMENT

All equipment shall be of a type approved by the Contract Administrator. The equipment shall be in good working condition and shall be so maintained for the duration of the Contract.

9. CONSTRUCTION METHODS

9.1 Base Preparation

9.1.1 Preparation of Base for Asphaltic Concrete Pavement

The placing of the asphaltic concrete paving mixture shall not commence until the construction of the sub-grade, sub-base and base course has been completed in accordance with the requirements of Specification CW 3110, and the installation of pavement and boulevard structures and appurtenances has been completed to the satisfaction of the Contract Administrator.

9.1.2 Preparation of Existing Pavement for Asphaltic Concrete Overlay

(a) Existing Asphaltic Concrete Surface

A layer of the existing asphaltic concrete surface course shall be removed to such depth as is specified on the Drawings or as directed by the Contract Administrator. This work will be done and paid for in accordance with Specification CW 3450.

If the existing asphaltic concrete overlay is removed down to the existing Portland cement concrete pavement, the preparation of existing Portland cement concrete pavement for asphaltic concrete overlay shall be in accordance with Section 9.1.2 (b) of this Specification.

If the surface remaining after the removal of the specified layer of asphaltic concrete surface course is asphaltic concrete, the Contractor shall proceed to fill any remaining holes and depressions with asphaltic concrete paving mixture and compact said areas with a steel wheel roller. The asphaltic concrete surface upon which the asphaltic concrete overlay is to be placed shall be as true to grade and cross-section as possible, as approved by the Contract Administrator. At the locations designated on the Drawings and at any other locations designated by the Contract Administrator, the Contractor shall make adjustment to existing structures and appurtenances, reconstruct sections of curb, seal all cracks and do other repair works as required. The adjustment of existing structures and appurtenances shall be done and paid for in accordance with Specification CW 3210, and the curb renewal, crack sealing and other repair works shall be done and paid for in accordance with Specifications CW 3230, CW 3240, and CW 3250.

(b) Existing Portland Cement Concrete Pavement

At the locations designated on the Drawings and at any other locations designated by the Contract Administrator, the Contractor shall make adjustments to the existing structures and appurtenances, reconstruct sections of concrete pavement, reconstruct sections of curb, seal all joints and cracks and do other repair works as required. The adjustment of existing structures and appurtenances shall be done and paid for in accordance with Specification CW 3210, and the pavement reconstruction, curb renewal, joint and crack sealing and other repair works shall be done and paid for in accordance with Specifications CW 3230, CW 3240, and CW 3250.

9.2 Placing Asphaltic Concrete Paving Mixture

The Contract Administrator shall approve the surface upon which new asphaltic concrete paving mix is to be placed before the paving operations for that course may begin.

The first course shall be laid upon a surface which is dry, clean and free from standing water, and only when weather conditions are suitable. The cleaning operation shall be done with a mechanical street sweeper.

In the case of placing new asphaltic concrete pavement, the base course shall have been previously prepared with one uniform application of Prime Coat prior to the delivery of the asphaltic concrete paving mixture.

In the case of asphaltic concrete overlay, the existing pavement surface shall have been previously prepared with one uniform application of Tack Coat prior to the delivery of the asphaltic concrete paving mixture. The Tack Coat shall be applied in small quantities only sufficient to wet the pavement surface on which the overlay is to be placed.

The type and amount of Prime Coat/Tack Coat applied, and the method of application, shall be as recommended by the manufacturer and shall be subject to the approval of the Contract Administrator.

No paving course shall be started until any frost or moisture from previous inclement weather has evaporated to leave a dry surface. The surface course shall be laid only under such conditions that the Contract Administrator determines to be conducive to obtaining the specified results.

The mixture shall be delivered to the job and placed at a temperature optimum for proper compaction, taking into consideration the weather conditions, the temperature of the surface on which the mixture is to be placed, and the thickness of the lift. In no case shall the mixture be placed at a temperature of less than 125°C nor greater than 155°C.

Unless otherwise permitted by the Contract Administrator, the mixture shall be spread by means of a mechanical self-powered paver capable of spreading the mixture true to the line, grade and crown required.

Pavers shall be equipped with hoppers and distributing screws of the reversing type to place the mixture evenly in front of adjustable screeds. The mixture shall be dumped in the centre of the hoppers and care exercised to avoid overloading and slopping over of the mixture upon the base. When laying the mixture, pavers shall operate so as to provide as continuous an operation as possible at a speed of between three metres and six metres per minute as may be decided by the Contract Administrator. They shall be equipped with a quick and efficient steering device and shall have forward and reverse travelling speeds of not less than 30 metres per minute.

Pavers shall be capable of spreading the mixture, without segregation, in thicknesses of not less than 25 mm and not more than 75 mm. Placement widths shall vary from a minimum of 1.5 metres to a maximum of 4.5 metres unless approved by the Contract Administrator. They shall be equipped with blending or joint leveling devices for smoothing and adjusting all longitudinal joints between strips or courses of the same thickness. Pavers shall be equipped with screeds.

The term screed includes any strike-off device operated by cutting, crowding or other practical action which is effective on the mixtures at workable temperature without tearing, shoving or gouging the finished surface.

Where the thickness of the mixture exceeds 75 mm, the mixture shall be placed in two layers. The leveling course, shall be placed such that the final layer or surface course is of uniform thickness and of minimum thickness of 40 mm. Asphalt material shall be removed from curb inlet grates to ensure a minimum 100 mm vertical opening in the curb inlet grate.

9.3 Main Line Paving, Tie-Ins and Approaches

9.3.1 Main Line Paving

Main line paving shall include the placement of leveling and surface courses for pavements and overlays utilizing mechanical pavers with automatic grade control for; all through and parallel turning lanes greater than 15.0 metres in length, intersections through which the main line continues, and other lanes greater than 15.0 metres in length. Main line paving also includes major and minor intersecting side streets through and turning lanes over 15.0 metres in length.

Main line paving with mechanical pavers shall utilize automatic grade control, except for; intersections through which the main line continues where side street traffic must be maintained, and the side of the paver adjacent to active traffic.

Asphalt materials placed by mechanical pavers shall be placed in accordance with Section 9.2 of this specification.

Hand placed asphalt materials shall be spread and compacted to match the finished grade to the satisfaction of the Contract Administrator. The Contractor shall ensure that the amount of material delivered to the site is placed within the placement temperatures.

9.3.2 Tie-Ins and Approaches

Tie-Ins and Approaches shall include the placement of leveling and surface courses for pavements and overlays for all areas other than main line paving lanes. This includes intersecting side streets to the main road under construction except as noted in Section 9.3.1 of this specification, intersection turnouts, right turn cut-offs, median openings, and private approaches. Tie-ins include miscellaneous asphalt for temporary ramping, sidewalk in-fill and isolations.

Tie-Ins and approaches shall utilize mechanical pavers where possible with or without automatic grade control, or hand methods as approved by the Contract Administrator.

Asphalt materials placed by mechanical pavers shall be placed in accordance with Clause 9.2 of this specification.

Hand placed asphalt materials shall be spread and compacted to match the finished grade to the satisfaction of the Contract Administrator. The Contractor shall ensure that the amount of material delivered to the site is placed within the placement temperatures.

9.4 Asphalt Patching

Remove and replace existing asphalt pavements adjacent to proposed or renewed sidewalks and concrete approaches for grade adjustment to ensure drainage and rideability are maintained. Areas to be considered as asphalt patches shall be less than 1.5 metres in width. The locations requiring asphalt patching shall be shown on the Drawings or as directed by the Contract Administrator.

The Contractor shall saw cut the asphalt pavement full-depth along the limits designated. The asphalt pavement shall be removed and disposed of in accordance with CW 3110. Upon removal of asphalt,

the existing base materials shall be levelled and compacted. The Contractor shall place and compact base course material as required to a maximum thickness of 50 mm. The asphalt shall be Type 1A material and match the thickness of the existing pavement. The material shall be placed and compacted by hand methods in accordance with Clause 9.3 of this specification to the satisfaction of the Contract Administrator.

Any additional excavation or base work shall be paid for in accordance with CW 3110.

All costs incurred for asphalt removal, compaction of existing base materials and placement of base course and asphalt materials shall be included in the unit price for "Construction of Asphalt Patches".

9.5 Joints

Joints shall be constructed in a careful and workmanlike manner by experienced and competent personnel. Joints shall be smooth, well bonded and tightly sealed. Joints shall conform smoothly and accurately to adjacent pavement surfaces such that when tested with a 3 metre straight edge placed across the joint the distance between the straight edge and the surface of the pavement shall not exceed 5 mm at any point.

Longitudinal joints shall be made true to line and parallel to the pavement edge wherever practicable.

On straight sections the joint line shall not deviate from a straight line by more than 75 mm at any point. On curved or tapered sections the joint shall be shaped so as to be as smooth as possible. Jagged, stepped or wandering edges shall be reshaped to a smooth line, to the satisfaction of the Contract Administrator, before the adjacent mat is laid.

9.5.1 Location of Joints

The location of joints shall be subject to the approval of the Contract Administrator and in addition shall conform to the following requirements:

(a) Longitudinal Joints

Longitudinal joints shall not be located within 150 mm of a longitudinal joint in any underlying pavement structure.

(b) Transverse Joints

Transverse joints shall not be located within 2 m of any other transverse joint in the same paving course or within 1 m of a transverse joint in any underlying pavement structure.

Note: Longitudinal cold joints are to be avoided wherever possible. To facilitate this:

i. Transverse joints shall be established with sufficient frequency to allow the full width of the paving course to be placed in a single shift.
ii. No paving lane shall progress more than 500 m beyond the end of an adjacent paving lane in the same course without the prior approval of the Contract Administrator.

9.5.2 Preparation of Joints

(a) Hot Joints

Hot joints shall be considered to be those longitudinal joints between successive mats in which the previously laid mat retains sufficient heat to facilitate good bonding and sealing of the joint. The edge of the previously laid mat shall be inspected prior to laying the new mat. Any areas not conforming to line and grade or having a rounded-off top corner shall be cut out to the full depth of the mat to a minimum width of 100 mm and replaced with fresh material and compacted when laying the new mat.

(b) Cold Joints

Cold joints shall be considered to be those longitudinal and transverse joints where the existing pavement mat is at or near ambient temperatures and shall include joints against pavement mats laid on previous days and joints against existing pavement structures. Transverse joints shall be cut back to a straight line for the full depth and width of the mat. The transverse joint shall be cut back to a location such that the pavement immediately before the joint, where checked with a 3 m straight edge, exhibits no tapering or rounding down.

Longitudinal edges of existing mats shall be inspected before laying the new mat. Any areas not conforming to line and grade shall be cut out full depth to a minimum width of 150 mm and replaced with fresh material and compacted when laying the new mat. Any areas with a rounded off top corner shall be cut back to the full depth of the mat to form a vertical face with a square top corner.

Joints against existing asphaltic concrete pavements shall be prepared by saw cutting, cold planing or other method(s) approved by the Contract Administrator, such that the face of the existing pavement is vertical with a square top corner.
All contact surfaces of cold joints shall be painted with a thin uniform coat of tack before the new asphaltic concrete is placed against them.

9.5.3 Construction of Joints

Fresh asphaltic concrete shall not be placed against the existing mat until the joint preparation has been completed in accordance with 9.5.2 and is approved by the Contract Administrator. Immediately after placing and before initial rolling the joint shall be checked and "set-up" by experienced and competent personnel so that an absolute minimum of back patching is required after rolling.

The fresh mat shall be laid to an elevation such that, when compacted, it will conform accurately to the grade of the existing pavement. Wherever practicable, this shall be done using mechanical pavers equipped with suitable automatic joints matching controls.

Joints shall always be rolled before the remainder of the mat. Wherever practicable the joint shall be rolled with the roller travelling parallel to the joint and with a minimum of seventy-five (75%) percent of the width of the main roller(s) supported on the existing mat. After the first pass of the roller the joint shall be checked and corrected if necessary before any additional rolling is done.

9.6 Compaction of Asphaltic Concrete Paving Mixture

Compaction of the mixture shall be obtained by the methods specified hereinafter.

A rolling pattern shall be established by the Contractor and approved by the Contract Administrator. The Contract Administrator must approve any deviation from the rolling pattern.

9.6.1 Static Rolling

A minimum of two approved rollers will be required on every contract. When the output of the mixing plant exceeds 70 tonnes per hour an extra roller will be required for each additional 35 tonnes of mix produced per hour.

The speed of the roller shall not exceed five kilometres per hour and shall at all times be slow enough to avoid displacement of the hot mixture. Any displacements occurring as a result of reversing the direction of the roller or from any other cause shall at once be corrected. Rolling shall proceed continuously until all roller marks are eliminated and no further compression is possible. To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened by the use of water, limewater, or approved detergent. An excess of moisture will not be permitted.

Compaction of the paving mixture shall consist of three (3) separate rolling operations as follows:

(a) Breakdown Rolling

Breakdown rolling with a tandem steel wheel roller weighing between seven and nine tonnes shall commence as soon as possible after the mixture has been spread without causing undue checking and displacement of the mixture. Delays in rolling freshly spread mixture will not be tolerated. Rolling shall start longitudinally at the sides and proceed toward the centre of the pavement overlapping on successive trips by at least 150 mm. Breakdown rolling shall consist of at least two complete coverages by the roller.

(b) Intermediate Rolling

The intermediate rolling shall be performed with a self-propelled pneumatic-tired roller having a minimum wheel load of 1100 kilograms and minimum tire pressure of 450 kPa. Intermediate rolling shall begin while the mix is still of a temperature that will result in the maximum density from this operation.

(c) Final Rolling

The final rolling shall be performed with a tandem steel wheel roller weighing not less than nine (9) tonnes, and shall be undertaken while the paving mixture is still warm enough for the removal of roller marks. Where the width permits, the pavement shall be subjected to diagonal rolling in two directions, the second diagonal rolling crossing the lines of the first. Final rolling shall be carried on until there is no further evidence of consolidation.

9.6.2 Vibratory Rolling

Vibratory rollers shall be of a type designed for asphalt finish rolling. They shall provide for the adjustment of both amplitude and frequency of vibration, and shall be equipped with an automatic device that positively prevents the drum from vibrating unless the roller is moving.

The optimum combination of amplitude, vibration frequency and roller speed shall be determined by the Contractor and approved by the Contract Administrator except that the maximum rolling speed in m/min. shall not exceed the vibration frequency per minute divided by 40.

$$\text{Maximum rolling speed (m/min.)} = \frac{\text{vibration frequency (VPM)}}{40}$$

Where vibratory rollers are used, the rolling pattern shall in all cases include at least one complete coverage in the static mode as the final rolling pass.

9.6.3 Compaction of Areas Inaccessible to Rollers

Along curbs, manholes and similar structures and at all places not accessible to the roller, thorough compaction must be secured by means of hot tampers and at all contacts of this character the joints between these structures and the mixture must be effectively sealed.

9.7 Requirements After Final Rolling

After final rolling the surface of each course shall be smooth and true to the established crown and grade. Any low or defective spots shall immediately be remedied by cutting out the course, or planing to a depth of 40 mm, at such spots and replacing it with a fresh hot mixture that shall be immediately compacted to conform with the surrounding area and shall be thoroughly bonded to it. The surface of the finished pavement shall be free from depressions exceeding 5 mm as measured with a three (3) metre straight edge.

The measured in-place density of the completed course shall be an average of ninety-seven (97%) percent of the 75 Blow Marshall Density of the paving mixture, with no individual test being less than ninety-five (95%) percent.

9.8 Opening to Traffic

In no case shall traffic or construction equipment be allowed on the asphaltic concrete pavement until completion of quality control testing by the Contract Administrator and until the completed pavement has cooled to atmospheric temperature or to such other temperature, as may be approved by the Contract Administrator, that will ensure no deformation of the pavement surface under traffic loading.

The Contract Administrator's decision as to when the pavement will be opened to traffic shall be final.

10. QUALITY CONTROL

10.1 Inspection

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

10.2 Access

The Contract Administrator shall be afforded full access for the inspection and control testing of asphaltic concrete paving mixture and constituent materials, both at the site of work and at any plant used for the production of asphaltic concrete paving mixture, to determine whether the mixture is being supplied in accordance with this Specification.

10.3 Materials

All materials supplied under this Specification shall be subject to testing and approval by the Contract Administrator in accordance with Section 5.3 of this Specification.

10.4 Quality of Asphaltic Concrete Paving Mixture

Quality control tests will be used to determine the acceptability of the asphaltic concrete paving mixture supplied by the Contractor. The latest revisions of the test methods at the time of testing

shall be used.

The Contract Administrator shall obtain samples of asphaltic concrete paving mixture and of the constituent materials required for quality control tests. The Contractor shall make no charge for these materials.

An outline of some of the quality control tests that will be used to check the physical properties of the mixture, and to check the properties, gradations and proportions of the constituent materials is as follows:

Samples of mineral aggregates shall be taken in accordance with ASTM Standard D75, Standard Methods of Sampling Aggregates.

Samples of asphaltic concrete paving mixtures shall be taken in accordance with ASTM Standard D979, Standard Methods of Sampling Bituminous Paving Mixtures.

The determination of the particle size distribution of aggregates shall be made in accordance with ASTM Standard C136, Standard Method of Test for Sieve or Screen Analysis of Fine and Coarse Aggregates.

The specific gravity of aggregates shall be determined in accordance with ASTM Standard C127, Standard Method of Test for Specific Gravity and Absorption of Coarse Aggregate, and ASTM Standard C128, Standard Method of Test for Specific Gravity and Absorption of Fine Aggregate.

The determination of the percent of asphalt cement in asphaltic concrete paving mixtures and pavement specimens shall be made in accordance with ASTM D2172, Standard Methods of Test of Quantitative Extraction of Bitumen from Bituminous Paving Mixtures.

The percent air voids, the percent voids in the mineral aggregate, the Marshall density, Marshall stability and flow index shall be determined in accordance with the Standard Marshall Procedure (75 Blows) and in accordance with ASTM Standard D1559, Standard Method of Test for Resistance to Plastic Flow of Bituminous Mixtures using Marshall Apparatus.

10.5 Quality of Asphaltic Concrete Pavement

Quality control tests will be used to determine the acceptability of the compacted asphaltic concrete pavement, as placed and compacted by the Contractor. The latest revisions of the test methods at the time of testing shall be used.

Pavement specimens will be taken from each compacted pavement course by the Contract Administrator and the holes made by the removal of said specimens shall be carefully filled by the contractor with the approved asphaltic concrete paving mixture and thoroughly compacted, so as to conform in every way with the adjoining undisturbed pavement.

10.6 Quality Assurance

The Contract Administrator shall ensure the frequency and number of quality assurance tests for each type of asphalt as follows:

1. Marshall test:
   A minimum of 1 test for every 300 tonnes of production.

2. Densometer Density test:
   Frequency of tests below shall be per type of asphalt and per lift of asphalt:

   Production < 500t: A minimum of one field density test for every 50m per lane with a minimum of three (3) tests per site visit by the test lab.

   Production ≥ 500t: A minimum of one field density test for every 100m per lane.

3. Core Sample for thickness and density:
   For all production quantities per day below: A minimum of 3 core samples shall be sufficient for the entire contract if the type of asphalt produced, remains unchanged and production continues from day to day.

   Frequency of tests below shall be per type of asphalt and per lift of asphalt:

   Production <500t: A minimum of 3 core samples per day.

   Production ≥500t: One core sample for every 400m per lane with a minimum of 3 core samples per day.

Additional number and frequency of testing shall be determined by the Contract Administrator.

Copies of test results shall be sent to the Research and Standards Engineer at the Public Works Department and to the Contract Administrator in a timely manner.

An outline of the quality assurance tests that will be used to check the compaction of the completed asphaltic concrete pavement is as follows:

In-place density determinations shall be made in accordance with ASTM Standard D2950, Standard Method of Test for Density of Bituminous Concrete in Place by Nuclear Method.

Density determinations on pavement specimens shall be made in accordance with ASTM Standard D2726, Standard Method of Test for Bulk Specific Gravity of Compacted Bituminous Mixtures using Saturated Surface-Dry Specimens.

10.7 Corrective Action

The Contractor shall, at his own expense, correct such work or replace such materials found to be defective under this Specification in an approved manner to the satisfaction of the Contract Administrator.

12. METHOD OF MEASUREMENT

As a requirement of this Specification the Contractor, at his own expense, shall provide, install and operate a weigh scale convenient to the mixing plant and of such capacity as to accurately weigh any single loaded truck leaving the plant. The scale shall be tested by the proper authority at the Contractor's expense prior to any paving mix being weighed on said scale and the customary certificate shall be exhibited to the Contract Administrator upon request. Whenever considered

necessary by the Contract Administrator, the scale shall be re-tested at the Contractor's expense.

12.1 Construction of Asphaltic Concrete Pavement

Construction of asphaltic concrete pavement will be measured on a weight basis. The weight to be paid for shall be the total number of tonnes placed and compacted in accordance with this Specification and accepted by the Contract Administrator, as measured on a certified weigh scale.

12.2 Construction of Asphaltic Concrete Overlay

Construction of asphaltic concrete overlay will be measured on a weight basis. The weight to be paid for shall be the total number of tonnes placed and compacted in accordance with this Specification and accepted by the Contract Administrator, as measured on a certified weigh scale.

12.3 Construction of Asphaltic Concrete Base Course

Construction of asphaltic concrete base course will be measured on a weight basis. The weight to be paid for shall be the total number of tonnes placed and compacted in accordance with this Specification and accepted by the Contract Administrator, as measured on a certified weigh scale.

12.4 Construction of Asphalt Patches

Construction of asphalt patches will be measured on an area basis. The area to be paid for shall be the total number of square metres removed and placed in accordance with this Specification and accepted by the Contract Administrator, as computed from measurements made by the Contract Administrator.

13. BASIS OF PAYMENT

13.1 Construction of Asphaltic Concrete Pavement

Construction of asphaltic concrete pavement will be paid for at the Contract Unit Price per tonne for the "Items of Work " listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work:

Construction of Asphaltic Concrete Pavement
- i) Main Line Paving (*)
- ii) Tie-ins and Approaches (*)

* Specify either Type I, Type IA, or Type II

13.2 Construction of Asphaltic Concrete Overlay

Construction of asphaltic concrete overlay will be paid for at the Contract Unit Price per tonne for the "Items of Work " listed here below, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

Items of Work

Construction of Asphaltic Concrete Overlay
- i) Main Line Paving (*)
- ii) Tie-ins and Approaches (*)

* Specify either Type I, Type IA, or Type II

13.3 Construction of Asphaltic Concrete Base Course

Construction of asphaltic concrete base course will be paid for at the Contract Unit Price per tonne for "Construction of Asphaltic Concrete Base Course (Type III)", measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

13.4 Construction of Asphalt Patches

Construction of asphalt patches will be paid for at the Contract Unit Price per square metre for “Construction of Asphalt Patches”, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described and all other items incidental to the work included in this Specification.

CW 3510 – SODDING

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CW 3510 - SODDING

1. GENERAL CONDITIONS

The General Conditions and Standard Provisions attached hereto shall apply to and be a part of this Specification.

3. DESCRIPTION

This Specification shall cover the supply and placing of cultivated turfgrass sod in park areas and in boulevard and median areas adjacent to the pavement.

5. MATERIALS

5.1 General

The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All sod supplied under this Specification shall be subject to inspection and testing by the Contract Administrator and/or the City's designated turf inspector. There shall be no charge to the City for any materials taken by the Contract Administrator or the City's designated turf inspector for inspection purposes.

Sod will be subject to tests for nitrate, phosphate, potassium, sulphate, pH, E.C. (salinity), mineral soil layer thickness and its organic matter content by a testing laboratory designated by the Contract Administrator.

Tests conducted to determine the thickness of the mineral soil layer of the sod and it's percent of organic matter shall be done in accordance with standard operating procedures approved by the Contract Administrator for both receiving, and analysing sod samples.

Any sod placed on the Work Site that in the opinion of the Contract Administrator does not conform to the Specification detailed herein, shall be rejected by the Contract Administrator and replaced by and at the expense of the Contractor.

5.2 Topsoil

Topsoil shall be supplied in accordance with Clause 5.2 of CW 3540.

5.3 Turf Grass Sod

The Contractor shall supply turf grass sod with a mineral soil layer containing a minimum of seventy (70%) percent inorganic soil. Upon delivery or thirty (30) days following delivery, the salinity rating shall be less than 4.0 mm hos/cm on a saturated paste basis. The pH range shall be between 6.0 – 8.0. Sod supplied shall have been sown in nursery fields with Canada Certified No. 1 or Canada Certified No. 2 grass seed and mixed by percentage (%) of weight to meet the following certified seed blends or mixtures:

5.3.1 Athletic grounds and golf course fairways, sod shall contain a blend composed of:

One hundred (100%) percent Kentucky Bluegrass (100% Class 1 cultivars as specified in Clause 5.3.3, 3 cultivars in equal proportion).

5.3.2 For general park areas, boulevards, medians and interchange areas, sod shall contain:

a) A blend composed of one hundred (100%) percent Kentucky Bluegrass (100% Class 1or Class 2 cultivars as specified in Clause 5.3.3, 3 cultivars in equal proportion); or

b) A mixture of ninety-five (95%) percent Kentucky Bluegrass (100% Class 2 cultivars as specified in Clause 5.3.3, 3 cultivars in equal proportion) and five (5%) percent Creeping Red fescue.

5.3.3 Wherever Kentucky Bluegrass is specified, the proportion of the cultivars to be included in the blend shall adhere to the following:

Class 1 Cultivars – specified blend of Class 1 cultivars shall consist of equal proportions of any three of the following:

Able 1	Absolute	Allure	Award	Baron
Bartitia	Blacksburg	Blackstone	Caliber	Challenger
Chateau	Estate	Explorer	Kelly	Liberator
Limousine	Midnight	Misty	Northstar	NuGlade
Pick 151	Pick 8	Platini	Quantum Leap	Rambo
Rugby II	Serene	Shamrock	SR 2000	Total Eclipse
Touchdown	Unique	VB 16015	Wildwood	

Class 2 Cultivars – specified blend of Class 2 cultivars shall consist of equal proportions of any three of the following:

A34	Abbey	Alpine	America	Apollo
Arcadia	Ascot	ASP 200	Banff	Baronie
Baruzo	Bluechip	Cardiff	Champagne	Chicago
Classic	Compact	Conni	Coventry	Crest
Cynthia	Dragon	Eclipse	Fortuna	Glade
Goldrush	Haga	Huntsville	Impact	Indigo
Jefferson	Kenblue	Langara	Lipoa	Livingston
Marquis	Mercury	Moonlight	Nimbus	NuBlue
NuStar	Odyssey	Park	Pepaya	Pick 3
Pick 4	Pick 855	Princeton 105	Raven	Rugby
Seabring	Sodnet	SR 2100	SR 2109	Washington

5.3.4 Any variations to the above referenced seed blends or mixtures shall be approved by the Contract Administrator prior to placement of sod.

5.3.5 Turf grass sod shall be free of disease, turf damaging insects and any grass specifies, strains or cultivars other than specified herein.

5.3.6 At the time of delivery, the turf grass sod shall:

a) not contain more than ten (10) broadleaf weeds per fifty (50) square metres;

b) have been mowed to a height of 50 mm prior to delivery and be of sufficient density that no surface soil will be visible;

c) have a uniform inorganic soil layer thickness of not less than 12 mm and not greater than 19 mm and shall be consistent throughout all loads delivered to the work site;

d) have the organic thatch layer within the sod not exceed an uncompressed thickness of 12 mm and in all cases, the final rolled and compacted topsoil/sod growing medium shall be maintained at not less than 100 mm in depth.

5.4 Herbicides

Herbicides shall be standard commercial products registered for sale and use in Canada under the Pest Control Products Act.

5.5 Insecticides

Insecticides shall be standard commercial products registered for sale and use in Canada under the Pest Control Product Act.

9. CONSTRUCTION METHODS

9.1 Site Safety and Traffic Control

Where work is to be done in boulevard and median areas adjacent to roadways, the Contractor shall maintain traffic and ensure that protection is afforded to the road user and that the Contractor's operations in no way interfere with the safe operation of traffic.

The Contractor shall supply, erect and maintain all applicable traffic control devices in accordance with the provisions of the latest edition of the Manual of Temporary Traffic Control in Work Areas on City Streets issued by the Public Works Department of the City of Winnipeg.

9.2 Site Grading

Site grading will be done and paid for in accordance with Specification CW 3110.

9.3 General

The Contractor shall not commence sodding operations until the finished topsoil surface has been inspected and approved by the Contract Administrator.

The Contractor shall provide the Contract Administrator with a minimum of two working days notice for inspection of the finished topsoil surface.

9.4 Topsoil and Finish Grading

Preparation of the finished topsoil surface shall be completed in accordance with Specification CW 3540.

To prevent the formation of depressions or water pockets, the Contractor shall smooth out any undulations or irregularities in the topsoil surface prior to placing the sod.

9.5 Placement of Sod

The sod shall be placed evenly and closely packed together, leaving no open joints and no overlap on adjacent pieces of sod. Joints in adjacent rows shall be staggered, as shown in Standard Detail SD-243. A full row of sod, not less than 450 mm in width shall be placed along the perimeter of the sodded area, parallel to planting or walkway areas.

Where big roll sod is to be placed, the Contractor shall ensure that any reinforcement netting that may be used to assist with the harvesting and/or placement of the sod roll is removed before final placement of the sod.

On embankments, sod shall be placed lengthwise across the face of the slope. On slopes of 1 vertical to 3 horizontal (18 degrees) or steeper, in every second row on the slope and at the foot of the slope, each piece of sod shall be pegged with two minimum 250 mm long wooden pegs driven into the soil layer of the sod.

For slopes of 1 vertical to 2 horizontal (26 degrees) or steeper, each piece of sod in every row shall be pegged as indicated above.

Small, broken or irregular pieces of sod will be rejected.

All visible joints, low, bare or dead spots shall be repaired to the satisfaction of the Contract Administrator prior to the commencement of the Thirty (30) Day Maintenance Period described in Clause 9.7.

Sodding operations shall be completed within two working days after placing the sod. This shall be deemed to include watering, rolling, and repairing any visible joints and low, bare or dead spots within the sodded area.

Sod shall not be placed in a frozen state, or when any other conditions unfavourable to the successful transplanting of sod exist.

The Contractor shall not place sod after September 15 unless the Contract Administrator gives written approval to proceed.

Should the Contract Administrator provide written approval to, or direct the Contractor to place sod after September 15, and termination of the sod maintenance period is not achieved in accordance with Clause 9.10 in that same year, the Contractor will not be held responsible for sod damage over the winter due to winter-kill, ice damage, sand/salt applications on adjacent streets or from snow removal or spring clean up equipment. When the Contract Administrator provides written approval, or direction to the Contractor to place the sod after September 15, the City will assume all costs related to the spring replacement of sod damaged over the winter provided that the layover was due only to the late season start and not defective sod or maintenance not conforming to this Specification.

Where the Contractor places sod prior to September 15, and termination of the sod maintenance period is not achieved in accordance with Clause 9.10 in that same year, the Contractor shall be responsible for replacement of any sod damaged over the winter due to winter-kill, ice damage, sand/salt applications on adjacent streets, or from snow removal or spring clean up equipment.

9.6 Watering and Rolling

Immediately after placement of sod, the Contractor shall water the area in sufficient quantities and frequencies required to obtain root development and sod growth. All costs to provide water for sodded areas shall be borne by the Contractor. These costs may include hydrant permit and meter rental fees.

After the sod and topsoil has dried sufficiently to prevent damage, the areas shall be rolled (the edges pounded if necessary) with a mechanical roller minimum weight of 220kg and minimum width of 760mm to form a uniform even surface and level with adjoining existing grades, sidewalks and curbs. Heavy rolling to correct irregularities in grade will not be permitted. Sodded areas near existing fixtures that are unable to be rolled shall be thoroughly tamped to ensure a good bond between topsoil and sod.

9.7 Commencement of Thirty (30) Day Maintenance Period

Immediately after the sod has been placed to the satisfaction of the Contract Administrator, the Contractor shall provide and pay for continuous maintenance of the sodded area until the criteria specified for termination of the maintenance period in Clause 9.10 has been met.

The Contract Administrator will not allow the Thirty (30) Day Maintenance Period to commence until the following requirements are met:

i. Written approval has been granted by the Contract Administrator to place sod if after September 15.
ii. The nursery sod supplied meets the seed mixture requirement specified in Clause 5.3.
iii. The sod is free of bare and dead spots.
iv. The nursery sod does not contain more than 10 broadleaf weeds per 50 square metres.
v. Sodded area has been rolled to form a firm, uniform even surface.
vi. The sod has sufficient shoot density that no surface soil is visible within sod.
vii. The height of the top growth of the sod is between 50 - 60 mm.
viii. The sodded area is free of any visual obstructions such as leaves.
ix. Sodded area is free of any turf damaging insects.

Any deficient, damaged or vandalized areas shall be resodded by the Contractor within three working days after receiving notification from the Contract Administrator and the area so resodded, shall be further maintained until it meets the criteria specified in Clause 9.10.

In situations where the start of the Thirty (30) Day Maintenance Period is not granted by the Contract Administrator before the end of a growing season, the Thirty (30) Day Maintenance Period will commence on May 15 of the following year or such date as is mutually agreed upon by all parties, at which time all sodded areas must meet the requirements listed above.

9.8 Maintenance of Sodded Area

The Contractor shall mow the turf area at regular intervals to a height of between 50 - 60 mm. Do not cut more than thirty (30%) percent of the grass height at any one mowing. Remove clippings that will smother grassed areas.

The Contractor shall water sodded areas in sufficient quantities and frequencies required to maintain sod growth. All costs to provide water for sodded areas shall be borne by the Contractor. These costs may include hydrant permit and meter rental fees.

The Contractor shall clean and remove all dead vegetation, leaves, debris and snowmold from turf areas to encourage healthy and uniform grass growth.

Given the need for weed control, the Contractor shall have in his possession a Pesticide Applicator's License and a Pesticide Use Permit for pesticide applications related to this Specification.

The Contractor shall apply herbicide when broadleaf weeds start developing in competition with grass. Apply herbicide in accordance with the City of Winnipeg Weed Control Standards and Procedures, manufacturer's instructions and the Manitoba Agriculture Guide to Crop Protection and Herbicide Recommendations for Landscape Applicators, latest editions and the following criteria:

i. Use 2,4-D Amine or MCPA Amine herbicide for susceptible broadleaf weeds.
ii. Use a mixture containing 2,4-D Amine or MCPA Amine, Mecoprop and Dicamba for 2,4-D resistant plants.
iii. Do not apply to newly seeded turf until after the second or third mowing.
iv. Do not water within 24 hours after application.
v. Apply when winds are less than 20 km/h and air temperature is above 10° (degrees) Celsius.
vi. Avoid use of pure Dicamba solutions near trees and shrubs.

Given the need for insect control, the Contractor shall have in his possession a Pesticide Applicator's License and a Pesticide Use Permit for pesticide applications related to this Specification. Use standard commercial products in accordance with the manufacturer's instructions and the Manitoba Agriculture Guide to Crop Protection (latest edition) for the particular insect/insects involved.

Copies of the Pesticide Applicator's License and the Pesticide Use Permit must be submitted to the Contract Administrator prior to commencement of pesticide application.

All persons handling pesticides shall be fully aware of toxicological rules and regulations governing their use.

The Contractor shall inform the Contract Administrator immediately of any dangerous occurrence.

9.9 Spring Clean Up

Where termination of the sod maintenance period has not been achieved in accordance with Clause 9.10 prior to the end of a growing season, the Contractor shall complete all operations related to the clean up of the work area in the following spring. This shall include the cleaning and removal of all dead vegetation, leaves, debris, snowmold and any sand or gravel resulting from winter sanding/deicing operations from turf areas to encourage healthy and uniform grass growth.

All costs for spring clean up operations shall be borne by the Contractor if in the previous year, the termination of the sod maintenance period, in accordance with Clause 9.10 was not achieved in that same year or where the damage was due to defective sod or maintenance not conforming to this Specification.

9.10 Termination of Maintenance Period

The Contract Administrator will terminate the sod maintenance period after the following criteria has been met:

i. The work site is clean and the sodded area is free of any visual obstructions such as leaves.
ii. The sod is free of bare and dead spots and without more than 10 broadleaf weeds per 50 square metres.
iii. Grass roots are well anchored into the underlying topsoil and the sodded area has established into a healthy, vigorously growing condition.
iv. Sodded areas are free of visible joints.
v. The sod has sufficient shoot density that no surface soil is visible when the grass has been cut to a height of 50 – 60 mm.
vi. Sodded area has been cut to a height of 50 – 60 mm within two working days before the final inspection.
vii. Sodded area is free of any turf damaging insects.

If the sodded area does not meet the above criteria, the deficient area shall be resodded within three working days after receiving notification from the Contract Administrator and maintained by and at the expense of the Contractor in accordance with Clauses 9.7 and 9.8 herein.

In situations where the termination of the maintenance period is not granted by the Contract Administrator before the end of a growing season, the maintenance period will commence as described in Clause 9.7.

9.11 Site Clean Up

During both the placement and maintenance of sod, all sidewalks, streets, approaches, driveways and properties near the sodding operation shall be kept clean at all times by the Contractor.

Upon completion of the project, the Contractor shall immediately remove all excess material, debris and equipment from the work site.

12. METHOD OF MEASUREMENT

12.1 Sodding

Supply, placement and maintenance of sod will be measured on an area basis. The area to be paid for shall be the total number of square metres placed and maintained in accordance with this Specification and accepted by the Contract Administrator, as computed from measurements made by the Contract Administrator. No payment will be made for sod placed outside of the limits of placement as directed by the Contract Administrator.

13. BASIS OF PAYMENT

13.1 Sodding

Supply, placement and maintenance of sod will be paid for at the Contract Unit Price per square metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for supplying all materials and for completing all operations herein described and all other items incidental to the work included in this Specification. Payment for sodding shall be in accordance with the following:

- Seventy-five (75%) of quantity following supply and placement
- Remaining twenty-five (25%) of quantity following termination of the maintenance period.

Items of Work:

Sodding

i.) Width < 600 mm
ii.) Width $\geq$ 600 mm

CW 3540 – TOPSOIL AND FINISH GRADING FOR ESTABLISHMENT OF TURF AREAS

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CW 3540 - TOPSOIL AND FINISH GRADING FOR ESTABLISHMENT OF TURF AREAS

1. GENERAL CONDITIONS

The General Conditions and Standard Provisions attached hereto shall apply to and be a part of this Specification.

3. DESCRIPTION

This Specification shall cover the supply and placing of topsoil for areas to be sodded or seeded.

The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for an incidental to the satisfactory performance and completion of all work as shown on the Drawings and hereinafter specified.

5. MATERIALS

5.1 General

The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator and/or the City's designated turf inspector. There shall be no charge to the City for any materials taken by the Contract Administrator or the City's designated turf inspector for inspection and testing purposes.

Topsoil will be subject to tests for nitrate, phosphate, potassium, sulphate, pH, E.C. (salinity) and volume of organic matter by a testing laboratory designated by the Contract Administrator.

The Contract Administrator and/or the City's designated turf inspector will collect as many samples as are deemed necessary to ensure that a good representation of the entire topsoil shipment is provided for the soil analysis report.

5.2 Topsoil

All topsoil required shall consist of a screened clay-textured or loam-textured dark topsoil, a fertile, friable material neither of heavy clay nor of very light sandy nature containing by volume, a minimum of four (4%) percent for clay loams and two (2%) percent for sandy loams to a maximum twenty-five (25%) percent organic matter (peat, rotted manure or composted material) and capable of sustaining vigorous plant growth. Topsoil shall be free of subsoil contamination, roots, stones over 25mm in diameter, baler twine or subsoil clay lumps over 25mm in diameter and other extraneous matter. Topsoil shall not contain quackgrass rhizomes, Canada thistle roots or other noxious weeds. Upon delivery or thirty (30) days following delivery, salinity rating shall be less than 4.0mm hos/cm on a saturated paste basis. The pH range shall be between 6.0 - 8.0.

Topsoil may be either on-site topsoil or imported topsoil.

On-site topsoil which has been stockpiled, can be reused providing that it is shredded or screened prior to being re-spread and that it meets the requirements specified above for topsoil.

Topsoil shall not be blow-in dirt taken from wind erosion sites and topsoil shall not be taken from fields abandoned to corn production where such soil may contain soil incorporated herbicides, such as eradicane and atrazine with lasting residual effects.

The Contractor shall inform the Contract Administrator of proposed source of topsoil to be supplied. The Contract Administrator reserves the right to reject topsoil not conforming to the requirements of this Specification.

5.3 Fertilizer

Chemical fertilizer with an N-P-K analysis of 1-2-1 ratio at a rate to provide 48 kg actual Nitrogen, 96 kg actual Phosphate and 48 kg actual Potassium per hectare.

Fertilizer shall be standard commercial brands meeting the requirements of the Canada Fertilizer Act and the Canadian Fertilizer Quality Assurance Program.

All fertilizers shall be granular, pelletized or pill form, and shall be dry and free flowing.

9. CONSTRUCTION METHODS

9.1 Site Safety and Traffic Control

Where work is to be done in boulevard and median areas adjacent to roadways, the Contractor shall maintain traffic and ensure that protection is afforded to the road user and that the Contractor's operations in no way interfere with the safe operation of traffic.

The Contractor shall supply, erect and maintain all applicable traffic control devices in accordance with the provisions of the latest edition of the Manual of Temporary Traffic Control in Work Areas on City Streets issued by the Public Works Department of the City of Winnipeg.

9.2 Preparation of Existing Grade

Subsoil shall be graded in accordance with Specification CW 3110 to eliminate uneven areas and low spots, ensuring positive drainage. Any soil contaminated by toxic materials shall be removed and disposed off site.

All surface debris, roots, vegetation, branches and stones in excess of 25mm shall be removed.

Grades on the area to receive topsoil that have been previously established in conformance with the Construction Drawings and/or other applicable specifications shall be maintained in a true and even grade.

Prior to placing topsoil, all sub-grade areas within athletic fields and all athletic field "run out" areas as Identified on the construction drawings shall be scarified to a minimum depth of 75mm.

9.3 Placing of Topsoil

The Contractor shall not commence placement of topsoil until the sub-grade has been inspected and approved by the Contract Administrator.

The Contractor shall provide the Contract Administrator with a minimum of two working days notice for inspection of required grading.

The topsoil mix shall be applied to a minimum of 75 mm compacted depth for areas requiring sod and a 100 mm compacted depth for seeding areas. All areas shall be rolled with a mechanical roller of a minimum weight of 220kg and minimum width of 760mm.

Topsoil shall be manually spread around trees, shrubs and other obstacles.

The Contractor shall ensure that topsoil does not come in contact with new asphaltic concrete pavement that is less than 2 weeks old.

9.4 Application of Fertilizer

The Contractor shall provide the Contract Administrator with a report for each work site indicating the fertilizer formulation used, the rate of application and the date of application.

Fertilizer shall be spread uniformly over the entire area of topsoil at a rate to provide 48 kg actual Nitrogen, 96 kg actual Phosphate and 48 kg actual Potassium per hectare.

9.5 Finish Grading and Rolling

The area shall be fine graded and the topsoil loosened. Eliminate rough spots and low areas to ensure positive drainage. Prepare a loose friable bed by means of cultivation and subsequent raking.

Topsoil shall be rolled with a mechanical roller of a minimum weight of 220kg, minimum width of 760mm roller, to consolidate it in areas to be seeded or sodded, leaving the surface smooth, uniform, firm against deep foot printing and to the satisfaction of the Contract Administrator.

9.6 Site Clean-Up

All sidewalks, streets, approaches, driveways and properties near the Work Site shall be kept clean at all times by the Contractor.

Upon completion of the project, the Contractor shall immediately remove all excess material and debris from the Work Site.

12. METHOD OF MEASUREMENT

There shall be no separate measurement for the work associated with this Specification.

13. BASIS OF PAYMENT

Payment for work specified under this Specification is to be included with the price for either sodding or seeding.

CW 3550 – Chain Link and Drift Control Fence

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CW 3550 – Chain Link and Drift Control Fence

1. GENERAL CONDITIONS

The General Conditions and General Requirements shall apply to and be a part of this Specification.

3. DESCRIPTION

This Specification shall cover the supply and installation of chain link fencing and drift control fence.

The work to be completed by the Contractor under this Specification shall include the supply of all materials, and the furnishing of all superintendence, overhead, labour, equipment, tools and all other things necessary for and incidental to the satisfactory completion of all of the work as hereinafter specified.

5. MATERIALS

5.1 Drift Control Fence

5.1.1 Approved Products

Use only those materials listed as Approved Products for Surface Works. The Approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at: http://www.winnipeg.ca/matmgt/info.stm

5.1.2 Material Property Requirements

a) Colour – Safety Orange
b) Width – 1220 ± 50mm (4 feet ± 2inches)
c) Roll Length – 15.25m (50 feet) approximately
d) Roll Weight - 17.0 kg (40 lbs)
e) Material – High Density Polyethylene
f) Mesh Size – 65mm x 95mm (2.5”x3.75”)
g) Horizontal Ultimate Tensile Strength – 45 kg (100 lbs) minimum per average strand
Or 725kg (1600lbs) minimum per 1220mm (4 foot wide)
h) Vertical Ultimate Tensile Strength – 45kg (100 lbs) minimum per average strand
or 180 kg (400 lbs) minimum per lineal foot.

5.1.3 T-bar Steel Posts for Drift Control Fence

Steel posts for drift control fence shall be:
a) No. 2 – T-bar steel posts
b) Seven feet (7’) in total length
c) Weight - seven to nine pounds (7 – 9 lbs) minimum.
d) One side shall have a serrated edge

5.2 Chain Link Fence

5.2.1 General

All chain link fence materials shall conform to this Specification and the Canadian General Standards Board (CGSB) Specifications CAN/CGSB-138.1, CAN/CGSB-138.2 and CAN/CGSB-138.4. Where any contradictions occur, Specification CW 3550-R2 shall take precedence over CGSB Specifications.

5.2.2 Terminal Posts

Terminal posts, comprising of end, gate, corner and straining posts shall be standard seamless, continuous weld, schedule 40 hot dip galvanized steel pipe weighing 11.28 kg per lineal metre. Posts shall be supplied with weatherproof caps. Tubing, conduit or open seam material will not be accepted.

End, gate, corner and straining posts shall be of the lengths and dimensions shown in following table:

TABLE 1
CW3550-R2.1

Fence Height mm	Pipe Diameter (outside) mm	Pipe Length mm	Diameter & Depth of Conc. Pile * mm
1220	88.9	2440	300 x 1800
1830	88.9	3200	300 x 1800
2440	88.9	3810	300 x 1800
3050	88.9	4420	300 x 1800
3660	114.3	5030	400 x 1800
4880	114.3	6550	400 x 1800

* Only where concrete is specified for post installation

5.2.3 Line Posts

Line posts shall be standard seamless, continuous weld, schedule 40 hot dip galvanized steel pipe weighing 5.43 kg per lineal metre. Line posts for fence fabric that is to be 3660 mm and higher shall weigh 8.63 kg per lineal metre. Tubing, conduit or open seam pipe will not be accepted.

Line posts shall be supplied with weatherproof eye top caps to accommodate continuous horizontal top rail and shall be of the lengths and dimensions shown in the following table:

TABLE 2
CW3550-R2.2

Fence Height mm	Pipe Diameter (outside) mm	Pipe Length mm	Diameter & Depth of Conc. Pile * mm
1220	60.3	2440	250 x 1800
1830	60.3	3200	250 x 1800
2440	60.3	3810	250 x 1800
3050	60.3	4420	250 x 1800
3660	73.0	5030	250 x 1800
4880	73.0	6550	250 x 1800

* Only where concrete is specified for post installation

5.2.4 Top and Bottom Rails

Top rails, or bottom rails where specified, shall be standard, continuous weld, schedule 40 hot dip galvanized steel pipe weighing 3.38 kg per lineal metre. Top rails shall be 6700 mm in length and have an outside diameter of not less than 43 mm.

5.2.5 Top and Bottom Rail Sleeve Couplings

Top and bottom rail sleeve couplings shall be schedule 40, hot dip galvanized steel pipe, 171 mm long and 45 mm inside diameter to accommodate a 43 mm outside diameter top rail and manufactured specifically as a top/bottom rail sleeve coupling for chain link fence.

5.2.6 Fabric

Fabric shall be No. 9 gauge steel wire woven into a uniform 50 mm (2") diamond pattern mesh or as specified. Size of mesh shall be determined by measuring the minimum clear distance between the wires forming the parallel sides of the mesh. Permissible variation in size of mesh shall be 3 mm (1/8"). Diameter of wire shall be no less than 3.68 mm (0.145"). The top and bottom selvage shall be knuckled.

Fabric shall be zinc coated before weaving by the hot dip process to an average mass per unit area of not less than 490 g/m^2.

Mesh fabric shall not be excessively rough, or have blisters, sal ammoniac spots, bruises or flaking.

Chain link fabric shall have a minimum tensile strength of 415 MPa.

5.2.7 Bottom Tension Wire

Bottom tension wire shall be No. 6 gauge single strand galvanized steel wire.

5.2.8 Turnbuckles

Where turnbuckles are specified, they shall be drop forged steel and be hot dip galvanized. The average overall length shall be approximately 300 mm, with ends in the closed position. Bolt diameter shall be 10 mm and shall be capable of taking up a minimum of 150 mm slack.

5.2.9 Braces

Braces, shall be schedule 40 hot dip galvanized steel pipe, not less than 43 mm outside diameter and weigh 3.38 kg per lineal metre.

5.2.10 Fittings and Accessories

Tension bars shall be 5 x 19 mm galvanized flat steel and not less than 50 mm shorter than the height of the fabric with which they are to be used.

Tension bands shall be 3 x 19 mm galvanized flat steel c/w 8 x 32 mm galvanized carriage bolts and nuts.

Brace bands shall be 3 x 19 mm galvanized flat steel c/w 8 x 32 mm galvanized carriage bolts and nuts to fasten top rail receptacles to terminal posts.

Cut ends of tension bars shall be ground smooth to remove all sharp edges and burrs.

Fabric clips shall be No. 9 gauge aluminum alloy wire.

Weatherproof post tops/caps, receptacles, and fittings shall be of adequate strength and may be of aluminum alloy, malleable steel or pressed steel. All ferrous metals shall be hot dip galvanized.

5.2.11 Concrete

Where concrete piles are specified for post installation, the concrete shall conform to CW 2160 and be sulphate resistant type 50, minimum compressive strength of 25 MPa at 28 days, air content of 4% - 7%, maximum slump of 80 mm and a maximum size of course aggregate of 40 mm.

9. CONSTRUCTION METHODS

9.1 Drift Control Fence

Install Drift Control Fence in accordance with the manufacturer's instructions or as directed by the Contract Administrator.

9.2 Chain Link Fence

9.2.1 General

The Contractor shall install chain link fence in accordance with Clauses 9.2 to 9.9 herein and the Canadian General Standards Board Specification CAN/CGSB-138.3. Where any contradictions occur, Specification CW 3550-R2 shall take precedence over CGSB Specifications.

Survey bars and control monuments must be protected during construction in accordance with Clause 4 of CW 1100, Standard Provisions.

9.2.2 Post Installation

Terminal and line posts, except where otherwise specified, shall be installed to a depth equal to the difference between the proposed fence height and the specified pipe length shown in Clauses 5.2 and 5.3 herein. Use hydraulic equipment to push or pound posts into the existing ground.
Where concrete piles are specified for post installation, they shall be of the lengths and dimensions shown in Clauses 5.2 and 5.3 herein. Posts shall be set in the centre of the concrete pile. Tops of concrete piles shall be crowned or domed to shed water and be installed 100mm below the finished grade. Concrete piles shall be constructed in accordance with CW 2160.

Posts shall be plumbed and set to give correct alignment. Bending of posts to give correct alignment is not acceptable.

Weatherproof post tops/caps shall be securely attached to eliminate removal by hand. Eye top caps shall allow for the insertion of a top rail in a horizontal position.

Maximum spacing between centerline of posts shall not exceed 3050 mm.

Straining posts shall be installed at all sharp changes in grade and where directed by the Contract Administrator.

9.2.3 Fabric Installation

Fabric shall be stretched taut to the correct tension as specified by the manufacturer and to the Contract Administrator's satisfaction. Where posts have been installed in concrete piles, fence fabric shall not be installed until piles have cured for a period of not less than five (5) days. Fabric shall be installed on the outside of the fence unless requirement for installation on the inside of the fence is specified.

Clearance between bottom of fabric mesh and ground surface shall be no less than 40 mm or more than 50 mm unless otherwise indicated on the drawing or approved by the Contract Administrator.

Fabric clips shall be used to fasten the fabric to the top rail at 450 mm spacing and to line posts at 380 mm maximum spacing. Wires ties on the top rail and bottom rail or tension wire shall have a minimum of two twists around mesh.

Tension bars, bands and bolts shall be used to fasten the fabric to terminal posts. Maximum spacing for tension bands and bolts shall be 380 mm. Top of tension bars shall not protrude above the bottom of the top rail.

The bottom tension wire shall be stretched taut along the bottom of the fabric and securely attached to all terminal and line posts and attached to the bottom edge of the fabric at 450 mm maximum spacing using hog rings.

9.2.4 Turnbuckles

Where turnbuckles are specified for installation, they shall be used to stretch the bottom tension wire taut and be able to take up a minimum of 150 mm slack.

9.2.5 Braces

Braces, where specified only, shall be placed either horizontally or diagonally from the terminal post to the first adjacent line post. Braces shall be secured to posts in accordance with construction drawing details and/or to the satisfaction of the Contract Administrator.

Corner and straining posts shall have braces on both sides.

9.2.6 Mid Rails

Mid rails for 4880 mm high fences shall be installed at a height of 2440 mm above the finished grade in accordance with construction drawing details and/or to the satisfaction of the Contract Administrator.

9.2.7 Gates

Gate frames shall be made from schedule 40 hot dip galvanized steel pipe; not less than 43 mm outside diameter, electrically welded at all joints with ample bracing to provide a rigid frame free from sag or twist.

Gate height shall match the height of the fence unless otherwise specified.

No. 9 gauge chain link fabric as specified in Clause 5.6 herein shall be attached to gate panels in accordance with Clause 9.3 herein. Top and bottom fabric selvage shall be knuckled.

Gates shall be supplied and installed complete with hot dip galvanized malleable iron hinges, latches, chain holdbacks, and a gate latch suitable for padlock, which is accessible from either side. Gates 3000 mm or more in width shall have three hinges per section.

Hinges shall permit the gate to swing back 180° degrees in line with the fence and shall be installed so as not to permit easy removal of the gate.

If requested by the Contract Administrator, the Contractor shall supply shop drawings of all gates to be supplied prior to manufacture for the Contract Administrator's approval.

9.2.8 Zinc Coating Repairs

All abraded and damaged galvanized surfaces shall be cleaned and painted. Damaged surface areas shall be thoroughly grinded or wire brushed and all loose and cracked zinc coating removed, after which the cleaned area shall be painted with two coats of a zinc pigmented paint approved by the Contract Administrator for these purpose.

9.2.9 Site Clean-Up

All areas of the Work Site shall be kept clean at all times by the Contractor.

Upon completion of the project, the Contractor shall immediately remove all excess material and debris from the Work Site to the satisfaction of the Contract Administrator.

12. METHOD OF MEASUREMENT

12.1 Drift Control Fence

Supply and installation of Drift Control Fence shall not be measured for payment and shall be incidental to the Contract.

12.2 Chain Link Fence

Chain link fence will be measured on a linear measure basis. The quantity to be paid for will be the actual number of linear metres constructed in accordance with this Specification and accepted by the Contract Administrator, as computed from measurements made by the Contract Administrator.

12.3 Chain Link Fence Gates

Gates will be measured on a linear measure basis. The quantity to be paid for will be the actual number of linear metres constructed in accordance with this Specification and accepted by the Contract Administrator, as computed from measurements made by the Contract Administrator.

13. METHOD OF PAYMENT

13.1 Chain Link Fence

Chain Link fence will be paid for at the Contract Unit Price per metre for "Chain Link Fence"* measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this Specification.

* Specify the following:
* Height of the Chain Link Fence
* If Concrete is required for Line Posts or for Terminal Posts

13.2 Chain Link Fence Gates

Gates will be paid for at the Contract Unit Price per metre for "Gates", measured as specified herein, which price shall be payment in full for supplying all materials and for performing all operations herein described and all other items incidental to the work included in this Specification.

The following list of drawings form part of this bid:

Architectural	
A0.1	Building Code Review, List of Drawings
A1.1	Key Plan, Site Plan, Site Details
A2.1	Floor Plan, Elevations, Plan Details
A3.1	Sections and Section Details
Structural	
S1.1	Notes
S2.1	Foundation, Main Floor and Roof Framing Plan
S3.1	Details and Sections
S4.1	Full Height Sections
Mechanical	
M0.0	Title Page and HVAC
M1.0	Mechanical Spec and Details
Electrical	
E1.0	Main Floor Plan Electrical

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises the construction of a storage garage, located at 200 North Town Road, Winnipeg; and further identified as Bridgwater Forest Parks Storage Garage Project. Work shall include the construction of a wood frame structure on a piled concrete foundation with associated site work as per contract drawings.

1.2 CONTRACT METHOD

.1 Construct Work under single stipulated price contract.

1.3 WORK BY OTHERS

.1 Not Applicable.

1.4 CONTRACTOR USE OF PREMISES

.1 Unrestricted use of immediate site until Substantial Performance.

.2 Co-ordinate use of site under direction of Project Manager.

1.5 CITY OF WINNIPEG FURNISHED ITEMS

.1 Not Applicable.

1.6 EXISTING SERVICES

.1 Notify, Project Manager and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Contract Administrator 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian and vehicular traffic.

.3 Establish location and extent of service lines in area of work before starting Work. Notify Contract Administrator of findings.

.4 Submit schedule to and obtain approval from Contract Administrator for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

.5 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.

.6 Where unknown services are encountered, immediately advise Contract Administrator and confirm findings in writing.

.7 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

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

.9 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.7 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:

- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Reviewed Shop Drawings.
- .5 List of Outstanding Shop Drawings.
- .6 Change Orders.
- .7 Other Modifications to Contract.
- .8 Field Test Reports.
- .9 Copy of Approved Work Schedule.
- .10 Health and Safety Plan and Other Safety Related Documents.
- .11 Other documents as specified.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

End of Section

PART 1 - GENERAL

1.1 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND FACILITIES

.1 Closures: protect work temporarily until permanent enclosures are completed.

1.3 EXISTING SERVICES

.1 Notify Contract Administrator and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Contract Administrator 48 hours of notice for necessary interruption of mechanical or electrical service that may interfere with Tenant occupants after Interim Occupancy. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for personnel and vehicular traffic.

.4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.4 SPECIAL REQUIREMENTS

.1 Carry out noise generating Work Monday to Friday and weekends & statutory holidays within provisions of applicable municipal by-laws.

.2 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.3 Keep within limits of work and avenues of ingress and egress.

.4 Ingress and egress of Contractor vehicles at site is limited to existing curb cuts.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 City of Winnipeg Construction Contract
.2 Project Supplementary Conditions

1.02 CASH ALLOWANCES

.1 To be included in contract price, identified as cash allowances.
.2 Cash allowances, unless otherwise specified, cover costs to Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage and other authorized expenses incurred in performing Work.
.3 Cash allowances are not to include the contractor’s overhead and profit.
.4 Contract Price will be adjusted by change order to provide for excess or deficit to each cash allowance.
.5 Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for excess incurred and substantiated as set out in Contract Documents.
.6 Include progress payments on accounts of work authorized under cash allowances in Consultant's monthly certificate for payment.
.7 Prepare schedule jointly with Consultant and Contractor to show when items called for under cash allowances must be authorized by Consultant for ordering purposes so that progress of Work will not be delayed.
.8 Amount of each allowance, for Work specified in respective specification Sections is as follows:
    .1 Section 03 30 00 include allowance of $4000.00 for purchase of concrete testing services.

PART 2 – PRODUCTS

2.01 NOT USED

.1 Not used.

PART 3 – EXECUTION

3.01 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 ADMINISTRATIVE

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

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

.3 Present shop drawings, product data, samples and mock-ups in units to match construction documents.

.4 Review submittals prior to submission to Contract Administrator. 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 Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.5 Notify Contract Administrator, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

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

.7 Contractor's responsibility for errors and omissions in submission is not relieved by Contract Administrator's review of submittals.

.8 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Contract Administrator review.

.9 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

.2 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.

.3 Allow 10 working days for Contract Administrator's review of each submission.

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

.5 Make changes in shop drawings as Contract Administrator may require, consistent with Contract Documents. When resubmitting, notify Contract Administrator in writing of revisions other than those requested.

.6 Accompany submissions with transmittal letter, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.7 Submissions include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:

.1 Subcontractor.
.2 Supplier.
.3 Manufacturer.

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

.5 Details of appropriate portions of Work as applicable:
.1 Fabrication.
.2 Layout, showing dimensions, including identified field dimensions, and clearances.
.3 Setting or erection details.
.4 Capacities.
.5 Performance characteristics.
.6 Standards.
.7 Operating weight.
.8 Wiring diagrams.
.9 Single line and schematic diagrams.
.10 Relationship to adjacent work.

.8 After Contract Administrator's review, distribute copies.

.9 Submit one electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Contract Administrator where shop drawings will not be prepared due to standardized manufacture of product.

.10 Submit one electronic copy of test reports for requirements requested in specification Sections and as requested by Contract Administrator.
.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.

.11 Submit one electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Contract Administrator.
.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.

.12 Delete information not applicable to project.

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

.14 If upon review by Contract Administrator, 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.

1.3 SAMPLES

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

.2 Deliver samples prepaid to Contract Administrator's business address.

.3 Notify Contract Administrator in writing, at time of submission of deviations in samples from requirements of Contract Documents.

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

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

.6 Make changes in samples which Contract Administrator may require, consistent with Contract Documents.

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

1.4 MOCK-UPS

.1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

1.5 CERTIFICATES AND TRANSCRIPTS

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

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

1.6 PROGRESS PHOTOGRAPHS

.1 Progress photographs taken weekly shall be provided by the General Contractor and submitted to the Project Administrator. Photos are to be submitted in high resolution digital format.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Contract Administrator for purpose of inspecting and/or testing portions of Work. Cost for such services will be borne by the City.

.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 Contract Administrator at no cost to City. Pay costs for re-testing and re-inspection.

1.2 ACCESS TO WORK

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

.2 Co-operate to provide reasonable facilities for such access.

1.3 PROCEDURES

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

.2 Submit samples and/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.

1.4 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 Contract Administrator 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 Contract Administrator, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, City may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Contract Administrator.

1.5 REPORTS

.1 Submit 3 copies of inspection and test reports to Contract Administrator.

.2 Provide copies to subcontractor of work being inspected or tested.

1.6 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

1.7 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 Contract Administrator.

.3 Prepare mock-ups for Contract Administrator'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 by reason of such default will be allowed.

.5 If requested, Contract Administrator will assist in preparing schedule fixing dates for preparation.

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

1.8 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical and electrical systems.

.2 Refer to relevant specification sections for definitive requirements.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.2 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.3 WATER SUPPLY

.1 Contractor will provide continuous supply of potable water for construction use.

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

.3 Contractor is to pay for utility charges at prevailing rates.

1.4 TEMPORARY HEATING AND VENTILATION

.1 Provide 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° 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 Permanent heating system of building, not to be used when available. Contractor is responsible for damage to heating system if use is permitted.

.7 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 Contract Administrator.

.8 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.

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

1.5 TEMPORARY POWER AND LIGHT

.1 Contractor to provide and pay for temporary power during construction for temporary lighting and operating of power tools and required equipment.

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

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

1.6 TEMPORARY COMMUNICATION FACILITIES

.1 Contractor to provide and pay for temporary telephone and fax equipment and hook up necessary for own use and use of Contract Administrator.

1.7 FIRE PROTECTION

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

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 INSTALLATION AND REMOVAL

.1 Provide construction facilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.2 SCAFFOLDING

.1 Scaffolding in accordance with CAN/CSA- S269.2.

.2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms, temporary stairs as required to perform work.

1.3 HOISTING

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

.2 Hoists to be operated by qualified operator.

1.4 SITE STORAGE/LOADING

.1 Confine work and operations by Contract Documents. Do not unreasonably encumber premises with products and materials.

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

1.5 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt public access to the park.

.2 Provide and maintain adequate access to project site.

1.6 OFFICES

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

.2 Provide clearly 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.

1.7 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.

1.8 SANITARY FACILITIES

.1 Provide 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.

1.9 CONSTRUCTION SIGNAGE

.1 Provide and erect project sign, within three weeks of signing Contract, of a design and in a location acceptable to City

.2 Install sign supplied by Contract Administrator on framing for project sign.

.3 No other signs or advertisements, other than warning signs, are permitted on site.

.4 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Contract Administrator.

1.10 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide access and temporary relocated roads as necessary to maintain traffic.

.2 Maintain and protect traffic on affected roads during construction period.

.3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs

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

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

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

.7 Construct access and haul roads necessary.

.8 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.2 HOARDING

.1 Erect temporary site enclosure using 2.4 m high metal mesh fence. Provide one lockable truck gate. Maintain fence in good repair.

.2 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.3 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open edges of floors and roofs.

.2 Provide as required by governing authorities.

1.4 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.

1.5 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.

1.6 ACCESS TO SITE

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

1.7 FIRE ROUTES

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

1.8 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

.2 Be responsible for damage incurred.

1.9 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.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 QUALITY

.1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) 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 any dispute arise as to quality or fitness of products, decision rests strictly with Contract Administrator based upon requirements of Contract Documents.

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

.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.

1.2 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 Contract Administrator of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

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

1.3 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 Contract Administrator.

.9 Touch-up damaged factory finished surfaces to Contract Administrator's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.4 TRANSPORTATION

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

1.5 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in 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 Contract Administrator in writing, of conflicts between specifications and manufacturer's instructions, so that Contract Administrator will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Contract Administrator to require removal and re-installation at no increase in Contract Price or Contract Time.

1.6 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 Contract Administrator if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Contract Administrator 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 Contract Administrator, whose decision is final.

1.7 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

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

1.8 CONCEALMENT

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

.2 Before installation inform Contract Administrator if there is interference. Install as directed by Contract Administrator.

1.9 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.

1.10 LOCATION OF FIXTURES

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

.2 Inform Contract Administrator of conflicting installation. Install as directed.

1.11 FASTENINGS

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

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 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.

.4 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.

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

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

1.12 FASTENINGS - 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 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.

1.13 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 Contract Administrator.

1.14 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.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Field engineering survey services to measure and stake site.

.2 Survey services to establish inverts for Work.

.3 Recording of subsurface conditions found.

1.2 REFERENCES

.1 City's identification of existing survey control points and property limits.

1.3 QUALIFICATIONS OF SURVEYOR

.1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Contract Administrator.

1.4 SURVEY REFERENCE POINTS

.1 Existing base horizontal and vertical control points are designated on drawings.

.2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to Contract Administrator.

.4 Report to Contract Administrator when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.5 Require surveyor to replace control points in accordance with original survey control.

1.5 SURVEY REQUIREMENTS

.1 Establish two permanent benchmarks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and topsoil placement and landscaping features.

.4 Stake slopes, swales and berms.

.5 Establish pipe invert elevations.

.6 Stake batter boards for foundations.

.7 Establish lines and levels for mechanical and electrical work.

1.6 EXISTING SERVICES

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

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

1.7 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 Contract Administrator 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 Contract Administrator.

1.8 RECORDS

.1 Prior to engaging in any demolition or excavation, conduct a condition survey including an annotated photographic record of existing structures adjacent to project extents. Investigate foundations to determine underpinning, and related works required.

.2 Prior to engaging in any demolition or excavation, record elevations, in relation to project geodetic, for existing structures adjacent to project extents.

.3 Maintain a complete, accurate log of control and survey work as it progresses.

.4 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

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

1.9 SUBMITTALS

.1 Submit name and address of Surveyor to Contract Administrator.

.2 On request of Contract Administrator, 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 with Contract Documents. The signed certificate will also note any elevations and locations that do not conform to Contract Documents.

.4 Provide the City with a Building Location Certificate prepared by a legal surveyor to document the location of the building and major features on the site.

1.10 SUBSURFACE CONDITIONS

.1 Promptly notify Contract Administrator 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 Contract Administrator determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders and Change Directives.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit written request in advance of cutting or alteration which 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 City or separate contractor.

.3 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 City or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.3 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 which are to be exposed by uncovering work; maintain excavations free of water.

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

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

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

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

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

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

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

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by City or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Contract Administrator. Do not burn waste materials on site.

.3 Clear snow and ice from access to building.

.4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.5 Provide on-site refuse containers for collection of waste materials and debris.

.6 Provide and use marked separate bins for recycling.

.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.

1.2 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris other than that caused by City or other General Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Contract Administrator. Do not burn waste materials on site.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

.9 Clean lighting reflectors, lenses, and other lighting surfaces.

.10 Vacuum clean and dust building interiors, behind grilles, louvers and screens.

.11 Prepare floor finishes as per manufacturers recommendations.

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

.13 Broom clean and wash exterior walks and surfaces; rake clean other surfaces of grounds.

.14 Remove dirt and other disfiguration from exterior surfaces.

.15 Clean and sweep roofs, and gutters.

.16 Sweep and wash clean paved areas.

.17 Clean equipment and fixtures to sanitary condition.

.18 Clean or replace filters of mechanical equipment.

.19 Clean roofs, downspouts, and drainage systems.

.20 Remove snow and ice from access to building.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 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 Documents.
- .1 Notify Contract Administrator in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
- .2 Request Contract Administrator's Inspection.

.2 Contract Administrator's Inspection: Contract Administrator and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:
- .1 Work has been completed and inspected for compliance with Contract Documents.
- .2 Defects have been corrected and deficiencies have been completed.
- .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
- .4 Certificates required by Utility companies have been submitted.
- .5 Operation of systems have been demonstrated to City's personnel.
- .6 Work is complete and ready for final inspection.

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

.5 Declaration of Substantial Performance: when Contract Administrator considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance. Refer to City Agreement for specifics to application.

.6 Commencement of Lien and Warranty Periods: date of City'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.

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

.8 Payment of Holdback: after issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback amount in accordance with City agreement.

1.2 CLEANING

.1 In accordance with Section 01 74 11 - Cleaning.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

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

.3 Copy will be returned after final inspection with Contract Administrator's comments.

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

.5 Two weeks prior to Substantial Performance of the Work, submit to the Contract Administrator, three final copies of operating and maintenance manuals in English.

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

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

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

.9 Pay costs of transportation.

1.2 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, under Section numbers and sequence of Table of Contents.

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

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

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

.9 All information within binders shall also be submitted in electronic ‘PDF’ format.

1.3 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;
- .1 Date of submission; names.
- .2 Addresses, and telephone numbers of Contract Administrator 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 specified in Section 01 45 00 - Quality Control.

.6 Training: refer to Section 01 79 00 - Demonstration and Training.

1.4 AS-BUILTS AND SAMPLES

.1 Maintain, at site for Contract Administrator, 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 Contract Administrator.

1.5 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings.

.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.

1.6 FINAL SURVEY

.1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.7 EQUIPMENT AND SYSTEMS

.1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.

.15 Additional requirements: as specified in individual specification sections.

1.8 MATERIALS AND FINISHES

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

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

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

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

1.9 SPARE PARTS

.1 Provide spare parts, in quantities specified in individual specification sections.

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

.3 Deliver to site; place and store.

.4 Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.

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

1.10 MAINTENANCE MATERIALS

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

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

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

.4 Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.

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

1.11 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 location as directed; place and store.

.4 Receive and catalogue items. Submit inventory listing to Contract Administrator. Include approved listings in Maintenance Manual.

1.12 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 Contract Administrator.

1.13 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 Contract Administrator for approval.

.3 Warranty management plan to include required actions and documents to assure that City 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 Contract Administrator 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 City's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.8 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 Contractor, 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, and commissioned systems such as fire protection systems.

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

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

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to City's personnel two weeks prior to date of final inspection.

.2 City will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for City's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

1.3 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation.

.2 Testing, adjusting, and balancing has been performed.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.4 PREPARATION

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated personnel are present.

1.5 DEMONSTRATION AND INSTRUCTIONS

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the designated location.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Common Work Results – Mechanical.

.2 Common Work Results - Electrical.

1.2 QUALITY ASSURANCE

.1 Provide testing organization services under provisions specified in Section 01 45 00 – Quality Control.

.2 Testing organization: current member in good standing certified to perform specified services.

.3 Comply with applicable procedures and standards of the certification sponsoring association.

.4 Perform services under discretion of supervisor qualified under certification requirements of sponsoring association.

1.3 REFERENCES

.1 Associated Air Balance Council (AABC): National Standards for Field Measurements and Instrumentation, Total Systems Balance, Air Distribution-Hydronics Systems.

1.4 SUBMITTALS

.1 Prior to the start of Work, submit name of organization proposed to perform services. Designate who has managerial responsibilities for coordination of entire testing, adjusting and balancing.

.2 Submit documentation to confirm organization compliance with quality assurance provision.

.3 Submit three (3) preliminary specimen copies of each report form proposed for use.

.4 Fifteen (15) days prior to Substantial Performance, submit three (3) copies of final reports on applicable forms.

.5 Submit reports of testing, adjusting and balancing postponed due to seasonal, climatic, occupancy, or other reasons beyond Contractor's control, promptly after execution of those services.

1.5 PROCEDURES - GENERAL

.1 Comply with procedural standards of certifying association under whose standard services will be performed.

.2 Notify Contract Administrator three (3) days prior to beginning of operations.

.3 Accurately record data for each step.

.4 Report to Contract Administrator any deficiencies or defects noted during performance of services.

1.6 FINAL REPORTS

.1 Testing organization having managerial responsibility shall make reports.

.2 Ensure each form bears signature of recorder, and that of supervisor of reporting organization.

.3 Identify each instrument used and latest date of calibration of each.

1.7 CONTRACTOR RESPONSIBILITIES

.1 Prepare each system for testing and balancing.

.2 Cooperate with testing organization and provide access to equipment and systems.

.3 Provide personnel and operate systems at designated times, and under conditions required for proper testing, adjusting and balancing.

.4 Perform services under discretion of supervisor qualified under certification requirements of sponsoring association.

1.8 PREPARATION

.1 Provide instruments required for testing, adjusting and balancing operations.

.2 Make instruments available to Contract Administrator to facilitate spot checks during testing.

.3 Retain possession of instruments and remove at completion of services.

.4 Verify systems installation is complete and in continuous operation.

.5 Verify lighting is turned on when lighting is included in cooling load.

.6 Verify equipment such as computers, laboratory and electronic equipment are in full operation.

1.9 EXECUTION

.1 Test equipment, balance distribution systems, and adjust devices for HVAC systems.

.2 Test hydronic systems, adjust and record liquid flow at each piece of equipment.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

End of Section

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes.

.1 Methods and procedures for demolishing, salvaging, recycling and removing sitework items designated to be removed in whole or in part, and for backfilling resulting trenches and excavations.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 Canadian Council of Ministers of the Environment (CCME).

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

.1 Material Safety Data Sheets (MSDS).

1.3 DEFINITIONS

.1 Demolition: rapid destruction of building following removal of hazardous materials.

.2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: ensure Work is performed in compliance with CEPA, CEAA, TDGA, and] applicable Provincial/Territorial regulations.

.2 Site Meetings.

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Section 01 32 18 - Construction Progress Schedules - Bar (GANTT) Chart to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Arrange for site visit with Contract Administrator to examine existing site conditions adjacent to demolition work, prior to start of Work.

.3 Hold project meetings every 2 weeks.

.4 Ensure key personnel attend.

.5 Contract Administrator will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

.3 Health and Safety.

.1 Do construction occupational health and safety in accordance with Section 01 35 30 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Storage and Protection.

.1 Protect in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

.2 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 Contract Administrator and at no cost to Contract Administrator

.3 Remove and store materials to be salvaged, in manner to prevent damage.

.4 Store and protect in accordance with requirements for maximum preservation of material.

.5 Handle salvaged materials as new materials.

1.6 SITE CONDITIONS

.1 Site Environmental Requirements.

.1 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.

.2 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.

.1 Ensure proper disposal procedures are maintained throughout the project.

.3 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

.4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.

.5 Protect trees, plants and foliage on site and adjacent properties where indicated.

.2 Existing Conditions.

.1 Remove contaminated or hazardous materials listed as hazardous as defined by authorities having jurisdiction as directed by Contract Administrator from site, prior to start of demolition Work, and dispose of at designated disposal facilities in safe manner in accordance with TDGA and other applicable regulatory requirements and Section 02 61 33 - Hazardous Materials.

1.7 SCHEDULING

.1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.

.1 Notify Contract Administrator in writing when unforeseen delays occur.

PART 2 – PRODUCTS

2.1 EQUIPMENT

.1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Inspect site with Contract Administrator and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies before starting demolition.

3.2 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.

3.3 REMOVAL OPERATIONS

.1 Remove items as indicated.

.2 Do not disturb items designated to remain in place.

.3 Removal of Pavements, Curbs and Gutters:

.1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Contract Administrator.

.2 Protect adjacent joints and load transfer devices.

.3 Protect underlying and adjacent granular materials.

.4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving,

.5 Remove designated trees during demolition.
.1 Obtain written approval of Contract Administrator prior to removal of trees not designated.

.6 Stockpile topsoil for final grading and landscaping.
.1 Provide erosion control and seeding if not immediately used.

3.4 REMOVAL FROM SITE

.1 Remove stockpiled material as directed by Contract Administrator, when it interferes with operations of project.

.2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.

3.5 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 which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.6 CLEANING

.1 Remove debris, trim surfaces and leave work site clean, upon completion of Work

.2 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

End of Section

PART 1 - GENERAL

1.1 SUMMARY

.1 Related Sections.

.1 Section 02 41 13 - Site Demolition

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 Department of Justice Canada (Jus)

.1 Canadian Environmental Assessment Act (CEAA), c. 37.

.2 Canadian Environmental Protection Act, (CEPA), c. 33.

.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 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.

.2 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial/Territorial regulations.

.2 Comply with hauling and disposal regulations of Authority Having Jurisdiction.

1.5 SITE CONDITIONS

.1 Protect existing site features to remain or identified for salvage or re use; make repairs and restore to a similar condition to existing where damage to these items occurs as directed by Contract Administrator and at no cost to The City of Winnipeg:

.1 Remove and store salvaged materials to prevent contamination.

.2 Store and protect salvaged materials as required for maximum preservation of material.

.3 Handle salvaged materials same as new materials.

.2 Perform pavement removal work to prevent adverse effects to adjacent watercourses, groundwater and wildlife, and to prevent excess air and noise pollution:

.1 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.

.2 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Authorities Having Jurisdiction.

.3 Protect existing site features and structures, trees, plants and foliage on site and adjacent properties

PART 2 – PRODUCTS

2.1 EQUIPMENT

.1 Use cold milling, planning or grinding equipment with automatic grade controls capable of operating from stringline, and capable of removing part of pavement surface to depths or grades indicated.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Verify extent and location of asphalt identified for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities, preserve active utilities traversing site in operating condition.

.3 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.
- .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.

.4 Prior to beginning removal operation, inspect and verify Contract Administrator areas, depths and lines of asphalt pavement to be removed.

.5 Protection: protect existing pavement not designated for removal, light units and structures from damage. In event of damage, immediately replace or make repairs to approval of Contract Administrator at no additional cost.

3.2 REMOVAL

.1 Remove existing asphalt pavement to lines and grades as indicated.

.2 Demolition of pavements:
- .1 Square up adjacent surfaces to remain in place by saw cutting or other method acceptable to Contract Administrator.
- .2 Protect adjacent joints and load transfer devices.
- .3 Protect underlying and adjacent granular materials where they are exposed and identified to remain.
- .4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving.

.3 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.

.4 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.

.5 Suppress dust generated by removal process.

3.3 FINISH TOLERANCES

.1 Finished surfaces in areas where asphalt pavement has been removed within +/-5 mm of grade specified but not uniformly high or low.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 07 92 10 - Joint Sealing.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 Canadian Standards Association (CSA)
- .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-O86.1, Engineering Design in Wood (Limit States Design).
- .3 CSA O121, Douglas Fir Plywood.
- .4 CSA O151, Canadian Softwood Plywood.
- .5 CSA O437, Standards for OSB and Waferboard.
- .6 CSA S269.1, Falsework for Construction Purposes.
- .7 CAN/CSA-S269.3, Concrete Formwork.

.2 Council of Forest Industries of British Columbia (COFI)
- .1 COFI Exterior Plywood for Concrete Formwork.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Formwork materials:
- .1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA-O86.1.
- .2 For concrete with special architectural features, use formwork materials to CAN/CSA-A23.1.

.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 release agent: non-toxic, low VOC.

.4 Falsework materials: to CSA-S269.1.

.5 Sealant: to Section 07 92 10 - 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 Obtain Contract Administrator's approval for use of earth forms framing openings not indicated on drawings.

.3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.

.4 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.

.5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.6 Do not place shores and mud sills on frozen ground.

.7 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.8 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1.

.9 Align form joints and make watertight. Keep form joints to minimum.

.10 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.

.11 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners , joints, unless specified otherwise.

.12 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.13 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.

.14 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.15 Clean formwork in accordance with CAN/CSA-A23.1, 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 3 days for footings and abutments.

.2 Remove formwork when concrete has reached 75 % of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 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.

.4 Space reshoring in each principal direction at not more than 3000 mm apart.

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

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Concrete Institute (ACI)
- .1 ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.2 American National Standards Institute/American Concrete Institute (ANSI/ACI)
- .1 ANSI/ACI 315, Details and Detailing of Concrete Reinforcement.

.3 Canadian Standards Association (CSA)
- .1 CAN3-A23.3, Design of Concrete Structures for Buildings.
- .2 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
- .3 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.3 SHOP DRAWINGS

.1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacing's, locations of reinforcement and mechanical splices if approved by Contract Administrator, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacing's 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.

.3 Detail lap lengths and bar development lengths to CAN3-A23.3.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Contract Administrator.

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

.3 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-30.18.

.4 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.

.5 Mechanical splices: subject to approval of Contract Administrator.

.6 Plain round bars: to CAN/CSA-G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, ANSI/ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Obtain Contract Administrator 's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Contract Administrator, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

PART 3 - EXECUTION

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Contract Administrator.

.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 CAN/CSA-A23.1.

.2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.

.3 Prior to placing concrete, obtain Contract Administrator 's approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

.5 Protect epoxy and paint coated portions of bars with covering during transportation and handling.

3.3 FIELD TOUCH-UP

.1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 03 10 00 - Concrete Forming and Accessories.

.2 Section 03 20 00 - Concrete Reinforcing.

.3 Section 03 35 00 - Concrete Finishing.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM C 109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens).
- .2 ASTM C 260, Specification for Air-Entraining Admixtures for Concrete.
- .3 ASTM C 332, Specification for Lightweight Aggregates for Insulating Concrete.
- .4 ASTM C 494, Specification for Chemical Admixtures for Concrete.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-37.2, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
- .2 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.3 Canadian Standards Association (CSA)
- .1 CAN/CSA-A5, Portland Cement.
- .2 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
- .3 CAN/CSA-A23.2, Methods of Test for Concrete.
- .4 CAN/CSA-A23.5, Supplementary Cementing Materials.
- .5 CAN/CSA A363, Cementitious Hydraulic Slag.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Use trigger operated spray nozzles for water hoses.

.2 Designate a cleaning area for tools to limit water use and runoff.

.3 Carefully coordinate the specified concrete work with weather conditions.

.4 Ensure emptied containers are sealed and stored safely for disposal away from children.

.5 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.

.6 Choose least harmful, appropriate cleaning method, which will perform adequately.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Portland cement: to CAN/CSA-A5.

.2 Supplementary cementing materials: to CAN/CSA-A23.5.

.3 Cementitious hydraulic slag: to CAN/CSA-A363.

.4 Water: to CAN/CSA-A23.1.

.5 Aggregates: to CAN/CSA-A23.1.

.6 Air entraining admixture: to ASTM C 260.

.7 Chemical admixtures: to ASTM C 494. Contract Administrator to approve accelerating or set

retarding admixtures during cold and hot weather placing.

.8 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
- .1 Compressive strength: 35 MPa at 28 days.
- .2 Consistency:
  - .1 Fluid: to ASTM C 827. Time of efflux through flow cone (ASTM C 939), under 30s.
  - .2 Flowable: to ASTM C 827. Flow table, 5 drops in 3s, (ASTM C 109, applicable portion) 125 to 145%.
  - .3 Plastic: to ASTM C 827. Flow table, 5 drops in 3 s, (ASTM C 109, applicable portions) 100 to 125 %.
  - .4 Dry pack to manufacturer's requirements.
- .3 Net shrinkage at 28 days: maximum 0 %.

.9 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 35 MPa at 28 days.

.10 Curing compound: to CAN/CSA-A23.1 white and to ASTM C 309, Type 1-chlorinated rubber.

.11 Premoulded joint fillers:
- .1 Bituminous impregnated fiber board: to ASTM D 1751.
- .2 Sponge rubber: to ASTM D 1752, Type I, flexible grade.

.12 Polyethylene film: 0.254 mm thickness to CAN/CGSB-51.34.

2.2 MIXES
.1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, as indicated on the drawings.

PART 3 - EXECUTION

3.1 PREPARATION
.1 Obtain Contract Administrator's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.

.2 Pumping of concrete is permitted only after approval of equipment and mix.

.3 Ensure reinforcement and inserts are not disturbed during concrete placement.

.4 Prior to placing of concrete obtain Contract Administrator's approval of proposed method for protection of concrete during placing and curing.

.5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.6 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.

.7 Do not place load upon new concrete until authorized by Contract Administrator.

3.2 CONSTRUCTION
.1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1.

.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 Contract Administrator.
- .2 Where approved by Contract Administrator, 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 Contract Administrator.
- .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Contract Administrator

before placing of concrete.

.4 Check locations and sizes of sleeves and openings shown on drawings.

.3 Anchor bolts.

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

.2 With approval of Contract Administrator, 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 to manufacturer's recommendations.

.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.4 Set bolts and fill holes with epoxy grout.

.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

.4 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 CAN/CSA-A23.1.

.2 Use procedures acceptable to Contract Administrator to remove excess bleed water. Ensure surface is not damaged.

.3 Provide smooth trowel finish on interior slabs unless otherwise indicated.

.4 Provide broom finish on exterior slabs unless otherwise indicated.

.5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.

.6 Joint fillers.

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Contract Administrator. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.2 Locate and form joints as indicated. Install joint filler.

.3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

3.3 SITE TOLERANCE

.1 Concrete tolerance in accordance with CAN/CSA-A23.1.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Contract Administrator in accordance with CAN/CSA-A23.1 and Section 01 45 00 - Quality Control.

.2 Inspection or testing by Contract Administrator will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

End of Section

PART 1 – GENERAL

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-25.20, Surface Sealer for Floors.

1.3 PERFORMANCE REQUIREMENTS

.1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.

.2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Place materials defined as hazardous or toxic waste in designated containers.

.2 Dispose of surplus chemical and finishing materials in accordance with federal, provincial and municipal regulations.

.3 Dispose of waste from stripping of floors in a manner that will not have unfavourable effects on the environment.

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 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 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.

.2 Provide continuous ventilation during and after coating application.

PART 2 - PRODUCTS

2.1 SEALING COMPOUNDS

.1 Surface sealer: to CAN/CGSB-25.20.

2.2 CURING COMPOUNDS

.1 Select water-based curing compounds.

2.3 MIXES

.1 Mixing, ratios and application in accordance with manufacturer's instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verify that slab surfaces are ready to receive work and elevations are as instructed by manufacturer.

3.2 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 as indicated on drawings.

.3 Remove chlorinated rubber or existing surface coatings.

.4 Use protective clothing, eye protection and respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

3.3 APPLICATION

.1 Prepare and mix materials in accordance with manufacturer’s directions to produce a uniform monolithic surface.

3.4 PROTECTION

.1 Protect finished installation in accordance with manufacturer's instructions.

End of Section

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation non-load bearing, plant-precast architectural concrete.

1.2 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete.

1.3 PERFORMANCE REQUIREMENTS

.1 Tolerance of precast elements to CAN/CSA-A23.4/A251.

.2 Length of precast elements not to vary from design length by more than plus or minus 3 mm.

.3 Cross sectional dimensions of precast elements not to vary from design dimensions by more than plus or minus 3 mm.

.4 Deviations from straight lines not to exceed 3mm in 3m.

.5 Precast elements not to vary by more than plus or minus 3mm from true overall cross sectional shape as measured by difference in diagonal dimensions.

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit shop drawings to CAN/CSA-A23.4/A251 and CSA-A23.3. Include the following items:
- .1 Design calculations for items designated by manufacturer.
- .2 Finishing schedules.
- .3 Methods of handling and erection.
- .4 Openings, sleeves, inserts and related reinforcement.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE SPLASH PADS

1 Precast Concrete Splashpad.
- .1 914x250x75mm for downspouts, Natural Pebblestone finish as manufactured by Barkman or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install splashpads as indicated on drawings.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 03 30 00 - Cast-in-Place Concrete.

.2 Section 04 05 10 - Common Work Results for Masonry.

.3 Section 04 05 19 - Masonry Anchorage and Reinforcements.

.4 Section 05 12 23 - Structural Steel for Buildings.

.5 Section 09 91 13 - Exterior Painting.

.6 Section 09 91 23 - Interior Painting.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Society for Testing and Materials International, (ASTM)

- .1 ASTM A-53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .2 ASTM A-269, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .3 ASTM A-307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 Canadian Standards Association (CSA International)

- .1 CAN/CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel.
- .2 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CAN/CSA-W59,Welded Steel Construction (Metal Arc Welding) (Imperial Version).

1.3 SUBMITTALS

.1 Product Data:

- .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

- .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Storage and Protection:

- .1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
- .2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W.

.2 Steel pipe: to ASTM A 53/A53M standard weight, galvanized finish.

.3 Welding materials: to CSA W59.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchor bolts: to ASTM A 307.

.6 Stainless steel tubing: to ASTM A 269, Type 302 Seamless welded with AISI No. 4 finish.

.7 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof headed screws on items requiring assembly by screws or as indicated.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.

.2 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper, 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.

.3 Shop coat primer: to CAN/CGSB-1.40.

.4 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.4 ISOLATION COATING

.1 Isolate aluminum from following components, by means of bituminous paint:
- .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
- .2 Concrete, mortar and masonry.
- .3 Wood.

2.5 SHOP PAINTING

.1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.

.3 Clean surfaces to be field welded; do not paint.

2.6 DOWNSPOUTS

.1 HSS pipe: nominal dimensions as indicated on drawings, formed to shape and sizes as indicated.

.2 Apply one shop coat of primer to metal items, with exception of galvanized items.

PART 3 - EXECUTION

3.1 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Contract Administrator such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Provide components for building by other sections in accordance with shop drawings and

schedule.

.6 Make field connections with bolts to CAN/CSA-S16.1, or weld.

.7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

.9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 BOLLARDS

.1 Install bollards in locations as indicated.

3.4 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

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

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Reserved

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM A 653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealled) by the Hot-Dip Process.
- .2 ASTM C 36/C36M, Specification for Gypsum Wallboard.

.2 Canadian Standards Association (CSA)
- .1 CSA B111, Wire Nails, Spikes and Staples.
- .2 CSA O121, Douglas Fir Plywood.
- .3 CAN/CSA-O141, Softwood Lumber.
- .4 CSA O151, Canadian Softwood Plywood.

.3 National Lumber Grades Authority (NLGA)
- .1 Standard Grading Rules for Canadian Lumber.

1.3 QUALITY ASSURANCE

.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Set aside damaged wood and dimensional lumber off-cuts for approved alternative uses (e.g. bracing, blocking, cripples, bridging). Store this separated reusable wood waste convenient to cutting station and area of work.

.2 Do not burn scrap at the project site.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

.1 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.0.

.2 Douglas fir plywood (DFP): to CSA O121, standard construction.

2.2 ACCESSORIES

.1 Exterior wall sheathing paper: to CAN/CGSB-51.32 spunbonded olefin type as indicated. Standard of Acceptance: Tyvek® CommercialWrap®

.2 Sealants: as per Section 07 92 10 - Joint Sealing.

.3 General purpose adhesive: to CSA O112 Series.

.4 Nails, spikes and staples: to CSA B111.

.5 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

2.3 FASTENER FINISHES

.1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for interior highly humid areas.

.2 Stainless steel: use stainless steel fasteners for pressure treated lumber and exterior work.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Store wood products such that they are not exposed to rainfall and ground moisture.

3.2 INSTALLATION

.1 Comply with requirements of Manitoba Building Code supplemented by following paragraphs.

.2 Install members true to line, levels and elevations, square and plumb.

.3 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding, electrical equipment mounting boards, and other work as required.

.4 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

3.3 ERECTION

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

3.4 SCHEDULES

.1 Electrical equipment mounting boards:

.1 Plywood, DFP or CSP, G1S grade, square edge 19 mm thick, painted grey.

End of Section

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation of asphalt shingles and roll roofing.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-37.4, Fibrated, Cutback Asphalt, Lap Cement for Asphalt Roofing.
- .2 CAN/CGSB-37.5, Cutback Asphalt Plastic Cement.

.2 Canadian Roofing Contractors' Association (CRCA).
- .1 CRCA Roofing Specification Manual.

.3 Canadian Standards Association (CSA International).
- .1 CAN/CSA-A123.1/A123.5, Asphalt Shingles Made From Organic Felt and Surfaced With Mineral Granules/Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules.
- .2 CSA A123.2, Asphalt-Coated Roofing Sheets.
- .3 CAN/CSA-A123.3, Asphalt Saturated Organic Roofing Felt.
- .4 CAN3-A123.51, Asphalt Shingle Application on Roof Slopes 1:3 and Steeper.
- .5 CAN3-A123.52, Asphalt Shingle Application on Roof Slopes 1:6 to Less Than 1:3.
- .6 CSA B111, Wire Nails, Spikes and Staples.

1.3 SUBMITTALS

.1 Submit product data sheets for asphalt shingles. Include:
- .1 Product characteristics, performance criteria, installation instructions, colour and finish.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Provide and maintain dry, off-ground weatherproof storage.

.3 Remove only in quantities required for same day use.

1.5 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 All unused shingles remain property of the City.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Asphalt shingles:
- .1 Shall be BP Harmony, KO Cambridge, or Certainteed Landmark, #1 grade, forty year (40) warranty, complete with double self sealing strip. Approved equals warranty must meet or exceed the specified products. Colour selection by Contract Administrator.

.2 Eave and Valley Sheet Protection: self-adhering polyethylene sheet with modified bituminous coating.
- .1 Acceptable material: Ice & Water Shield by W.R. Grace & Co.
- .2 Acceptable material: Ice & Water Protector by IKO.

.3 Sheathing paper: to CAN/CGSB-51.32, single ply laminated type, perforated.

.4 Roofing Synthetic Underlayment:
- .1 Shall be TRI-FLEX XTREME by GRACE Construction Products, FelTex by Grace, DeckGARD by BP Synthetic roof underlayment or approved equal. Roofing synthetic underlayment shall cover entire roof area to receive new shingles with minimum 4” (100mm) overlap onto self-adhering bituminous starter strip, minimum 4” (100mm) lap on all horizontal

joints and 8" (200mm) lap on all vertical joints. **Felt underlay #15 is not acceptable.**

.5 Cement:
- .1 Plastic cement: to CAN/CGSB-37.5.
- .2 Lap cement: to CAN/CGSB-37.4.

.6 Nails: to CSA B111, of galvanized steel aluminum, sufficient length to penetrate 19 mm into deck.

.7 Sealant: shall be Tremco® Tremflex 25, or approved equal.

.8 Drip Edge and Metal Flashing: galvanized or prefinished steel and a minimum of .48mm (.018") thickness. Includes step, counter, chimney, curb, saddle, electrical masts, etc. Pre-finished flashings to be chosen from the standard in stock range of Stelco 8000 series colours.

PART 3 - EXECUTION

3.1 APPLICATION

.1 Do asphalt shingle work in accordance with CAN3-A123.51 except where specified otherwise.

.2 Install drip edge along eaves, overhanging 12 mm, with minimum 50 mm flange extending onto roof decking. Nail to deck at 400 mm on centre.

.3 Install bottom step flashing (soaker base flashing) interleafed between shingles at vertical junctions.

.4 Install asphalt shingles on roof slopes 1:3 and steeper in accordance with CAN3-A123.51.

End of Section

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 ASTM International
  .1 ASTM A 653/A 653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  .2 ASTM C 1186 Standard Specification for Flat Fiber-Cement Sheets

.2 British Standards Institution (BSI)
  .1 BS EN 12467: Fibre-cement flat sheets. Product specification and test methods.

.3 Canadian Standards Association (CSA)
  .1 CAN/CSA-S136 - North American Specification for The Design of Cold-Formed Steel Structural Members

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  .1 Material Safety Data Sheets (MSDS).

.5 National Research Council Canada (NRC)
  .1 National Building Code of Canada (NBC).
  .2 Manitoba Building Code (MBC).

.6 Underwriters Laboratories' of Canada (ULC)
  .1 CAN/ULC-S102 Test for Surface Burning Characteristics of Building Materials and Assemblies.
  .2 CAN/ULC-S114 Standard Method of Test for determination of Non-Combustibility in Building Materials.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
  .1 Submit manufacturer's instructions, printed product literature and data sheets for cementitious materials, support system, fasteners, adhesives and accessories. 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 The Manitoba, Canada.
    .1 Submit partial elevations and section details indicating panel dimensions, support system layout, fastener locations, end details, typical joint detail, wall openings, head, jamb, sill and mullion detail, inside and outside corners, parapet detail, transition details, substrate, air barrier and insulation, all materials and finishes, anchor details, compliance with design criteria and requirements of related work.
    .2 Minimum scale 1:5.

1.03 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.

.3 Storage and Handling Requirements:
  .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  .2 Replace defective or damaged materials with new.

PART 2 – PRODUCTS

2.01 PERFORMANCE CRITERIA

.1 Panels and support system: non-combustible when tested to CAN/ULC S114.

2.02 DESIGN REQUIREMENTS

.1 Design cementitious panel wall cladding and support system to allow for thermal movement of component materials caused by ambient temperature range of 80 degrees C without causing buckling, undue stress on fasteners or other detrimental effects.

.2 Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to panels, supports or anchors, or racking of joints.
.3 Design members to withstand dead load and wind loads as calculated in accordance with National Building Code of Canada (NBC) and applicable Municipal/Territorial regulations, to maximum allowable deflection of 1/180 of span.
.4 Provide assembled system with cavity vented and drained to exterior in accordance with NRC "Rain Screen Principles".
.5 Design wall system to accommodate specified erection tolerances of structure.
.6 Panels to be supported by concealed fasteners as per manufacturer's installation instructions.

2.04 CLADDING SYSTEM COMPONENTS

.1 HardiePlank HZ5 lap siding, HardiPanel HZ5 vertical siding requirement for Materials:
  .1 Fiber-cement Siding - complies with ASTM C 1186 Type A Grade II.
  .2 Fiber-cement Siding - complies with ASTM E 136 as a noncombustible material.
  .3 Fiber-cement Siding - complies with ASTM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.
  .4 CAL-FIRE, Fire Engineering Division Building Materials Listing - Wildland Urban Interface (WUI) Listed Product.
  .5 National Evaluation Report No. NER 405 (BOCA, ICBO, SBCCI, IBC, IRC).
  .6 CCMC, Institute for Research and Construction.
.2 Lap Siding: HardiePlank HZ5 Lap siding with a sloped top, beveled drip edge and nailing line as manufactured by James Hardie Building Products, Inc.
  .1 Type: Horizontal cedarmill lapped siding 160mm width 12.7mm exposure, length as required for project.
.3 Vertical Siding: HardiePanel as manufactured by James Hardie Building Products, Inc.
  .1 Type: Smooth Vertical siding panel (1220 mm by 2440mm)
.4 Cement Cladding Panels: Hardie Reveal Panel as manufactured by James Hardie Building Products, Inc.
  .1 Type: Smooth panel (1205 mm by 2425mm). Product shall be engineered for climate conditions.
.5 Hardie Trim Board:
  .1 Type: 19mm and 25mm Hardie Trim NT3 Board Smooth width as per drawings, length as required for project. Colour to match adjacent siding unless noted otherwise.

2.05 ACCESSORY COMPONENTS

.1 As per manufacturers requirements to provide a full and complete system.
.2 Fasteners: Stainless steel where exposed, paint matched where concealed, self-tapping and type as recommended by manufacturer for service and substrate.
.3 Gaskets: EPDM rubber sheet.
.4 Adhesive: purpose made, waterproof, type as recommended by panel manufacturer for exposure and service conditions.
.5 Isolation coating: bituminous paint.
.6 Easytrim System.
  .1 EZ.33 –Arrow Outside Corner LAP Trim
    .1 Acceptable product: EZ.33, EZ33.LAP, EZ.33 - Arrow Outside Corner LAP Trim.
    .2 Characteristics:
      .1 Description: EZ.33 Arrow Outside Corner LAP Trim creates a rigid, straight and true, abuse resistant outside corner with exposed 1-3/4" tabs that create a right angle where they meet and cover the vertical ends of the two inset 5/16" lapped fiber cement plank siding boards.
      .2 Materials: Extruded Aluminum (Alloy 6063-T5). Colour to match adjacent HardiePanel finish.
      .3 Features: EZ.Bump™ under 1-3/4" tabs for inset lapped fiber cement plank siding boards to be installed on top of EZ.Bump™ to create air flow and a moisture/water drainage channel. 1-3/4"" tabs with EZ.Bump™ allow inset cladding to self-drain and do not require caulk for water management. The large fluted nailing flange improves installation speed and helps create a more secure installation.

  .2 EZ.40 – Vertical Window Sill J LAP Trim
    .1 Acceptable product: EZ40, EZ40.LAP, EZ-40.

.2 Characteristics:
.1 Description: EZ.40 - Vertical Window Sill J LAP Trim creates a straight and true vertical terminating point with an exposed 3/4" tab that fully covers and protects the vertical ends of inset 5/16" lapped fiber cement plank siding. Can also be used around the sides and bottoms of windows and doors and other vertical wall penetrations.
.2 Materials: Extruded Aluminum (Alloy 6063-T5). Colour to match adjacent HardiePanel finish.
.3 Features: EZ.Bump™ under 3/4" tab for inset lapped planks to be installed on top of EZ.Bump™ to create air flow and a moisture/water drainage channel. 3/4" tabs with EZ.Bump™ allow inset cladding to self-drain and do not require caulk for water management. The large fluted nailing flange improves ease of and speed of securely fastened install.

.3 EZ.48 – Horizontal Base Z LAP Trim
.1 Acceptable product: EZ.48, EZ48.LAP, EZ.48 – Horizontal Base Z LAP Trim.
.2 Characteristics:
.1 Description: EZ.48 - Horizontal Base Z LAP Trim provides the kickout required to start LAP plank installation. A 1" tab covers and hides any unsightly gaps left exposed. The EZ.Guard™ blocks any moisture from getting up to the nailing flange and beyond. The EZ.Slope™ ensures the moisture properly drains.
.2 Materials: Extruded Aluminum (Alloy 6063-T5). Colour to match adjacent HardiePanel finish.
.3 Features: EZ. Slope ™ is positive slope that drains moisture/water away from the building envelope. EZ.Guard™ ice and water dam blocks unwanted water from climbing further in. EZ.Line™ screw and alignment guide. EZ.Kickout™ angles the plank to the correct installation angle. The EZ.48 – Horizontal Base Z Panel Trim will tuck/slot into all EasyTrim Reveals corner and vertical profiles containing the EZ.Bump™ or one side of vertical two piece assemblies not containing the EZ.Bump™ to create smooth horizontal/vertical terminations that effectively manage water/moisture.

2.06 FINISHES

.1 Factory Finish:
.1 Factory applied finish by fiber cement manufacturer in a controlled environment within the fiber cement manufacturer's own facility utilizing a multi-coat, heat cured finish within one manufacturing process.
.2 Accessories: Complete finishing system includes pre-packaged touch-up kit provided by fiber cement manufacturer. Provide quantities as recommended by manufacturer.
.3 Colour: Colour to be selected from full range of manufacturer's panel and siding colours. Trim board and EasyTrim colour, to be confirmed by contract administrator.

PART 3 – EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for composite building panel installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate.
.2 Inform Project Manager of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied.

3.02 PREPARATION

.1 Clean surfaces thoroughly prior to installation.
.2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
.3 Install a water-resistive barrier is required in accordance with local building code requirements.
.4 The water-resistive barrier must be appropriately installed with penetration and junction flashing in accordance with local building code requirements.
.5 Install Engineered for ClimateTM HardieWrapTM weather barrier in accordance with local building code requirements.

.6 Use HardieWrapTM Seam Tape and joint and laps.
.7 Install HardieWrapTM flashing, and HardieWrapTM Flex Flashing.

3.03 INSTALLATION

.1 Install materials in strict accordance with manufacturer's installation instructions.
.2 Block framing between studs where HardiePanel siding horizontal joints occur.
.3 Prefinished metal flashing and reveals.
  .1 Inside and Outside Corner Trims: Install at designated corners.
  .2 Z Trim/B Trim: Begin at the base of the building to set your perimeter plum line. Install around perimeter of designated wall areas as starter trim. (When trimming around windows, install Z trim above windows and doors and other wall penetrations. Note: Do not use Z trims in place of primary wall/through wall metal flashings. Z trims are to be used as a decorative accessory only).
  .3 Install Vertical Backplates where vertical architectural lines are designated. (Do not overlap Vertical Backplates over any other trim or nailing flange.)
  .4 Install 8mm wall panel.
  .5 Install next level of Horizontal Trim, placing bottom 12mm tab directly on top of the first course of horizontal panels.
  .6 Note architectural detailed screw pattern and detailed screw type.
  .7 Cut Vertical Top Cap longer than the Vertical Backplate so it slides under the horizontal ½" tab reveal at the top of the panel and over the horizontal nailing flange at the base of the panel fitting flush with the top edge of the 12mm horizontal at the bottom edge of the panel. Apply a small amount of silicone to the Vertical Backplate track. Using a rubber mallet, tap the Vertical Top Cap into place until the SnapLock engages.
  .8 Install the next course of Vertical Backplates, Panels, and Vertical Top Caps.
  .9 In instances where there is a soffit line, finish off the top of the wall with the Soffit J Trim tucked into the vertical EZ – 1, 2, 3 or 8, to cap the top horizontal edge of the final course of panels.
  .10 Install the General J trim around the sides and bottoms of windows, doors and other wall penetrations and as a mid-wall terminating point as detailed.
.4 Special considerations and best practices:
  .1 Never install the General J Trim horizontally or the Soffit J Trim in manner that may allow the J Trim to collect water.
  .2 Never install any vertical trims horizontally in a manner that may allow them to collect water.
  .3 Install cut edge of panels at door and window openings and at intersections with other materials. Seal cut edges of panels according to manufacturer's specifications.
  .4 Reveal Flashing is not to be used as a primary form of through wall or wall penetration flashings and are not designed to replace flashings that are required by local building codes, architects, envelope engineers or Contract Administrators.
.5 Place fasteners no closer than 9.5 mm from panel edges and 51 mm from panel corners.
.6 Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
.7 Maintain clearance between siding and adjacent finished grade.
.8 Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.
.9 Factory Finish Touch Up: Apply touch up paint to cut edges in accordance with manufacturer's printed instructions:
  .1 Touch-up nicks, scrapes, and nail heads in pre-finished siding using the manufacturer's touch-up kit pen.
  .2 Touch-up of nails shall be performed after application, but before plastic protection wrap is removed to prevent spotting of touch-up finish.
  .3 Use touch-up paint sparingly. If large areas require touch-up, replace the damaged area with new pre-finished siding. Match touch up color to siding color through use of manufacturer's branded touch-up kits.

3.03 CLEANING AND WASTE MANAGEMENT

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  .1 Wash down exposed exterior surfaces using solution of mild domestic detergent in warm water, applied with soft clean wiping cloths.
  .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 74 11 - Cleaning.

3.04 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Requirements for the installation of preformed metal cladding/siding.

1.2 RELATED SECTIONS

.1 Section 07 92 10 - Joint Sealing.

1.3 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American National Standards Institute (ANSI).
- .1 ANSI B18.6.4, Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws.

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM D 2369, Test Method for Volatile Content of Coatings.
- .2 ASTM D 2832, Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
- .3 ASTM D 5116, Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

.3 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-51.32, Sheathing, Membrane, Breather Type.
- .2 CAN/CGSB-93.2, Prefinished Aluminum Siding, Soffits and Fascia, for Residential Use.
- .3 CAN/CGSB-93.3, Prefinished Galvanized and Aluminum-Zinc Alloy Steel Sheet for Residential Use.
- .4 CAN/CGSB-93.4, Galvanized and Aluminum-Zinc Alloy Coated Steel Siding Soffits and Fascia, Prefinished, Residential.
- .5 CGSB 93.5, Installation of Metal Residential Siding, Soffits and Fascia.

.4 Canadian Standards Association (CSA International).
- .1 CSA B111, Wire Nails, Spikes and Staples.

.5 Environmental Choice Program (ECP).
- .1 CCD-045, Sealants and Caulking Compounds.

1.4 SUBMITTALS

.1 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate dimensions, profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits, fascia, metal furring, and related work.

.2 Samples:
- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate 300mm x 300 mm samples of siding material, of colour and profile specified.

.3 Manufacturer's Instructions:
- .1 Submit manufacturer's installation instructions.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused caulking, sealants, and adhesive materials from landfill through disposal at hazardous material depot.

PART 2 - PRODUCTS

2.1 ALUMINUM CLADDING COMPONENTS

.1 Fascia and exposed trim: to CAN/CGSB-93.2, Type C, Class 1

.1 Colour: As per drawings, colour to be determined by contract administrator if not otherwise noted. Colours to be from manufacturers full range of color options.

.2 Gloss: medium.

.3 Profile: flat sheet 'V' crimped for stiffness.

.4 Pattern: plain surface.

.5 Thickness: .635mm.

2.2 STEEL CLADDING AND COMPONENTS

.1 Prefinished Metal Cladding: to CAN/CGSB-93.2.

.2 Prefinished Metal Soffit: to CAN/CGSB-93.2.

2.3 ACCESSORIES

.1 Exposed trim: inside corners, outside corners, cap strip, drip cap, undersill trim, starter strip and window/door trim of same material, colour and gloss as cladding, with fastener holes pre-punched.

2.4 FASTENERS

.1 Screws: ANSI B18.6.4. Self tapping, nylon coated head screws with neoprene washer. Colour to match metal colour.

2.5 CAULKING

.1 Sealants: See Section 07 92 10 - Joint Sealing.

2.6 SHEATHING PAPER

.1 Exterior wall sheathing paper: to CAN2-51.32 spunbound olefin type as indicated. See Section 07 27 10 Air Barriers.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install cladding in accordance with CGSB 93.5, and manufacturer's written instructions

.2 Install one layer exterior wall sheathing paper horizontally by stapling and lapping edges 150mm.

.3 Install continuous starter strips, inside and outside corners, edgings, soffit, drip, cap, sill and window/door opening flashings as indicated.

.4 Install outside corners, fillers and closure strips with carefully formed and profiled work.

.5 Install fascia cladding as indicated.

.6 Maintain joints in exterior cladding, true to line, tight fitting, hairline joints.

.7 Attach components in manner not restricting thermal movement.

.8 Caulk junctions with adjoining work in accordance with Section 07 92 10 – Joint Sealing.

3.3 CLEANING

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

End of Section

PART 1 - GENERAL

1.1 References

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 The Aluminum Association Inc. (AA)
- .1 Aluminum Sheet Metal Work in Building Construction.
- .2 AA DAF45, Designation System for Aluminum Finishes.

.2 American Society for Testing and Materials (ASTM International)
- .1 ASTM A 167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM A 591/A591M, Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Applications.
- .3 ASTM A 653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 ASTM A 792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .5 ASTM B 32, Standard Specification for Solder Metal.

.3 Canadian Roofing Contractors Association (CRCA)
- .1 Roofing Specifications Manual.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-37.5, Cutback Asphalt Plastic Cement.
- .2 CAN/CGSB-51.32, Sheathing, Membrane, Breather Type.
- .3 CAN/CGSB-93.1, Sheet Aluminum Alloy, Prefinished, Residential.

.5 Canadian Standards Association (CSA International)
- .1 CSA A123.3, Asphalt Saturated Organic Roofing Felt.
- .2 CSA B111, Wire Nails, Spikes and Staples.

PART 2 - PRODUCTS

2.1 Sheet Metal Materials

.1 Zinc coated steel sheet: Provide sheet metal in base metal thickness specified. Where no thickness specified, provide base sheet metal in thickness recommended in SMACNA Architectural Sheet Metal Manual for type of item being fabricated, but not less than the thickness required by the authority having jurisdiction. Commercial quality to ASTM A 653/A653M, with Z275 designation zinc coating.

2.2 Prefinished Steel Sheet

.1 Prefinished steel with factory applied polyvinylidene fluoride.
- .1 Class F1S.
- .2 colour selected by Contract administrator from manufacturer's standard range.
- .3 Coating thickness: not less than 22 micrometres.
- .4 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D 822 as follows:
  - .1 Outdoor exposure period 2500 hours.
  - .2 Humidity resistance exposure period 5000 hours.

.2 Prefinished steel with factory applied galvalume finish.
- .1 Thickness and finish to match roof system.

2.3 Prefinished Aluminum Sheet

Finish: factory applied polyvinylidene fluoride (PVDF) coating to AAMA 621 as follows:
Finished one side.
Colour as selected by Contract Administrator from manufacturer's standard full colour range.
Coating system thickness: not less than 22 micrometres dry film thickness.

2.3 Accessories

.1 Isolation coating: alkali resistant bituminous paint.

.2 Plastic cement: to CAN/CGSB 37.5.

.3 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.

.4 Self-adhesive membrane underlay and tie-in membrane for metal flashings: To CSA A123.22 or ASTM D 1970, minimum 3mm thickness.

.5 Sealants: as per Section 07 92 10 - Joint Sealing.

.6 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.

.7 Fasteners: of same material as sheet metal, to CSA B111, flat head roofing nails of length and thickness suitable for metal flashing application.

.8 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.9 Touch-up paint: as recommended by prefinished material manufacturer.

2.4 Fabrication

.1 Fabricate metal flashings and other sheet metal work as indicated.

.2 Fabricate aluminum flashings and other sheet aluminum work in accordance with AA-Aluminum Sheet Metal Work in Building Construction.

.3 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.

.4 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.

.5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.5 Metal Flashings

.1 Form flashings, copings and fascias to profiles indicated of 20 Gauge thick prefinished steel.

2.6 Eaves Troughs and Downpipes

.1 Form, rain gutters, rain water leaders and downpipes from 20 Gauge thick prefinished steel sheet metal, color as specified by contract administrator.

.2 Sizes and profiles as indicated.

.3 Provide goosenecks, outlets, strainer baskets and necessary fastenings.

PART 3 - EXECUTION

3.1 Installation

.1 Install sheet metal work as detailed.

.2 Use concealed fastenings except where approved before installation.

.3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints as detailed.

.5 Lock end joints and caulk with sealant.

.6 Install pans, where shown around items projecting through roof membrane.

3.2 Eaves Troughs and Downpipes

.1 Install eaves troughs and secure to building at 750 mm on centre with eaves trough spikes through spacer ferrules. Slope eaves troughs to downpipes as indicated. Seal joints watertight.

.2 Install downpipes and provide goosenecks back to wall. Secure downpipes to wall with straps at 1800 mm on centre; minimum two straps per downpipe.

.3 Install HSS downpipes as per drawings.

.4 Install splash pads as indicated.

End of Section

PART 1 - GENERAL

1.1 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Society for Testing and Materials International, (ASTM)
- .1 ASTM C 919, Standard Practice for Use of Sealants in Acoustical Applications.

.2 Canadian General Standards Board (CGSB)
- .1 CGSB 19-GP-5M, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
- .2 CAN/CGSB-19.13, Sealing Compound, One-component, Elastomeric, Chemical Curing.
- .3 CGSB 19-GP-14M, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
- .4 CAN/CGSB-19.17, One-Component Acrylic Emulsion Base Sealing Compound.
- .5 CAN/CGSB-19.24, Multi-component, Chemical Curing Sealing Compound.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.2 DELIVERY, STORAGE, AND HANDLING

.1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.3 PROJECT CONDITIONS

.1 Environmental Limitations:
- .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.

PART 2 - PRODUCTS

2.1 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.

.3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Urethanes Two Part.
- .1 Self-Leveling to CAN/CGSB-19.24, Type 1, Class B, colour as selected.
- .2 Acceptable material: Tremco THC 900, Vulkem 245

.2 Urethanes Two Part.
- .1 Non-Sag to CAN/CGSB-19.24, Type 2, Class B, colour as selected
- .2 Acceptable material: Tremco Dymeric 240, Vulkem 227

.3 Urethanes One Part.
- .1 Self-Leveling to CAN/CGSB-19.13, Type 1, colour as selected

.2 Acceptable material: Vulkem 45

.4 Urethanes One Part.
.1 Non-Sag to CAN/CGSB-19.13, Type 2, colour as selected
.2 Acceptable material: Tremco Dymonic, Vulkem 116, Vulkem 431

.5 Silicones One Part.
.1 To CAN/CGSB-19.13.
.1 Acceptable material: Tremco Spectrum 2 or 3, GE Silpruf 2000
.2 To CAN/CGSB-19.22 (Mildew resistant).
.1 Acceptable material: Tremco Tremsil 200, GE SCS 1700 Sanitary

.6 Acrylics One Part.
.1 To CGSB 19-GP-5M.
.2 Acceptable material: Tremco 555

.7 Acrylic Latex One Part.
.1 To CAN/CGSB-19.17.
.2 Acceptable material: Tremflex 834

.8 Acoustical Sealant.
.1 To CAN/CGSB-19.21.
.2 Acceptable material: Tremco Acoustic Sealant

.9 Butyl.
.1 To CGSB 19-GP-14M.
.2 Acceptable material: Tremco Butyl

.10 Preformed Compressible and Non-Compressible back-up materials.
.1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
.1 Extruded closed cell foam backer rod.
.2 Size: oversize 30 to 50 %.
.2 Neoprene or Butyl Rubber.
.1 Round solid rod, Shore A hardness 70.
.3 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 density, or neoprene foam backer, size as recommended by manufacturer.
.4 Bond Breaker Tape.
.1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT SELECTION

.1 Perimeters of exterior openings where frames meet exterior facade of building (ie. brick, block, precast masonry): Sealant type: 2.2.4

.2 Cornice and wash (or horizontal surface joints): Sealant type: 2.2.4

.3 Exterior joints in horizontal wearing surfaces: Sealant type: 2.2.4

.4 Seal interior perimeters of exterior openings as detailed on drawings: Sealant type: 2.2.7

.5 Perimeters of interior frames, as detailed and itemized: Sealant type: 2.2.4

.6 Interior masonry vertical control joints (block-to-block, block-to-concrete, and intersecting masonry walls): Sealant type: 2.2.4

.7 Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, waterclosets, basins, vanities): Sealant type: 2.2.5.2

.8 Exposed interior control joints in drywall: Sealant type: 2.2.4

2.4 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

.2 Primer: as recommended by manufacturer.

PART 3 - EXECUTION

3.1 PROTECTION

.1 Protect installed Work of other trades from staining or contamination.

3.2 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.

3.3 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.

3.4 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

.1 Mix materials in strict 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 Do not cover up sealants until proper curing has taken place.

.3 Cleanup.
- .1 Clean adjacent surfaces immediately and leave Work neat and clean.
- .2 Remove excess and droppings, using recommended cleaners as work progresses.
- .3 Remove masking tape after initial set of sealant.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 07 92 10 - Joint Sealing

.2 Section 08 71 10 - Door Hardware

.3 Section 09 91 13 - Exterior Painting.

.4 Section 09 91 23 - Interior Painting.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Society for Testing and Materials (ASTM International)
- .1 ASTM A 653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM B 29, Specification for Refined Lead.
- .3 ASTM B 749, Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA International)
- .1 G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.4 Canadian Steel Door Manufacturers' Association, (CSDMA).
- .1 CSDMA, Specifications for Commercial Steel Doors and Frames.
- .2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors.

1.3 DESIGN REQUIREMENTS

.1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35° C to 35° C.

.2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 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.

.3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings fire rating finishes.

.4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings.

1.5 REQUIREMENTS

.1 Steel fire rated doors and frames: labeled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104M NFPA 252 for ratings specified or indicated.

.2 Provide fire labeled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict conformance with CAN4-S104, ASTM E 152 or NFPA 252 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.

1.6 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 If requested, submit one 300 x 300 mm top butt corner sample of each type door.

.3 If requested, submit one 300 x 300 mm corner sample of each type of frame.

.1 Show butt cutout glazing stops 300 mm long removable mullion connection snap-on trim with clips.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Hot dipped galvanized steel sheet: to ASTM A 653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.

.2 Reinforcement: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A 653M, ZF75.

.3 Composites: balance of core materials used in conjunction with lead: in accordance with manufacturers' proprietary design.

2.2 DOOR CORE MATERIALS

.1 Thermal insulation material must:

.1 Not require being labeled as poisonous, corrosive, flammable or explosive under the Consumer Chemical and Container Regulations of the Hazardous Products Act;

.2 Be manufactured using a process that uses chemical compounds with the minimum ozone depletion potential (ODP) available.

2.3 ADHESIVES

.1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

.2 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.

.3 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.4 PRIMER

.1 Touch-up prime CAN/CGSB-1.181.

2.5 PAINT

.1 Field paint steel doors and frames in accordance with Sections 09 91 23 - Interior Painting and 09 91 13 - Exterior Painting. Protect weatherstrips from paint. Provide final finish shall be free of scratches or other blemishes.

2.6 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Exterior and interior top and bottom caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.

.3 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.

.4 Metallic paste filler: to manufacturer's standard.

.5 Sealant: as per Section 07 92 10 - Joint Sealing.

2.7 FRAMES FABRICATION GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Interior frames: 1.6 mm (16 gauge), construction as indicated.

.4 Blank, reinforce, drill and tap frames for mortised, templated hardware, using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.5 Protect mortised cutouts with steel guard boxes.

.6 Prepare frame for door silencers, 3 for single door.

.7 Manufacturer's nameplates on frames and screens are not permitted.

.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.

2.8 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.

.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 o.c. maximum.

2.9 FRAMES: KNOCKED-DOWN TYPE

.1 Ship knocked-down type frames unassembled.

.2 Provide frames with mechanical joints which inter-lock securely and provide functionally satisfactory performance when assembled and installed in accordance with CSDMA Recommended Installation Guide for Steel Doors and Frames.

.3 Securely attach floor anchors to inside of each jamb profile.

2.10 DOOR FABRICATION GENERAL

.1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.

.2 Exterior doors: insulated construction.

.3 Fabricate doors with longitudinal edges locked seam. Seams: visible.

.4 Blank, reinforce, drill doors and tap for mortised or templated hardware.

.5 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.6 Reinforce doors where required, for surface mounted hardware. Provide flush PVC top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.

.7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.8 Provide fire labeled doors for those openings requiring fire protection ratings, as scheduled. Test such products in strict conformance with CAN4-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.

.9 Manufacturer's nameplates on visible faces of doors are not permitted.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

.1 Install labeled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

.2 Install doors and frames to CSDMA Installation Guide.

3.2 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 Caulk perimeter of frames between frame and adjacent material.

.6 Maintain continuity of vapour retarder.

3.3 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 10 - Door Hardware.

.2 Provide even margins between doors and jambs and doors and finished floor as follows.
- .1 Hinge side: 1.0 mm.
- .2 Latchside and head: 1.5 mm.
- .3 Finished floor, top of carpet and thresholds: 13 mm.

.3 Adjust operable parts for correct function.

3.4 FINISH REPAIRS

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 The Aluminum Association Inc. (AA).
- .1 Aluminum Association Designation System for Aluminum Finishes-DAF 45-03.

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A 1008/A1008M, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

.3 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-1.105, Quick-Drying Primer.
- .2 CAN/CGSB-1.213, Etch Primer (Pretreatment Coating) for Steel and Aluminum.

.4 Canadian Standards Association (CSA International).
- .1 CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 SYSTEM DESCRIPTION

.1 Design Requirements.
- .1 Design exterior door assembly to withstand wind load of 1 kPa with a maximum horizontal deflection of 1/240 of opening width.
- .2 Design door panel assemblies with thermal insulation factor 2.84 RSI.
- .3 Design door assembly to withstand minimum 100 000 cycles per annum, and 5 years total life cycle.

1.4 SUBMITTALS

.1 Shop Drawings
- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate sizes, service rating, types, materials, operating mechanisms, glazing locations and details, hardware and accessories, required clearances and electrical connections.

.2 Manufacturer's Instructions:
- .1 Submit manufacturer's installation instructions.

1.5 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for overhead door hardware for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Dispose of corrugated cardboard, polystyrene and plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

.3 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

1.7 EXTRA MATERIALS

.1 Provide spare parts in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide spare parts for overhead doors as follows:
- .1 Door rollers: 4
- .2 Weather stripping Set: 1

.3 Store where directed. Identify each part and reference to appropriate door.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Richard-Wilcox Canada Model Landmark L-200
  .1 ANSI/DAASMA 102 – American National Standard Specifications for Sectional Overhead Type Doors.

.2 Door Model: Flush panel – Slate Grey.

.3 Size: See Drawings. Door is to be 25mm higher than finished door opening and extend 25mm beyond jamb on either side of finished door opening width.

.4 Door Sections: 6.3mm ship-lap.

.5 Panel Thickness: 51mm.

.6 Exterior Surface: Flush with a non-repeating random stucco surface texture.

.7 Exterior Steel: Pre-painted 0.016" (0.41mm), hot-dipped galvanized.

.8 Interior Surface: Rib pattern with a non-repeating random stucco surface texture.

.9 Interior Steel: Pre-painted 0.016" (0.41mm), hot-dipped galvanized.

.10 End Stiles: End Caps: 16 gauge (1.6mm) hot dipped galvanized steel.

.11 High Cycle Springs: 100,000 cycles.

.12 Insulation: Foamed in place CFC-free and HCFC-free polyurethane, fully encapsulated.

.13 Thermal Value: R=18.5, U=0.054 (RSI=3.26, USI=0.310).

.14 Windows: 4 "AA" acrylic windows in top panel.

.15 Exterior Colours: Manufacture's standard white.

.16 Interior Colours: Manufacture's standard white.

.17 Hardware: 3" (75mm) Zinc coated steel hinges and fixtures. Ball bearing rollers with hardened steel races
  .1 Standard continuous, replaceable dual seals between sections.
  .2 Standard bottom seal: 4" (102mm) vinyl retained in aluminum extrusion.
  .3 Top seal: PVC/Vinyl type.
  .4 Jamb seal: Dual fin vinyl/steel.

.18 Track: 3" (75mm) Standard lift type complete with adjustable continuous angle. Brackets or clip angle NOT accepted.

.19 Operation: Equip doors for operation by:
  .1 Electrical jack shaft type, side mounted operator.
    Standard of Acceptance: LM-MJ Medium-Duty Wall-Mount Operator
    Operator features included:
      .1 3 button control – open, close, stop.
      .2 Adjustable automatic friction clutch.
      .3 Motor control: heavy duty reversing contactor.
      .4 Limit switches.
      .5 Manual overload relay.
      .6 Electrical control cabinet.
      .7 Step down transformer for controls.
      .8 Emergency chain hoist.
      .9 Heavy duty solenoid brake.
      .10 Safety electrical interlock.
      .11 Door speed: 300mm per second

  .2 Operation: inside pushbutton and individual remote control.
    .1 Remote pushbutton station: surface mounted, adjacent to door on the inside, with

"OPEN-STOP-CLOSE" designations on pushbuttons in English.

.3 Safety switch: combination roll rubber with limit switches for full length of bottom rail of bottom section of door, to reverse door to open position when coming in contact with object on closing cycle.

2.2 HARDWARE

.1 Counter-balance System:

.1 Oil tempered torsion springs: minimum 100,000 cycles.

.2 Spring: Sized to suit the cycles.

.3 Shaft: 1" (25mm) solid CRS shaft with full length keyway, recommended for doors up to 1,000lbs (450kg).

.4 Wire Rope: Aircraft type 7x19 construction with a safety factor of 5:1 minimum.

.2 Include all the required hardware and zinc plated fasteners:

.1 Hinges: Linear style, 11 gauge (3mm) zinc coated steel.

.1 ADCA Mount: Continuous adjustable track angle ADCA. Bolted type, field adjustable to ensure weather tight seal, fabricated from 14 gauge (2.0mm) commercially galvanized steel, designed to provide continuous track support for full opening height.

.2 Track Hangers: Perforated type, 1 ¼"" (32mm by 32mm) angles, roll formed from 14 gauge (2.0mm) thick commercially galvanized steel.

.3 Horizontal track curve: 16" (406mm) radius.

.4 Rollers: Hardened steel outer race, 2 7/8" (73mm) diameter, with ten – 5/16" (8mm) ball bearings, and 7/16" (11mm) diameter roller axels.

.5 Roller Brackets: Fabricated from commercially galvanized steel. Graduated type design to suit the slope in the vertical track to ensure weather tight seal. Thickness as follows;

.1 11 gauge (3.1mm).

.6 Pusher springs: For all standard lift doors with manual chain hoist or jackshaft electric operators.

.7 Track guards: Formed from 3/16" (4.8mm) minimum steel, 60" (1520mm high).

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install overhead doors and hardware in accordance with manufacturer's instructions.

.2 Rigidly support rail and operator and secure to supporting structure.

.3 Install operator including electrical motors, controller units, pushbutton stations, relays and other electrical equipment required for door operation.

.4 Lubricate and adjust door operating components to ensure smooth opening and closing of doors.

.5 Adjust weather stripping to form a weather tight seal.

.6 Adjust doors for smooth operation.

3.3 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Remove traces of primer, caulking; clean doors and frames.

.3 Clean glass and glazing materials with approved non-abrasive cleaner.

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

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 07 92 10 - Joint Sealing.

1.2 REFERENCES

All reference standards shall be current issue or latest revisions at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 National Building Code of Canada (NBC)

.2 North American Fenestration Standard (NAFS)

.1 AAMA/WDMA/SCA 101/I.S.2/A440-8, NAFS – North American Fenestration Standard, Specification for Windows, Doors and Skylights.

.3 Canadian Standards Associations (CSA) International

.1 CSA-A440.2, Energy Performance of Windows and Other Fenestration Systems

.2 CSA-A440.4, Window and Door Installation.

.3 CSA-A440SI, Canadian supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS- North American Fenestration Standard, Specification for Windows, Doors and Skylights.

.4 CSA-440.7, Window and Door Installation.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate materials and details in full size scale for head, jamb and sill, profiles of components, interior and exterior trim, junction between combination units, elevations of unit, anchorage details, description of related components and exposed finishes fasteners, and caulking. Indicate location of manufacturer's nameplates.

.3 Provide manufacturers fabrication dimensions for all window components (cut sheets) for all window types and configurations.

.4 Indicate on shop drawings, dimensions, relation to construction of adjacent work, air and vapour seal with adjacent construction materials, component anchorage and locations, anchor methods, shim methods and material, and hardware installation details. Include also opening dimensions, frames opening tolerances and affected related work and installation requirements. Provide shop drawings for anchor and shim methods and materials, sealed by an engineer registered in the Province of Manitoba.

1.4 PERFORMANCE REQUIREMENTS

.1 Design frames in exterior walls to accommodate expansion and contraction within services temperature range of -40°C to 75°C.

.2 Accommodate, without damage to components or deterioration of seals:

.1 Expansion and contraction within system caused by a cycling temperature changes without causing detrimental affect to system components including buckling, failure of joint seals, or undue stress on fasteners.

.2 Movement between system and perimeter framing components.

.3 Dynamic loading and release of loads.

.4 Deflection of structural support framing.

.3 System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within the system, to the exterior by a weep drainage network.

.4 Thermal Movement: Design sections to permit movement caused by thermal expansion and contraction of fibreglass to suite glass, infill, and perimeter opening construction.

.5 Design glazing system, mullions and frames to support a live load of 1.46 kN/m acting vertically, 1.61kN/m acting horizontally at any point up to 1070mm above the floor or, 0.73kN/m at 1070mm above the floor or 0.73kN/m at 1070mm above the floor, whichever produces the greatest effect.

.6 Mullions to have L/175 deflection limit rating as per NAFS using Mullion Assembly (MA) designation.

1.5 MOCK UP

.1 Upon commencement of the contract, one typical unit window shall be prepared as a sample of the work, including insulation and interior casing/finishing. Work shall not proceed until the sample unit has been approved by the Contract Administrator. The quality of the sample unit installation shall be maintained through the balance of the project.

1.6 MAINTENANCE DATA

.1 Provide operation and maintenance data for windows for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.7 WARRANTY

.1 Provide written warranty for window sashes and frames against material or manufacturing defects occurring within 20 years from date of substantial performance.

.2 Provide written warranty for glazing seal failure against material or manufacturing defects occurring within 10 years from the date of substantial performance.

1.8 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for windows for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Materials: to CSA-A440/A440.1 supplemented as follows:

.2 All windows of similar material to be by same manufacturer.

.3 Main frame: fiberglass.

.4 Glass: Polycarbonate security glazing:
- .1 Single 19 mm thick polycarbonate sheet, clear colour.
- .2 Flexural strength: to ASTM D 790.
- .3 Surface burning characteristics for flame and smoke spread: to ASTM E 84.
- .4 Self ignition characteristics: to ASTM D 1929..

.5 Isolation coating: alkali resistant bituminous paint.

2.2 WINDOW TYPE AND CLASSIFICATION

.1 Type:
- .1 Fixed fiberglass: Polycarbonate security glazing.
  - .1 Acceptable material: Duxton 325 Series or approved equal.
- .2 Fixed fiberglass: Tempered with polycarbonate security panel.
  - .1 Acceptable material: Duxton 658 Series or approved equal.

2.3 FABRICATION

.1 Fabricate in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 supplemented as follows:
.2 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.
.3 Face dimensions detailed maximum permissible sizes.
.4 Brace frames to maintain squareness and rigidity during shipment and installation.
.5 Finish steel clips and reinforcement with 380 g/m^2 zinc coating to ASTM A 123/A 123M.

2.4 FIBERGLASS FINISHES

.1 Finish exposed interior and exterior surfaces of fiberglass components in "espresso" finish.

2.4 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 GLAZING

.1 Glaze windows in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 with polycarbonate security glazing.
.2 Glazing as per section 08 80 50.

2.7 AIR BARRIER AND VAPOUR RETARDER

.1 Equip window frames with site installed air/ vapour barrier material for sealing to building air/ vapour barrier 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 All rough openings on windows and doors are to be wrapped on all sides with a self-adhered modified bituminous membrane.

PART 3 - EXECUTION

3.1 WINDOW INSTALLATION

.1 Install in accordance with CSA-A440/A440.1.

.2 Arrange components to prevent abrupt variation in colour.

3.2 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 Secure sills in place with anchoring devices located at ends and evenly spaced 600 mm on centre in between.

.3 Fasten expansion joint cover plates and drip deflectors with self tapping stainless steel screws.

3.3 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 10 - Joint Sealing. Conceal sealant within window units except where exposed use is permitted by Contract Administrator.

3.4 SCHEDULE

.1 Window series and colour.

Window	Type	Series	Int. Colour	Ext. Colour
W1	Fibreglass	325	Espresso (Stock Color)	Espresso (Stock Color)
W2	Fibreglass	658	Espresso (Stock Color)	Espresso (Stock Color)

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 08 11 14 – Metal Doors and Frames

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA).
- .1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction): standard hardware location dimensions.

.2 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-69.17, Bored and Preassembled Locks and Latches.
- .2 CAN/CGSB-69.18/ANSI/BHMA A156.1, Butts and Hinges.
- .3 CAN/CGSB-69.19/ANSI/BHMA A156.3, Exit Devices.
- .4 CAN/CGSB-69.20/ANSI/BHMA A156.4, Door Controls (Closers).
- .5 CAN/CGSB-69.21/ANSI/BHMA A156.5, Auxiliary Locks and Associated Products.
- .6 CAN/CGSB-69.22/ANSI/BHMA A156.6, Architectural Door Trim.
- .7 CAN/CGSB-69.29/ANSI/BHMA A156.13, Mortise Locks and Latches.
- .8 CAN/CGSB-69.31/ANSI/BHMA A156.15, Closer/Holder Release Device.
- .9 CAN/CGSB-69.32/ANSI/BHMA A156.16, Auxiliary Hardware.
- .10 CAN/CGSB-69.34/ANSI/BHMA A156.18, Materials and Finishes.

1.3 SUBMITTALS

.1 Hardware List:
- .1 Submit contract hardware list in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

.2 Manufacturer's Instructions:
- .1 Submit manufacturer's installation instructions.

.3 Closeout Submittals
- .1 Provide operation and maintenance data for door closers, locksets, door holders and fire exit hardware for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, Shipping, Handling and Unloading:
- .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.2 Storage and Protection:
- .1 Store finishing hardware in locked, clean and dry area.

1.6 WASTE DISPOSAL AND MANAGEMENT

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

1.7 MAINTENANCE

.1 Provide maintenance data and materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Data:
- .1 Provide maintenance data, parts lists and manufacturer’s instructions for each type of door closer, lockset, door holder and fire exit hardware.
- .2 Brief maintenance staff regarding proper care, cleaning and general maintenance.

.3 Extra Materials:
- .1 Provide two (2) sets of special wrenches for door closers, locksets and fire exit hardware and other tools applicable to each different or special hardware component.

.2 Provide two (2) sets of maintenance tools and accessories supplied by hardware component manufacturer.

.3 Provide two (2) copies of all installation instructions, operating manuals, programming guides and product warranties.

PART 2 - PRODUCTS

2.1 HARDWARE ITEMS

.1 Use one manufacturer's products only for similar items.

2.2 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 Use fasteners compatible with material through which they pass.

2.3 KEYING

.1 Provide construction cores.

.2 City shall provide all permanent cores to be installed by Contractor.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their Work to receive hardware.

.3 Furnish manufacturers' instructions for proper installation of each hardware component.

.4 Install closers and stops to allow maximum door swing permitted by the hardware and adjacent construction.

.5 Where special placement is required, consult the City.

3.2 INSTALLATION

.1 Install hardware to meet the new Manitoba Amendments Article 3.8.3.3(3).

.2 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.3 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.4 Remove construction cores when directed by Contract Administrator; install permanent cores and check operation of locks.

3.3 ADJUSTING

.1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.

.2 Lubricate hardware, operating equipment and other moving parts.

.3 Adjust door hardware to provide tight fit at contact points with frames.

.4 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.4 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacture's instructions.

.3 Remove protective material from hardware items where present.

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

3.5 SCHEDULE

Hardware Set#: 1

Single: D100A

4	Hinge (heavy weight)	TA2314 4.5” x 4” NRP	US32D	MK
1	Lockset/Deadbolt	AUR882FL	626	YA
1	Core	Supplied by City of Winnipeg		BE
1	Closer	210 TPN	689	NO
1	Kick Plate	K1050 10"	US32D	RO
1	Threshold	172A		PE
1	Crash Stop	CS115-25	US26D	IV
1	Sweep	315CN		PE
1	Weatherstrip	2891AS (Head)		PE
2	Weatherstrip	290AS (Jamb)		PE
1	Astragal	3572 SP		PE

Notes: City to provide permanent lock cores, temporary construction lock cores to be provided by G.C. and used throughout construction.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

.1 American National Standards Institute (ANSI).
- .1 ANSI/ASTM E330-02, Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM C 542-94(1999), Specification for Lock-Strip Gaskets.
- .2 ASTM D 790-02, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- .3 ASTM D 2240-02b, Test Method for Rubber Property - Durometer Hardness.
- .4 ASTM F 1233-98, Test Method for Security Glazing Materials and Systems.

.3 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
- .2 CAN/CGSB-12.8-97, Insulating Glass Units.

.4 Canadian Standards Association (CSA International).
- .1 CSA A440.2-[98], Energy Performance Evaluation of Windows and Sliding Glass Doors.
- .2 CSA Certification Program for Windows and Doors [2000].

.5 Flat Glass Manufacturers Association (FGMA).
- .1 FGMA Glazing Manual - [1997].

1.3 SYSTEM DESCRIPTION

.1 Performance Requirements:
- .1 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
  - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
- .2 Size glass to withstand wind loads, dead loads and positive and negative live loads.
- .3 Limit glass deflection to 1/200 with full recovery of glazing materials.

1.4 SUBMITTALS

.1 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Manufacturer's Instructions:
- .1 Submit manufacturer's installation instructions.

.3 Closeout Submittals:
- .1 Provide maintenance data including cleaning instructions for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Remove form site and dispose of packaging materials at appropriate recycling facilities.

.2 Dispose of corrugated cardboard, polystyrene and plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

PART 2 - PRODUCTS

2.1 MATERIALS: FLAT GLASS

.1 Polycarbonate security glazing:
Single 19 mm thick polycarbonate sheet, clear colour.

Flexural strength: to ASTM D 790.
Surface burning characteristics for flame and smoke spread: to ASTM E 84.
Self ignition characteristics: to ASTM D 1929..

2.2 MATERIALS: SEALED INSULATING GLASS

.1 Insulating glass units: to CAN/CGSB-12.8, double unit.
- .1 Glass: to CAN/CGSB-12.1
- .2 Glass thickness: as per glazing schedule.
- .3 Glass coating: Sun-Stop® low E.
- .4 Inert gas fill: argon
- .5 Spacer: Super Spacer® structural foam

2.3 ACCESSORIES

.1 Clear Safety and Security Window Film: 3M Safety S40 (SH4CLARL) Safety and Security Window Film. Optically clear polyester film with a durable acrylic abrasion resistant coating over one surface and a pressure sensitive adhesive over the other. The film may be laminated to other clear polyester film layers to achieve the desired thickness of the film.

1. Physical / Mechanical Performance Properties:
   - a. Film Color: Clear.
   - b. Thickness: Nominal 4.0 mils (0.10 mm).
   - c. Tensile Strength (ÅSTM D 882): 25,000 psi.
   - d. Elongation: 130 percent.
   - e. Break Strength (ASTM D 882) (Per Inch Width): 100 lbs..

.2 Setting blocks: Neoprene, 80-90 Shore A durometer hardness to ASTM D 2240, to suit glazing method, glass light weight and area.

.3 Spacer shims: Neoprene, 50-60 Shore A durometer hardness to ASTM D 2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

.4 Glazing tape:
- .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D 2240; coiled on release paper, black colour.
- .2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25 %, to effect an air and vapour seal.

.5 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot, colour as selected.

.6 Glazing clips: manufacturer's standard type.

.7 Lock-strip gaskets: to ASTM C 542.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

.1 Verify that openings for glazing are correctly sized and within tolerance.

.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.3 PREPARATION

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.4 INSTALLATION: EXTERIOR - DRY METHOD (PREFORMED GLAZING)

.1 Perform work in accordance with FGMA Glazing Manual.

.2 Cut glazing tape to length; install on glazing light. Seal corners by butting tape and sealing junctions with sealant.

.3 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.

.4 Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

.5 Install removable stops without displacing glazing tape. Exert pressure for full continuous contact.

.6 Trim protruding tape edge.

3.5 INSTALLATION: EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

.1 Perform work in accordance with FGMA Glazing Manual.

.2 Cut glazing tape to length and set against permanent stops, 6 mm below sight line. Seal corners by butting tape and dabbing with sealant.

.3 Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.

.4 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.

.5 Rest glazing on setting blocks and push against tape and heel head of sealant with sufficient pressure to attain full contact at perimeter of light or glass unit.

.6 Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, maximum 9 mm below sight line.

.7 Apply cap head of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.6 INSTALLATION: EXTERIOR - WET METHOD (SEALANT AND SEALANT)

.1 Perform work in accordance with FGMA Glazing Manual.

.2 Place setting blocks at 1/4 points and install glazing light or unit.

.3 Install removable stops with glazing centred in space by inserting spacer shims both sides at 600 mm intervals, 6 mm below sight line.

.4 Fill gaps between glazing and stops with sealant to depth of bite on glazing, maximum 9 mm below sight line to ensure full contact with glazing and continue air and vapour seal.

.5 Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.7 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Remove traces of primer, caulking.

.3 Remove glazing materials from finish surfaces.

.4 Remove labels after work is complete.

.5 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacture's instructions.

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

3.8 PROTECTION OF FINISHED WORK

.1 After installation, mark light with an "X" by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.

3.9 SCHEDULE

.1 Fibreglass Frame Exterior Window: factory sealed, double glazed units with 6mm tempered glass, both panes, safety film on surface 2.

.2 Fibreglass Frame Clerestory Exterior Window: 12mm polycarbonate sheet, clear colour. Flexural strength: to ASTM D 790.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 09 91 23 - Painting of Interior Surfaces.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 Architectural Painting Specifications Manual, Master Painters Institute (MPI).

1.3 QUALITY ASSURANCE

.1 Contractor shall have a minimum of five years proven satisfactory experience. When requested, provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager.

.2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

.3 Conform to latest MPI requirements for exterior painting work including preparation and priming.

.4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.

.5 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.

.6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Contract Administrator.

.7 Standard of Acceptance:

- .1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
- .2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.4 SCHEDULING OF WORK

.1 Submit work schedule for various stages of painting to Contract Administrator for approval. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Schedule painting operations to prevent disruption of occupants in and about the building.

1.5 SUBMITTALS

.1 Submit product data and manufacturer's installation/application instructions for paints and coating products to be used in accordance with Section 01 33 00 - Submittal Procedures.

.2 Upon completion, submit records of products used. List products in relation to finish system and include the following:

- .1 Product name, type and use.
- .2 Manufacturer's product number.
- .3 Colour numbers.

1.6 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit 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 Painting Specification Manual standards submitted on the 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.

.3 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

.4 Submit full range of available colours where colour availability is restricted.

1.7 EXTRA MATERIALS

.1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Submit one - four litre can of each type and colour of primer, stain and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Deliver to Contractor and store where directed.

1.8 DELIVERY, HANDLING AND STORAGE

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver and store materials in original containers, sealed, with labels intact.

.3 Labels shall clearly indicate:
- .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.

.4 Remove damaged, opened and rejected materials from site.

.5 Provide and maintain dry, temperature controlled, secure storage.

.6 Observe manufacturer's recommendations for storage and handling.

.7 Store materials and supplies away from heat generating devices.

.8 Store materials and equipment in a well ventilated area with temperature range 7° C to 30° C.

.9 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.10 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Contract Administrator. After completion of operations, return areas to clean condition to approval of Contract Administrator.

.11 Remove paint materials from storage only in quantities required for same day use.

.12 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.13 Fire Safety Requirements:
- .1 Provide one 4.5 kg Type ABC 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 the National Fire Code of Canada.

1.9 SITE REQUIREMENTS

.1 Heating, Ventilation and Lighting:
- .1 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10° C for 24 hours before, during and after paint application until paint has cured sufficiently.
- .2 Where required, provide continuous ventilation for seven days after completion of application of paint.
- .3 Coordinate use of existing ventilation system with City and ensure its operation during and after application of paint as required.
- .4 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.

.5 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no painting work when:

.1 ambient air and substrate temperatures are below 10° C.

.2 substrate temperature is over 32° C unless paint is specifically formulated for application at high temperatures.

.3 substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.

.4 the relative humidity is above 85% or when dew point is less than 3° C variance between air/surface temperature.

.5 rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.2 Perform no painting work when maximum moisture content of substrate exceeds:

.1 12% for concrete and masonry (clay and concrete brick/block).

.2 15% for wood.

.3 12% for plaster and gypsum board.

.3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".

.4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish only 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 only to adequately prepared surfaces and to surfaces within moisture limits noted herein.

.3 Apply paint only when previous coat of paint is dry or adequately cured.

.4 Apply paint finishes only when conditions forecast for entire period of application fall within manufacturer's recommendations.

.5 Do not apply paint when:

.1 Temperature is expected to drop below 10° 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.

.6 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.

.7 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.

.8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

.9 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of the City such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.2 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.3 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
- .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
- .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
- .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
- .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
- .5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.4 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Paint materials listed in the latest edition of the MPI Approved Products List (APL) are acceptable for use on this project.

.2 Paint materials for paint systems shall be products of a single manufacturer.

.3 Water-borne surface coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).

.4 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.
- .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
- .2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
- .3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

2.2 COLOURS

.1 Contract Administrator will provide Colour Schedule after Contract award.

.2 Colour schedule will be based upon selection of three base colours and two accent colours. No more than five colours will be selected for the entire project.

.3 Selection of colours will be from manufacturers full range of colours.

.4 Where specific products are available in a restricted range of colours, selection will be based on the limited range.

.5 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site.

.2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

.3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.

.4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy

of instructions to Contract Administrator.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:

Gloss Level Category	Units @ 60°	Units @ 60°
G1 – matte finish	0 to 5	max. 10
G2 - velvet finish	0 to 10	10 to 35
G3 – eggshell finish	10 to 25	10 to 35
G4 – satin finish	20 to 35	min. 35
G5 - semi gloss	35 to 70	
G6 - gloss finish	70 to 85	
G7 – high gloss finish	> 85	

.2 Gloss level ratings of painted surfaces as noted on Finish Schedule.

2.5 EXTERIOR PAINTING SYSTEMS

.1 Galvanized Metal: not chromate passivated
- .1 EXT 5.3A - Latex Gloss Level 5 finish.
- .2 EXT 5.3D – Polyurethane, Pigmented (over vinyl wash primer and epoxy primer)

PART 3 - EXECUTION

3.1 GENERAL

.1 Perform preparation and operations for exterior painting in accordance with MPI Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXISTING CONDITIONS

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Contract Administrator damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Contract Administrator. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:
- .1 Wood: 15%.

3.3 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 such surfaces as directed by Contract Administrator.

.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, building occupants and general public in and about the building.

.5 Removal of light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings shall be done prior to undertaking painting operations by General Contractor. Items shall be securely stored and re-installed after painting is completed by General Contractor.

.6 Move and cover exterior furniture and portable equipment as necessary to carry out painting

operations. Replace as painting operations progress.

.7 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of Contract Administrator.

3.4 CLEANING AND PREPARATION

.1 Clean and prepare exterior surfaces in accordance with MPI Painting Specification Manual requirements. Refer to the MPI Manual in regard to specific requirements and as follows:
- .1 Remove dust, dirt, and other surface debris by brushing, 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. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.

.2 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 pretreatment as soon as possible after cleaning and before deterioration occurs.

.3 Where possible, prime 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.

.4 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.

.5 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 brushing with clean brushes.

.6 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.

3.5 APPLICATION

.1 Method of application to be as approved by Contract Administrator. Apply paint by brush, roller, or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:
- .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
- .2 Work paint into cracks, crevices and corners.
- .3 Paint surfaces and corners not accessible to brush using spray, daubers and/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 shall be free of roller tracking and heavy stipple unless approved by Contract Administrator.
- .5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray Application:
- .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly 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 a uniform layer, with overlapping at edges of spray pattern.

.4 Brush out immediately runs and sags.
.5 Use brushes 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 and only when specifically authorized by Contract Administrator.

.5 Apply coats of paint as a 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 time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.

.9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.3 Do not paint over nameplates.

.4 Paint fire protection piping red.

.5 Paint steel electrical light standards. Do not paint outdoor transformers and substation equipment.

3.7 RESTORATION

.1 Clean and re-install all hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashing's on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Contract Administrator. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Contract Administrator.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 09 91 13 – Exterior Painting

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 Architectural Painting Specifications Manual, Master Painters Institute (MPI).

1.3 QUALITY ASSURANCE

.1 Qualifications:

- .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.

1.4 SCHEDULING

.1 Submit work schedule for various stages of painting to Contract Administrator for review. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Schedule painting operations to prevent disruption of occupants.

1.5 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

- .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.

.3 Samples:

- .1 Submit full range colour sample chips to indicate where colour availability is restricted.
- .2 Submit 200 x 300mm 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.
- .3 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include following:
  - .1 Product name, type and use.
  - .2 Manufacturer's product number.
  - .3 Colour numbers.

1.6 MAINTENANCE

.1 Extra Materials:

- .1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.
- .2 Quantity: provide one - four litre can of each type and colour of primer, stain, finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

.1 Pack, ship, handle and unload materials in accordance with Section 01 61 00 - 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 4.5 kg Type ABC 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.

.9 Waste Management and Disposal:
- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
  - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
  - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
  - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
  - .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
  - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).

1.8 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:
- .1 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.
- .2 Provide continuous ventilation for seven days after completion of application of paint.
- .3 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.

.4 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 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 under 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature. 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 Allow new concrete and masonry to cure minimum of 28 days.

.2 15% for wood.

.3 12% for plaster and gypsum board.

.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 City such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.9 EXTRA MATERIALS

.1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Submit one - four litre can of each type and colour of primer, stain and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

.3 Deliver to Contractor and store where directed.

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 Conform to latest MPI requirements for interior painting work including preparation and priming.

.4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.

.5 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 Contract Administrator will provide Colour Schedule after Contract award.

.2 Colour schedule will be based upon selection of two base colours and three accent colours. No more than six colours will be selected for entire project.

.3 Selection of colours from manufacturers full range of colours.

.4 Where specific products are available in restricted range of colours, selection based on limited range.

.5 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 Perform colour tinting operations prior to delivery of paint to site.

.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.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

Gloss Level Category	Units @ 60°	Units @ 60°
G1 – matte finish	0 to 5	max. 10
G2 - velvet finish	0 to 10	10 to 35
G3 – eggshell finish	10 to 25	10 to 35
G4 – satin finish	20 to 35	min. 35
G5 - semi gloss	35 to 70	
G6 - gloss finish	70 to 85	
G7 – high gloss finish	> 85	

.2 Gloss level ratings of painted surfaces as indicated and as noted on Finish Schedule.

2.5 INTERIOR PAINTING SYSTEMS

.1 Concrete Floor: smooth
  .1 INT 3.2D –Polyurethane pigmented finish over epoxy. Premium Grade.

.2 Galvanized Metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.
  .1 INT 5.3A - Latex Gloss Level 5 finish. Premium Grade.

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 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 Contract Administrator damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.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 Clay and Concrete Block/Brick: 12%.
- .3 Wood: 15%.

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 Contract Administrator.
- .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, building occupants 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 City.

.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
- .1 Remove dust, dirt, and other surface debris by vacuuming, or wiping with dry, clean cloths.
- .2 Wash surfaces with a biodegradable detergent 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 pretreatment 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 brushing with clean brushes.

.8 Touch up of shop primers with primer as specified.

3.5 APPLICATION

.1 Method of application to be as approved by Contract Administrator. Apply paint by brush, roller 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 and/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 and 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 time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 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.

.9 Finish inside of cupboards and cabinets as specified for outside surfaces.

.10 Finish closets and alcoves as specified for adjoining rooms.

.11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

.1 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.

.2 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.3 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied

by manufacturer of equipment.

.4 Do not paint over nameplates.

.5 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

.6 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.

.7 Do not paint interior transformers and substation equipment.

3.7 SITE TOLERANCES

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.8 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashing's on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Contract Administrator. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Contract Administrator.

End of Section

PART 1 - GENERAL

1.1 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American National Standards Institute (ANSI)
- .1 ANSI/NFPA 10, Portable Fire Extinguishers.

.2 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S508, Rating and Fire Testing of Fire Extinguishers and Class "D" Extinguishing Media.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

PART 2 - PRODUCTS

2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS

.1 Stored pressure rechargeable type with hose and shut-off nozzle, ULC labeled for A, B and C class protection. Size 4.5 kg.

2.2 EXTINGUISHER BRACKETS

.1 Type recommended by extinguisher manufacturer.

2.3 IDENTIFICATION

.1 Identify extinguishers in accordance with recommendations of ANSI/NFPA 10.

.2 Attach tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install or mount extinguishers in cabinets or on brackets as indicated.

End of Section

PART 1 - GENERAL

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings, product data and catalogue illustrations in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate materials, thicknesses, sizes, finishes, colours, construction details, removable and interchangeable components, mounting methods and schedule of signs.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Aluminum: 5052 Alloy.

.2 Welding materials: to CSA W59.

.3 Solder: to ASTM B32, Type Sn50.

.4 Adhesives, paints, sealants and solvents for sheet: type recommended by sheet manufacturer for applicable condition.

.5 Acrylic top-coat: clear, non-yellowing, exterior grade, satin finish, acrylic polyester resin protective coating, compatible with metal surface of type recommended by sheet manufacturer.

.6 Bituminous paint: to MPI EXT 5.4D.

2.2 CUT-OUT LETTERS

.1 8” Flat Cut-Out metal letters from aluminum sheet.

.2 Sizes and letters: Letters sized to be 356, 200 or 125mm, as indicated on exterior elevations. Font to be Helvetica.

.3 Finish: Aluminum – Clear Anodized, 6061 Alloy, bead-blasted returns process meets A43 Aluminum Architectural grad anodized finish (8.1mm) no clear coat.

.4 Mounting: stud mounted into wood cladding, 13mm metal spacer sleeve offset.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Erect and install letters plumb and level as per the drawings.

.2 Mechanical attachment, as per manufacturer’s written instructions, specific to wall type at letter locations.

.3 Allow for thermal movement without distortion of components.

.4 Exposed fasteners are not permitted.

3.2 CLEANING

.1 Leave signs clean.

.2 Touch up any damaged finishes.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 03 30 00 – Cast-in-Place Concrete.

.2 Section 32 11 19 – Granular Sub-base.

.3 Section 32 11 23 – Granular Base.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Society for Testing and Materials (ASTM)

.1 ASTM D 4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.3 SAMPLES

.1 If requested, submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide Contract Administrator with access to source and processed material for sampling.

.3 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused granular materials from landfill to local facility as approved by Contract Administrator.

PART 2 - PRODUCTS

2.1 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.

.2 Flat and elongated particles of coarse aggregate: to ASTM D 4791.

.1 Greatest dimension to exceed five times least dimension.

.3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:

.1 Natural sand.

.2 Manufactured sand.

.3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.

.4 Coarse aggregates satisfying requirements of applicable section to be one of, or blend of, following:

.1 Crushed rock.

.2 Gravel composed of naturally formed particles of stone.

.3 Light weight aggregate, including slag and expanded shale.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Topsoil stripping

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.

.2 Begin topsoil stripping of areas as indicated after area has been cleared of brush, weeds and grasses and removed from site.

.3 Strip topsoil to depths as directed by Contract Administrator. Avoid mixing topsoil with subsoil.

.4 Stockpile in locations as Contract Administrator. Stockpile height not to exceed 3.0m.

.2 Aggregate source preparation

.1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as approved by authority having jurisdiction.
.2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
.3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
.4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
.5 Trim off and dress slopes of waste material piles and leave site in neat condition.

.3 Processing
.1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
.2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Contract Administrator.
.3 Wash aggregates, if required to meet specifications. Use only equipment approved by Contract Administrator.
.4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

.4 Handling
.1 Handle and transport aggregates to avoid segregation, contamination and degradation.

.5 Stockpiling
.1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Contract Administrator. Do not stockpile on completed pavement surfaces.
.2 Stockpile aggregates in sufficient quantities to meet Project schedules.
.3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
.4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 100 mm of pile into Work.
.5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
.6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Contract Administrator within 48 h of rejection.
.7 Stockpile materials in uniform layers of thickness as follows:
.1 Max 1.5 m for coarse aggregate and base course materials.
.2 Max 1.5 m for fine aggregate and sub-base materials.
.3 Max 1.5 m for other materials.
.8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
.9 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.2 CLEANING

.1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.2 Leave any unused aggregates in neat compact stockpiles as directed by Contract Administrator.

.3 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 23 10 - Excavation, Trenching and Backfill.

1.2 REFERENCES

.1 City of Winnipeg Standard Construction Specifications.

.1 CW 3110 Clearing and Grubbing, all works to adhere to the most recent City of Winnipeg Standard Construction Specifications.

1.3 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than a 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 all fallen timber and surface debris.

.5 Grubbing consists of excavation and disposal of stumps and roots and boulders and rock fragments to not less than a specified depth below existing ground surface.

1.4 STORAGE AND PROTECTION

.1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing paved areas, utility lines, site appurtenances, root systems of trees, which are to remain.

.1 Repair any damaged items to approval of Contract Administrator.

.2 Replace any trees designated to remain, if damaged, as directed by Contract Administrator.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 not applicable

PART 3 - EXECUTION

3.1 PREPARATION

.1 Inspect site and verify with Contract Administrator, items designated to remain.

.2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site.

.3 Notify utility authorities before starting clearing and grubbing.

3.2 CLEARING

.1 Clear as indicated by Contract Administrator, by cutting at a 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.

.2 Cut off branches and cut down trees overhanging area cleared as directed by Contract Administrator.

3.3 CLOSE CUT CLEARING

.1 Close cut clearing to within 100 mm of ground surface.

.2 Cut off branches overhanging area cleared as directed by Contract Administrator.

3.4 UNDERBRUSH CLEARING

.1 Clear underbrush from areas as indicated to within 300 mm of ground surface.

3.5 GRUBBING

.1 Grub out stumps and roots from areas indicated to not less than 200 mm below ground surface.

.2 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension.

3.6 REMOVAL AND DISPOSAL

.1 Remove cleared and grubbed materials off site.

3.7 FINISHED SURFACE

.1 Leave ground surface in condition suitable for stripping of topsoil to approval of Contract Administrator.

End of Section

PART 1 - GENERAL

1.1 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 Canadian Standard Association (CSA)
  .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.

.2 City of Winnipeg Standard Construction Specifications
  .1 CW-3170 Earthwork and Grading

1.2 SOIL REPORT

.1 Examine soil report attached to this specification document.

1.3 REGULATIONS

.1 Shore and brace excavations, protect slopes and banks and perform all work in accordance with Provincial and Municipal regulations whichever is more stringent.

1.4 TESTS AND INSPECTIONS

.1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Contract Administrator.

.2 Do not begin backfilling or filling operations until material has been approved for use by Contract Administrator.

.3 Not later than 48 hours before backfilling or filling with approved material, notify Contract Administrator so that compaction tests can be carried out by designated testing agency.

.4 Before commencing work, conduct, with Contract Administrator, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

1.5 BURIED SERVICES

.1 Before commencing work establish the location of all buried services on and adjacent to the site.

.2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.

.3 Remove obsolete buried services within 2 m of foundations. Cap cut-offs.

1.6 PROTECTION

.1 Protect excavations from freezing.

.2 Keep excavations clean, free of standing water, and loose soil.

.3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Contract Administrator's approval.

.4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.

.5 Protect buried services that are required to remain undisturbed.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Granular A.

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

.1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.

.2 Remove stumps and tree roots below slabs, and paving, and to 600 mm below finished grade elsewhere.

.3 Dispose of cleared and grubbed material off site daily to disposal areas acceptable to authority having jurisdiction.

3.2 EXCAVATION

.1 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil. Stockpile topsoil on site for later use.

.2 Excavate as required to carry out work, in all materials met. Do not disturb soil or rock below bearing surfaces. Notify Contract Administrator when excavations are complete.

.3 Excavate trenches to provide uniform continuous bearing and support for 150mm thickness of pipe bedding material on solid and undisturbed ground. Trench widths below point 150mm above pipe not to exceed diameter of pipe plus 600 mm.

.4 Excavate for slabs and paving to subgrade levels. In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.3 BACKFILLING

.1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Contract Administrator.

.2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.

.3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.

.4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill. Fill excavated areas with gravel and sand compacted as specified for fill.

.5 Placing:
- .1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.

.6 Compaction: compact each layer of material to following densities for material to ASTM D 698:
- .1 To underside of basecourses: 95%.
- .2 Basecourses: 100%.
- .3 Elsewhere: 90%.

.7 Under slabs and paving:
- .1 Use 150 mm up to bottom of granular base courses.
- .2 Use 150 mm for base courses.

.8 In trenches:
- .1 Up to 300 mm above pipe or conduit: sand placed by hand.
- .2 Over 300 mm above pipe or conduit: native material approved by Contract Administrator.

.9 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.

.10 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

3.4 GRADING

.1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by the Contract Administrator. Grade to be gradual between finished spot elevations shown on drawings.

3.5 SHORTAGE AND SURPLUS

.1 Supply all necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.

.2 Dispose of surplus material off site.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 05 17 - Aggregate Materials.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM C 117, Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .3 ASTM D 422-63, Standard Test Method for Particle-Size Analysis of Soils.
- .4 ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
- .1 Rock: any solid material in excess of 0.25m and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m^3 bucket. Frozen material not classified as rock.
- .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.

.3 Topsoil:
- .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25mm in any dimension.

.4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.

.5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.

.6 Unsuitable materials:
- .1 Weak, chemically unstable, and compressible materials.
- .2 Frost susceptible materials:
  - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.2.

  .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45

  .3 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

1.4 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Preconstruction Submittals:

.1 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, location plan of relocated and abandoned services, as required.

.3 Samples:

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures if requested.

.2 Submit ten (10) kg samples of type of fill specified including representative samples of excavated material upon request of Contract Administrator.

.3 Ship samples prepaid to Contract Administrator, in tightly closed containers to prevent contamination and exposure to elements.

1.5 QUALITY ASSURANCE

.1 Qualification Statement: submit proof of insurance coverage for professional liability.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Storage and Protection:

.1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.

.2 Existing buried utilities and structures:

.1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

.2 Prior to beginning excavation Work, notify City and applicable authorities having jurisdiction, establish location and state of use of buried utilities and structures. City and authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.

.3 Confirm locations of buried utilities by careful test excavations.

.4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.

.5 Where utility lines or structures exist in area of excavation, obtain direction of utility before removing or re-routing.

.6 Record location of maintained, re-routed and abandoned underground lines.

.3 Existing buildings and surface features:

.1 Conduct, with Contract Administrator, condition survey of existing service poles, wires and survey bench marks which may be affected by Work.

.2 Protect existing buildings and surface features on adjacent properties from damage while Work is in progress. In event of damage, inform Contract Administrator immediately.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Type 1 and Type 2 fill: properties to Section 31 05 17 - Aggregate Materials and the following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.

.3 Table:

Sieve Designation	% Passing		Sieve Designation	% Passing	
	Type 1	Type 2		Type 1	Type 2
75mm	-	100	9.5mm	50-100	-
50mm	-	-	4.75mm	30-70	22-85
37.5mm	-	-	2.00mm	20-45	-
25mm	100	-	0.425mm	10-25	5-30
19mm	75-100	-	0.180mm	-	-
12.5mm	-	-	0.075mm	3-8	0-10

.2 Type 3 fill: selected material from excavation or other sources, approved by Contract Administrator for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

.3 Shearmat: honeycomb type bio-degradable cardboard 150mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.

.4 Polyethylene: 0.254mm thick

.5 Void form: Aerofoam Type I insulation.

.6 Pea Gravel: clean, round stone of uniform 9.5mm size.

PART 3 - EXECUTION

3.1 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 STRIPPING OF TOPSOIL

.1 Begin topsoil stripping of areas as indicated after area has been cleared of brush, weeds, and grasses and removed from site.

.2 Strip topsoil to depths as indicated as indicated. Do not mix topsoil with subsoil.

.3 Stockpile in locations as directed by Contract Administrator. Stockpile height not to exceed 3.0 m and should be protected from erosion.

.4 Dispose of unused topsoil off site.

3.3 STOCKPILING

.1 Stockpile fill materials in areas designated by Contract Administrator. Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

.3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.4 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while Work is in progress.

3.5 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated.

.2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation.

.3 For trench excavation, unless otherwise authorized by Contract Administrator in writing, do not excavate more than 30m of trench in advance of installation operations and do not leave open more than 15m at end of day's operation.

.4 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Contract Administrator.

.5 Restrict vehicle operations directly adjacent to open trenches.

.6 Dispose of surplus and unsuitable excavated material off site.

.7 Do not obstruct flow of surface drainage or natural watercourses.

.8 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.9 Notify Contract Administrator when bottom of excavation is reached.

.10 Obtain Contract Administrator approval of completed excavation.

.11 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Contract Administrator.

.12 Correct unauthorized over-excavation as follows:
- .1 Fill under bearing surfaces and footings with concrete specified for footings.
- .2 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected Standard Proctor maximum dry density.

.13 Hand trim, make firm and remove loose material and debris from excavations.
- .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.6 FILL TYPES AND COMPACTION

.1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D 698.
- .1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95% of corrected maximum dry density.
- .2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 100% of corrected maximum dry density.
- .3 Under concrete slabs: provide 150mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 100%.
- .4 Retaining walls: use Type 3 fill to subgrade level on high side for minimum 500mm from wall and compact to 85%.

3.7 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated.

.2 Place bedding and surround material in unfrozen condition.

3.8 BACKFILLING

.1 No machine tracks or vehicular tires are allowed within 1.8m of foundation walls. All backfill within 1.8m of foundation wall shall be placed in maximum 300mm lifts and compacted to maximum 95% Standard Proctor density with light duty, hand-operated plate compactors.

.2 Do not proceed with backfilling operations until completion of following:
- .1 Contract Administrator has inspected and approved installations.
- .2 Contract Administrator has inspected and approved of construction below finish grade.
- .3 Inspection, testing, approval, and recording location of underground utilities.
- .4 Removal of concrete formwork.
- .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.

.3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.4 Do not use backfill material which is frozen or contains ice, snow or debris.

.5 Place backfill material in uniform layers not exceeding 150mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.6 Backfilling around installations.
- .1 Place bedding and surround material as specified elsewhere.
- .2 Do not backfill around or over cast-in-place concrete within 72 hours after placing of concrete.
- .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 0.6 m.
- .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
  - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Contract Administrator or:

.2 If approved by Contract Administrator, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Contract Administrator.

.7 Install drainage filter system in backfill as indicated.

3.9 RESTORATION

.1 Replace topsoil as indicated.

.2 Reinstate lawns to elevation which existed before excavation.

.3 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

.4 Clean and reinstate areas affected by Work as directed by Contract Administrator.

.5 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 11 00 - Clearing and Grubbing.

.2 Section 31 23 10 - Excavation, Trenching and Backfill.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Society for Testing and Materials (ASTM)

.1 ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).

1.3 EXISTING CONDITIONS

.1 Examine subsurface investigation report which is bound into this specification document.

.2 Known underground and surface utility lines and buried objects are as indicated on site plan.

.3 Refer to dewatering in Section 31 23 10 – Excavating, Trenching and Backfill.

1.4 PROTECTION

.1 Protect and/or transplant existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as directed by Contract Administrator. If damaged, restore to original or better condition unless directed otherwise.

.2 Maintain access roads to prevent accumulation of construction related debris on roads.

PART 2 - PRODUCTS

2.1 NOT USED

.1 not used.

PART 3 - EXECUTION

3.1 STRIPPING OF TOPSOIL

.1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Contract Administrator.

.2 Commence topsoil stripping of areas as indicated after area has been cleared of brush, weeds and grasses and removed from site.

.3 Rototill weeds and grasses in stripped topsoil and retain as topsoil on site. Avoid mixing topsoil with subsoil.

.4 Dispose of unused topsoil off site.

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.

.2 375 mm for asphalt paving.

.3 250 mm for concrete walks.

.3 Slope rough grade away from building 1:50 minimum.

.4 Grade ditches to depth as indicated.

.5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. 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 D 698, as per recommendations in soils report attached to this specification document.

3.3 SURPLUS MATERIAL

.1 Remove surplus material and material unsuitable for fill, grading or landscaping off site.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 05 17 - Aggregate Materials.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM C 117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
- .2 ASTM C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D 422-63, Standard Test Method for Particle-Size Analysis of Soils.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

.3 City of Winnipeg Standard Construction Specifications
- .1 CW – 3110 Sub-Grade, Sub-Base and Base Course Construction, all works to adhere to the most recent City of Winnipeg Standard Construction Specifications.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused granular material from landfill to local quarry as approved by Contract Administrator.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Granular sub-base material: in accordance with Section 31 05 17 - Aggregate Materials and following requirements:
- .1 Crushed, pit run or screened stone, gravel or sand.
- .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.
- .3 Table

Sieve Designation	% Passing			
100mm	-	-	-	-
75mm	100	100	100	-
50mm	-	-	-	100
37.5mm	-	-	-	-
25mm	55-100	-	-	60-100
19mm	-	-	-	-
12.5mm	-	-	-	38-70
9.5mm	-	-	-	-
4.75mm	25-100	25-85	-	22-55
2.00mm	15-80	-	-	13-42
0.425mm	4-50	5-30	0-30	5-28
0.180mm	-	-	-	-
0.075mm	0-8	0-10	0-8	2-10

- .4 Other Properties as follows:
  - .1 Liquid Limit: to ASTM D 4318, Maximum 25.
  - .2 Plasticity Index: to ASTM D 4318, Maximum 6.
  - .3 Los Angeles degradation: to ASTM C 131. Max% Loss by mass: 40.

PART 3 - EXECUTION

3.1 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by Contract Administrator.

.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 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Contract Administrator may authorize thicker lifts (layers) if specified compaction can be achieved.

.7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.8 Remove and replace portion of layer in which material has become segregated during spreading.

3.2 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Compact to density of not less than 98% corrected maximum dry density.

.3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.4 Apply water as necessary during compaction to obtain specified density.

.5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Contract Administrator.

.6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.4 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 Contract Administrator.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 31 05 17 - Aggregate Materials.

.2 Section 32 11 19 - Granular Sub-base.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C 117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.

.2 ASTM C 131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

.3 ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600kN-m/m^3).

.5 ASTM D 4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

.2 City of Winnipeg Standard Construction Specifications.

.1 CW 3110 – Sub-Grade Sub-Base and Base course construction, all works to adhere to the most recent City of Winnipeg Standard Construction Specifications.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Deliver and stockpile aggregates in accordance with Section 31 05 17 - Aggregate Materials. Stockpile minimum 50% of total aggregate required prior to beginning operation.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Divert unused granular material from landfill to local quarry as approved by Contract Administrator.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Granular base: material in accordance with Section 31 05 17 - Aggregate Materials and following requirements:

.1 Crushed stone or gravel.

.2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.2.

.1 Gradation Method # 1 to:

Sieve Designation	% Passing (1)	(2)	(3)
100mm	–	–	–
75mm	-	-	-
50mm	100	-	-
37.5mm	70-100	-	-
25.0mm	-	100	-
19.0mm	50-75	-	100
12.5mm	-	65-100	70-100
9.5mm	40-65	-	-
4.75mm	30-50	35-60	40-70
2.00mm	-	22-45	23-50
0.425mm	10-30	10-25	7-25
0.180mm	-	-	-
0.075mm	3-8	3-8	3-8

PART 3 - EXECUTION

3.1 SEQUENCE OF OPERATION

.1 Place granular base after sub-base surface is inspected and approved by Contract Administrator.

.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 Place material using methods which do not lead to segregation or degradation of aggregate.
- .5 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Contract Administrator may authorize thicker lifts (layers) if specified compaction can be achieved.
- .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .7 Remove and replace that portion of layer in which material becomes segregated during spreading.

.3 Compaction Equipment

- .1 Compaction equipment to be capable of obtaining required material densities.

.4 Compacting

- .1 Compact to density not less than 100% maximum dry density.
- .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 by Contract Administrator.
- .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.2 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.

3.3 PROTECTION

.1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Contract Administrator.

End of Section

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for asphalt concrete pavement for car park areas, driveways to buildings, and storage areas.

1.2 REFERENCES

.1 City of Winnipeg Standard Construction Specifications.

.1 CW 3410 – R12 – Asphaltic Concrete Pavement Works. Adhere to this or any subsequent revisions to CW 3410 for all asphalt paving, and base prep for asphalt paving.

(CW 3410-R12 is attached for reference in section 00 04 00 Accompanying Docs)

1.3 SUBMITTALS

.1 Submit product data in accordance with Section [01 33 00 - Submittal Procedures].

.2 Submit asphalt concrete mix design to the Contract Administrator for approval.

.3 Materials to be tested by testing laboratory approved by the contract administrator.

.4 Submit test certificates showing suitability of materials at least 4 weeks prior to commencing work.

.5 Submit samples in accordance with Section [01 33 00 - Submittal Procedures].

2.1 PROTECTION

.1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38 degrees C. Do not permit stationary loads on pavement until 48 hours after placement. If CW3410-R12 specifies more stringent timelines for protection adhere to guidelines as laid out within that document.

.2 Provide access to buildings as required. Arrange paving schedule so as not to interfere with normal use of premises.

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 03 10 00 - Concrete Forming and Accessories.

.2 Section 03 20 00 - Concrete Reinforcing.

.3 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 American Society for Testing and Materials (ASTM)

.1 ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft^3) (600kN-m/m^3).

.2 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

.3 City of Winnipeg Standard Construction Specifications.

.1 CW 3310 Portland Cement Concrete Pavement Works, all works to adhere to the most recent City of Winnipeg Standard Construction Specifications.

.2 CW 3325 Portland Cement Concrete Sidewalk, all works to adhere to the most recent City of Winnipeg Standard Construction Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Concrete mixes and materials: to Section 03 30 00 - Cast-in-Place Concrete.

.2 Reinforcing steel: to Section 03 20 00 - Concrete Reinforcing.

.3 Curing Compound: to Section 03 30 00 - Cast-in-Place Concrete.

.4 Non-staining mineral type form release agent: chemically active release agents containing compounds that react with free lime to provide water soluble soap.

.5 Fill material: to Section 31 23 10 - Excavating, Trenching and Backfill.

.6 Boiled linseed oil: to CAN/CGSB-1.2.

.7 Kerosene: to CAN/CGSB-3.3.

PART 3 - EXECUTION

3.1 GRANULAR BASE

.1 Obtain Contract Administrator's approval of subgrade before placing granular base.

.2 Place granular base material to lines, widths, and depths as indicated.

.3 Compact granular base to at least 95% of maximum density to ASTM D 698.

3.2 CONCRETE

.1 Obtain Contract Administrator's approval of granular base and reinforcing steel prior to placing concrete.

.2 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Immediately after floating, give sidewalk surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.

.4 Provide edging as indicated with 10 mm radius edging tool.

.5 Slip-form pavers equipped with string line system for line and grade control may be used if quality of work acceptable to Contract Administrator can be demonstrated. Hand finish surfaces when directed by Contract Administrator.

3.3 TOLERANCES

.1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

3.4 EXPANSION AND CONTRACTION JOINTS

.1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 1 m.

.2 Install expansion joints at intervals of 6 m.

.3 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

3.5 ISOLATION JOINTS

.1 Install isolation joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.

.2 Install joint filler in isolation joints in accordance with Section 03 30 00 - Cast-in-Place Concrete.

.3 Seal isolation joints with sealant approved by Contract Administrator.

3.6 CURING

.1 Cure concrete by adding moisture continuously in accordance with CAN/CSA-A23.1 to exposed finished surfaces for at least 1 day after placing, or sealing moisture in by curing compound approved by Contract Administrator.

.2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.

.3 Apply curing compound evenly to form continuous film in accordance with manufacturer's requirements.

3.7 BACKFILL

.1 Allow concrete to cure for 7 days prior to backfilling.

.2 Backfill to designated elevations with material approved by Contract Administrator. Compact and shape to required contours as indicated or as directed by Contract Administrator.

End of Section

PART 1 - GENERAL

1.1 DESCRIPTION

.1 To provide all material, labour, equipment and services necessary to install new galvanized steel chain link fencing, including gates and related materials, to satisfactory completion.

.2 When not specified, any material used outdoors shall be galvanized or deemed suitably weather resistant by contract administrator.

.3 Where contradictions occur between this specification and CAN/CGSB standards, this specification shall take precedence.

1.2 REFERENCES

All reference standards shall be current issue or latest revision at the date of building permit issue. This specification refers to the following standards, specifications or publications:

.1 CW 3550 – Chain Link and Drift Control Fence, all works to adhere to the most recent City of Winnipeg Standard Construction Specifications.

.2 CAN/CSA-A23.1,Concrete Materials and Methods of Concrete Construction.

.3 CAN/CGSB-138.1, Fence, Chain Link, Fabric.

.4 CAN/CGSB-138.2, Fence, Chain Link, Framework, Zinc-Coated, Steel.

.5 CAN/CGSB-138.3, Fence, Chain Link - Installation.

.6 CAN/CGSB-138.4, Fence, Chain Link, Gates.

.7 CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.8 ASTM A90, Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.

.9 ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.10 CGSB 1-GP-181M, Coating, Zinc-Rich, Organic, Ready Mixed.

1.3 SITE CONDITIONS

.1 The Contractor is responsible to contact surface and underground utility companies to have all the underground lines located and marked before commencing work. The Contractor will be responsible for damages related to the failure of not locating utilities. Damages to the utilities shall be reported to the City immediately and prior to the Contractor attempting repair the damages. At the City's discretion "others" may be called upon to repair the damages and the costs of these repairs will be the responsibility of the Contractor.

1.4 PROTECTION

.1 Protect existing items to remain. In the event of damages to City property, the Contractor shall immediately report the damages to the City, prior to the Contractor attempting to repair the damages. At the City's discretion "others" may be called upon to repair the damages and the costs of these repairs will be the responsibility of the Contractor.

1.5 SHOP DRAWINGS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

PART 2 – PRODUCTS

2.1 MATERIALS

Use only materials listed as Approved Products for Surface Works. The approved Products are available in Adobe Acrobat (.pdf) format at the City of Winnipeg, Corporate Finance, Material Management Internet site at: https://www.winnipeg.ca/matmgt/info.stm

All chain link fence materials shall conform to this specifications and the Canadian General Standards Board (CGSB) Specifications CAN/CGSB-138.1, CAN/CGSB-138.2 and CAN/CGSB-138.4. Where any contradictions occur, Specifications CW 3550 shall take precedence over CGSB Specifications.

.1 Chain-link fence fabric: to CAN/CGSB-138.1and as indicated;
- a) 50 mm x 50 mm (2”x2”) diamond pattern, galvanized fabric, minimum thickness wire of 3.69 mm, No. 9 gauge (.145”). Top and bottom selvage to be knuckled. Fabric shall have a minimum tensile strength of 415 Mpa.
- b) Height of wire, as specified in the Contract Documents.

.2 Concrete mixes and materials, when specified: CAN/CSA-A23.1.
- a) Nominal coarse aggregate size: 40 mm max size, 5 mm min.
- b) Compressive strength: 25 MPa minimum at 28 days.
- c) Water/ cement ratio to CAN 3-A23.1-M77 Table 7 for Class A exposure 80 mm slump
- d) Air entrainment: 4 to 7 %
- e) Concrete piles to be minimum 300mm x 1500mm, when specified or deemed required.
- f) Concrete shall conform to a minimum spec of CW 2160 and be sulphate resistant type 50.

.3 Posts and rails: standard seamless, continuous weld, Schedule 40 hot dip galvanized steel pipe, lengths and diameters as per the following, for pushed, pounded or concrete pier installations;

Fence mesh height mm (ft)	Line post diameter mm	End, gate, corner post diam, mm	Pipe length mm
1830 (8 feet)	63.3	88.9	3810

Top rails shall be a minimum 43 mm outside diameter and 6700mm long for full lengths. Coupling locations to be adjacent to line post cap location to prevent sagging of the top rail joint. Sleeve couplings to be minimum 171 mm in length. Couplings and receptacles to be 43 mm inside diameter. All posts to be provided with weatherproof caps.

.4 Bottom tension wire: single strand, galvanized steel wire, No. 6 gauge, attached to bottom of fabric with hog rings. Provide one turnbuckle per single continuous run of wire.

.5 Tie wire fasteners: single strand, No. 9 gauge aluminum alloy wire.

.6 Tension bar: 5mm x 19 mm (1/4”x 3/4”)minimum galvanized flat steel bars not less than 50mm shorter than the height of the fabric. Cut ends of the bars to be ground smooth and galvanized.

.7 Tension and brace bands: 3mm x 19 mm (1/8”x 3/4”) minimum, galvanized steel with 8 x 32 mm galvanized carriage bolts and nuts.

.8 Swing Gates: to CAN/CGSB-138.4. Space gate posts 1220 mm (4'0") clear width, unless specified otherwise, and to match the specified height of the adjacent fence.

.9 Swing Gate frames: to ASTM A53, galvanized steel pipe, standard weight 45 mm outside diameter pipe for outside frame, 35 mm outside diameter pipe for interior bracing.
- a) Fabricate gates as indicated with electrically welded joints, and hot-dip galvanized after welding.
- b) Furnish gates with galvanized malleable iron hinges, latch and latch catch with

provision for padlock, which can be attached and operated from either side of installed gate.

c) Furnish double gates with chain hook to hold gates open and centre rest with drop bolt for closed position.

.10 Fittings and hardware: cast aluminum alloy, galvanized steel or malleable or ductile cast iron. Post caps/tops to provide waterproof fit, to fasten securely over posts and to carry top rail. Turnbuckles to be drop forged galvanized steel with sufficient adjustment to make the bottom tension wire taut.

.11 Organic zinc rich coating: to CGSB 1-GP-181M.

2.2 FINISHES

.1 Galvanizing:

a) For chain link fabric: to CAN/CGSB-138.1 Grade 2.

b) For pipe: 550 g/m2 minimum to ASTM A90.

c) For other fittings: to CSA G164.

PART 3 - EXECUTION

3.1 GRADING/PREPARATION

.1 Remove debris, trees and stumps where indicated, and correct ground undulations along fence line to obtain smooth uniform gradient between posts. Provide clearance between bottom of fence and ground surface neither less than 50 mm (2") nor more than 100 mm (4"). Fill shall be clean topsoil.

.2 Call utilities for locating of underground gas lines, water and sewer lines, electrical, telephone and cable. Hand dig and install concrete pier when instructed by the utility.

3.2 ERECTION OF FENCE

.1 Erect fence along lines, as indicated and in accordance with CAN/CGSB-138.3. Protect survey bars and control monuments.

.2 Posts shall be installed to a depth equal to the difference between the fence height and post length as shown in the table 2.1.3. Posts to be installed plumb with hydraulic equipment to push or pound posts into the existing ground, unless otherwise specified.

.3 Space line posts a maximum of 3.05 m (10') apart, measured parallel to ground surface.

.4 Space straining posts at equal intervals not exceeding 150 m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade.

.5 Install additional straining posts at sharp changes in grade and where directed

.6 Install corner post where change in alignment exceeds 10^{o} (degrees).

.7 Install end posts at end of fence and at buildings/obstructions. Install gate posts on both sides of gate openings. Maximum space between buildings and posts to be 76mm (3"). Install gate posts with concrete pile method where insufficient vertical strength is encountered.

.8 When concrete is specified, place concrete in post holes, then embed posts into concrete minimum 900 mm depth. Place top of concrete 50 mm below ground level. Brace to hold posts in plumb position and true to alignment and elevation until concrete has set. Do not install fence fabric until concrete has cured a minimum of 5 days.

.9 Install brace (when specified) between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface. Install braces on both sides of corner and straining posts in similar manner. When specified, corner and straining posts are to be braced on both sides.

.10 Install tops and caps. Secure gate post, corner post and terminal post caps with a

galvanised/stainless steel screw.

.11 Install top rail between posts and fasten securely to terminal posts.

.12 Install bottom tension wire, stretch tightly and fasten securely to termination posts with cable clamps and turnbuckles. Adjust to be taut.

.13 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 380 mm (15in.) intervals. Tension bars not to protrude above the bottom of the top rails.

.14 Fence fabric is to face the outside of the yard/enclosure. Secure fabric to top rails and line posts with tie wires at 458 mm (18") intervals. Give tie wires a minimum of two twists. Secure fabric to bottom tension wire with hog rings at 458 mm (18") intervals.

3.3 INSTALLATION OF GATES

.1 Install gates in locations, hinging and swing plane as indicated.

.2 Level contours between gate posts and set gate bottom approximately 76 mm (3") above ground surface.

.3 Confirm position of centre gate rest for double gate with the contract administrator. Cast gate rest in concrete as directed. Dome concrete above ground level to shed water.

.4 Install gate stops and hold backs when/where indicated.

3.4 TOUCH UP

.1 Clean damaged surfaces with wire brush, removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas. Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.5 CLEANING

.1 Clean and trim areas disturbed by operations. Dispose of surplus material and replace damaged sod.

.2 Clean any concrete spillage from the finished surface of galvanized posts and rails and touch up galvanizing where removed by the cleaning.

End of Section

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Supply and installation of all fill and topsoil as necessary for grading, regarding and repairing damaged sodded areas.

.2 Furnishing all labour, materials, equipment, supervision, incidentals and all other miscellaneous works required to complete the work as shown and detailed on the drawings and/or as specified herein.

1.2 REFERENCES

.1 City of Winnipeg Standard Construction Specifications.

.1 CW 3540 – Topsoil and Finish Grading for Establishment of Turf Areas, all works to adhere to the most recent City of Winnipeg Standard Construction Specifications.

1.3 SOURCE QUALITY CONTROL

.1 Advise Project Administrator of sources of topsoil to be utilized seven days in advance of starting work.

.2 Contractor is responsible for soil analysis and related costs, and requirements for amendments to supply topsoil as specified.

.3 Test topsoil for clay, sand and silt, NPK, Mg, soluble salt content, PH, growth inhibitors, soil sterilants and organic matter.

.1 Submit 0.5 kg sample of topsoil to testing laboratory and indicate present use, intended use, type of subsoil and quality of drainage. Prepare and ship sample in accordance with provincial regulations and testing laboratory requirements.

.2 Submit 2 (two) copies of soil analysis and recommendations for corrections to the Project Administrator.

1.4 SCHEDULE OF WORK

.1 Schedule finish grading to permit sodding and/or seeding operations under optimum conditions.

1.5 PROTECTION OF EXISTING FACILITIES

.1 Protect elements surrounding the work of this section from damage or disfiguration.

.2 Protect landscaping and other features remaining as final Work.

.3 Protect existing structures, fences, roads, sidewalks, paving and curbs.

.4 In the event of damage immediately replace such items or make repairs to the same, at no additional cost to the City.

1.6 DELIVERY AND STORAGE

.1 Coordinate locations for storage of all materials with Project Administrator.

.2 Deliver and store fertilizer in waterproof bags accompanied in writing by weight, analysis and name of manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Topsoil

.1 Shall consist of a screened clay-textured or loam-textured dark topsoil, a fertile, friable material neither of heavy clay nor of very light sandy nature containing by volume, a minimum of 4% to a maximum of 25% organic matter (peat, rotted manure or composted material) and capable of sustaining vigorous plant growth.

.2 Ph value: 7.5 to 8.2

.3 Contain no toxic elements or growth inhibiting materials.

.4 Free from:
- .1 Debris, roots, stones and clay lumps over 40 mm diameter.
- .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
- .3 Subsoil contamination.
- .4 Quackgrass rhizomes, Canada Thistle roots or other noxious weeds.
- .5 Consistence: friable when moist.
- .6 Salinity rating less than 1.5mmhos/cm.

.5 Planting mix: 4 parts topsoil with 1 part peatmoss.

.2 Soil Amendments

.1 Peatmoss:
- .1 Derived from partially decomposed species of Sphagnum Mosses.
- .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.

.2 Sand: washed course silica sand, medium to course textured.

.3 Limestone, if required as a result of soil analysis:
- .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: Synthetic slow release fertilizer with and NPK analysis of 1-2-1 ratio at a rate to provide 48 kg actual Nitrogen, 96 kg actual Phosphate and 48 kg actual Potassium per hectare.

PART 3 - EXECUTION

3.1 PREPARATION OF EXISTING GRADE

.1 Subsoil shall be fine graded and shaped so that by spreading a uniform depth of topsoil, the final elevations and contours may be achieved. Uneven areas and low spots shall be eliminated to ensure positive grade.

.2 Verify that grades are correct. If discrepancies occur, notify Project Administrator and do not commence work until instructed by Project Administrator.

.3 Areas which are to receive topsoil shall be cultivated to a depth of 100 mm. This cultivation shall be repeated and cross cultivated in locations where machinery or equipment has compacted the soil.

.4 Remove surface debris, roots, vegetation, branches and stones in excess of 40 mm in diameter. Remove any soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 75 mm above surface. Dispose of removed material off site.

3.2 SPREADING OF TOPSOIL

.1 Subgrade shall be inspected and approved by the City prior to spreading topsoil.

.2 Topsoil shall be evenly spread with adequate moisture, in uniform layers not exceeding 150 mm, over approved, unfrozen subgrade free of standing water, in locations where sodding or planting is indicated.

.3 Keep topsoil 25 mm below finished grade in areas to be sodded.

.4 Apply topsoil to the following minimum depths after settlement and 80% compaction:

.1 Refer to drawing details.

.2 150 mm for seeded and sodded areas.
.3 300 mm for flower beds.
.4 500 mm for shrub beds.

.5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.3 SOIL AMENDMENTS

.1 Any soil amendments required shall be applied to the topsoil at a rate as specified and as determined by the soil sampling. Mix any soil amendments in to the full depth of the topsoil prior to application of fertilizer.

3.4 APPLICATION OF FERTILIZER

.1 Spread fertilizer over entire area to receive topsoil at a rate as recommended by the manufacturer or as determined by the soil testing.

.2 Mix fertilizer thoroughly to a minimum depth of 150 mm of the topsoil

3.5 FINISH GRADING

.1 Areas shall be leveled and graded to provide positive drainage. Leveling shall be in accordance with the contour lines, elevations, drainage direction arrows and other descriptions as shown on the drawings or specified herein.

.2 Positive surface drainage shall be provided on all areas to be sodded by creating grade not less than 2% unless otherwise shown on the drawings.

.3 Prepare loose friable bed by means of cultivation and subsequent raking. Roll lightly and rake wherever topsoil is too loose.

.4 Roll topsoil with a 100 kg, 1000 mm minimum wide roller, to consolidate topsoil in areas to be sodded. Leave a smooth, uniform surface, firm against deep foot printing. Surface shall be even textured.

.5 The site shall be kept tidy during operations and all excess material shall be disposed of off-site, to a legal dump site at no cost to the City.

3.6 ACCEPTANCE

.1 Contract Administrator will inspect topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

End of Section

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Supply, preparation, installation and ancillary procedures involved in the total application of sod is areas identified herein or as required to correct damage during construction activities.

.2 Furnishing all labour, materials, preparation, equipment, supervision, incidentals and all other miscellaneous works required to complete the work as shown and detailed on the drawings and/or as specified herein.

1.2 REFERENCES

.1 City of Winnipeg Standard Construction Specifications.

.1 CW 3510 - Sodding, all works to adhere to the most recent City of Winnipeg Standard Construction Specifications.

1.3 SOURCE QUALITY CONTROL

.1 Obtain approval from Contract Administrator of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization.

1.4 SAMPLES

.1 Submit one square metre of sod if requested by Contract Administrator.

1.5 DELIVERY AND STORAGE

.1 Deliver, unload, and store sod on pallets.

.2 Deliver sod to site within 24 hours of being lifted and lay sod within 36 hours of being lifted.

.3 Do not deliver small, irregular, broken or discoloured pieces of sod.

.4 During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling.

.5 During dry weather, protect sod from drying and water sod as necessary to ensure its vitality and prevent dropping of soil in handling. Dry sod will be rejected.

PART 2 - PRODUCTS

2.1 GENERAL

.1 The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification. All sod supplied under this Specification shall be subject to inspection and testing by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for inspection purposes.

.2 Sod will be subject to tests for nitrate, phosphate, potassium, sulphate, pH, E.C. (salinity), mineral soil layer thickness and its organic matter content by a testing laboratory designated by the Contract Administrator

.3 Tests conducted to determine the thickness of the mineral soil layer of the sod and its percent of organic matter shall be done in accordance with standard operating procedures approved by the Contract Administrator for both receiving, and analyzing sod samples.

.4 Any sod placed on the Work Site that in the opinion of the Contract Administrator does not conform to the Specification detailed herein, shall be rejected by the Contract Administrator and replaced by and at the expense of the Contractor.

2.2 TOPSOIL

.1 Topsoil shall be supplied in accordance with Section 32 91 21 Topsoil Placement and Grading.

2.3 TURF GRASS SOD

.1 The Contractor shall supply turf grass sod with a mineral soil layer containing a minimum of seventy (70%) percent inorganic soil. Upon delivery or thirty (30) days following delivery, the salinity rating shall be less than 4.0 mm hos/cm on a saturated paste basis. The pH range shall be between 6.0 –

8.0. Sod supplied shall have been sown in nursery fields with Canada Certified No. 1 or Canada Certified No. 2 grass seed and mixed by percentage (%) of weight to meet the following certified seed blends or mixtures:

.1 Athletic grounds, sod shall contain a blend composed of:
One hundred (100%) percent Kentucky Bluegrass (100% Class 1 cultivars as specified in Clause 2.3.3, 3 cultivars in equal proportion).

.2 For general park areas and backyards, sod shall contain:
.1 A blend composed of one hundred (100%) percent Kentucky Bluegrass (100% Class 1or Class 2 cultivars as specified in Clause 2.3.3, 3 cultivars in equal proportion); or
.2 A mixture of ninety-five (95%) percent Kentucky Bluegrass (100% Class 2 cultivars as specified in Clause 2.3.3, 3 cultivars in equal proportion) and five (5%) percent Creeping Red fescue.

.3 Wherever Kentucky Bluegrass is specified, the proportion of the cultivars to be included in the blend shall adhere to the following:
Class 1 Cultivars – specified blend of Class 1 cultivars shall consist of equal proportions of any three of the following:

Able 1	Absolute	Allure	Award	Baron
Bartitia	Blacksburg	Blackstone	Caliber	Challenger
Chateau	Estate	Explorer	Kelly	Liberator
Limousine	Midnight	Misty	Northstar	NuGlade
Pick 151	Pick 8	Platini	Quantum Leap	Rambo
Rugby II	Serene	Shamrock	SR 2000	Total Eclipse
Touchdown	Unique	VB 16015	Wildwood	

Class 2 Cultivars – specified blend of Class 2 cultivars shall consist of equal proportions of any three of the following:

A34	Abbey	Alpine	America	Apollo
Arcadia	Ascot	ASP 200	Banff	Baronie
Baruzo	Bluechip	Cardiff	Champagne	Chicago
Classic	Compact	Conni	Coventry	Crest
Cynthia	Dragon	Eclipse	Fortuna	Glade
Goldrush	Haga	Huntsville	Impact	Indigo
Jefferson	Kenblue	Langara	Lipoa	Livingston
Marquis	Mercury	Moonlight	Nimbus	NuBlue
NuStar	Odyssey	Park	Pepaya	Pick 3
Pick 4	Pick 855	Princeton 105	Raven	Rugby
Seabring	Sodnet	SR 2100	SR 2109	Washington

.4 Any variations to the above referenced seed blends or mixtures shall be approved by the Contract Administrator prior to placement of sod.

.5 Turf grass sod shall be free of disease, turf damaging insects and any grass specifies, strains or cultivars other than specified herein.

.6 At the time of delivery, the turf grass sod shall:
.1 not contain more than ten (10) broadleaf weeds per fifty (50) square metres;
.2 have been mowed to a height of 50 mm prior to delivery and be of sufficient density that no surface soil will be visible;
.3 have a uniform inorganic soil layer thickness of not less than 12 mm and not greater than 19 mm and shall be consistent throughout all loads delivered to the work site;
.4 have the organic thatch layer within the sod not exceed an uncompressed thickness of 12 mm and in all cases, the final rolled and compacted topsoil/sod growing medium shall be maintained at not less than 100 mm in depth.

2.4 HERBICIDES

.1 Herbicides shall be standard commercial products registered for sale and use in Canada under the Pest Control Products Act.

2.5 PESTICIDES

.1 Insecticides shall be standard commercial products registered for sale and use in Canada under the Pest Control Product Act.

2.6 OTHER MATERIALS

.1 Wire mesh: 40mm chicken wire.

.2 Wooden pegs: 17mm x 17mm x 250mm wood or approved 250mm long steel staples

PART 3 - EXECUTION

3.1 GENERAL

.1 The Contractor shall not commence sodding operations until the finished topsoil surface has been inspected and approved by the Contract Administrator.

.2 The Contractor shall provide the Contract Administrator with a minimum of two working days notice for inspection of the finished topsoil surface.

3.2 SITE GRADING

.1 Site grading will be done and paid for in accordance with Section 31 23 10 Excavating, Trenching and Backfill.

3.3 TOPSOIL AND FINISH GRADING

.1 Preparation of the finished topsoil surface shall be completed in accordance with Section 32 91 21 Topsoil Placement and Grading.

.2 To prevent the formation of depressions or water pockets, the Contractor shall smooth out any undulations or irregularities in the topsoil surface prior to placing the sod.

3.4 PLACEMENT OF SOD

.1 The sod shall be placed evenly and closely packed together, leaving no open joints and no overlap on adjacent pieces of sod. Joints in adjacent rows shall be staggered. A full row of sod, not less than 450 mm in width shall be placed along the perimeter of the sodded area, parallel to planting or walkway areas.

.2 Where big roll sod is to be placed, the Contractor shall ensure that any reinforcement netting that may be used to assist with the harvesting and/or placement of the sod roll is removed before final placement of the sod.

.3 On embankments, sod shall be placed lengthwise across the face of the slope. On slopes of 1 vertical to 3 horizontal (18 degrees) or steeper, in every second row on the slope and at the foot of the slope, each piece of sod shall be pegged with two minimum 250 mm long wooden pegs driven into the soil layer of the sod.

.4 For slopes of 1 vertical to 2 horizontal (26 degrees) or steeper, each piece of sod in every row shall be pegged as indicated above.

.5 Small, broken or irregular pieces of sod will be rejected.

.6 All visible joints, low, bare or dead spots shall be repaired to the satisfaction of the Contract Administrator prior to the commencement of the Maintenance Period described in Clause 3.6.

.7 Sodding operations shall be completed within two working days after placing the sod. This shall be deemed to include watering, rolling, and repairing any visible joints and low, bare or dead spots within the sodded area.

.8 Sod shall not be placed in a frozen state, or when any other conditions unfavourable to the successful transplanting of sod exist.

.9 Edge sod to a neat 1 m diameter circular opening at the base of all trees. A full row of sod, not less than 300 mm in width, shall be placed along the perimeter of sodded areas adjacent to the edges of shrub beds.

3.5 WATERING AND ROLLING

.1 Immediately after placement of sod, the Contractor shall water the area in sufficient quantities and frequencies required to obtain root development and sod growth. All costs to provide water for sodded areas shall be borne by the Contractor. These costs may include hydrant permit and meter rental fees.

.2 After the sod and topsoil has dried sufficiently to prevent damage, the areas shall be rolled (the edges pounded if necessary) with a mechanical roller minimum weight of 220kg and minimum width of 760mm to form a uniform even surface and level with adjoining existing grades, sidewalks and curbs.

.3 Heavy rolling to correct irregularities in grade will not be permitted. Sodded areas near existing fixtures that are unable to be rolled shall be thoroughly tamped to ensure a good bond between topsoil and sod.

3.6 COMMENCEMENT OF THIRTY (30) DAY MAINTENANCE PERIOD

.1 Immediately after the sod has been placed to the satisfaction of the Contract Administrator, the Contractor shall provide and pay for continuous maintenance of the sodded area until the criteria specified for termination of the maintenance period in Clause 3.9 has been met.

.2 The Contract Administrator will not allow the Thirty (30) Day Maintenance Period to commence until the following requirements are met:

.1 The nursery sod supplied meets the seed mixture requirement specified in Clause 2.3.
.2 The sod is free of bare and dead spots.
.3 The nursery sod does not contain more than 10 broadleaf weeds per 50 square metres.
.4 Sodded area has been rolled to form a firm, uniform even surface.
.5 The sod has sufficient shoot density that no surface soil is visible within sod.
.6 The height of the top growth of the sod is between 50 - 60 mm.
.7 The sodded area is free of any visual obstructions such as leaves.
.8 Sodded area is free of any turf damaging insects.

.3 Any deficient, damaged or vandalized areas shall be resodded by the Contractor within three working days after receiving notification from the Contract Administrator and the area so resodded, shall be further maintained until it meets the criteria specified in Clause 3.9.

.4 In situations where the start of the Thirty (30) Day Maintenance Period is not granted by the Contract Administrator before the end of a growing season, the Thirty (30) Day Maintenance Period will commence on May 15 of the following year or such date as is mutually agreed upon by all parties, at which time all sodded areas must meet the requirements listed above.

3.7 MAINTENANCE OF SODDED AREA

.1 The Contractor shall mow the turf area at regular intervals to a height of between 50 - 60 mm. Do not cut more than thirty (30%) percent of the grass height at any one mowing. Remove clippings that will smother grassed areas.

.2 The Contractor shall water sodded areas in sufficient quantities and frequencies required to maintain sod growth. All costs to provide water for sodded areas shall be borne by the Contractor. These costs may include hydrant permit and meter rental fees.

.3 The Contractor shall clean and remove all dead vegetation, leaves, debris and snow mold from turf areas to encourage healthy and uniform grass growth.

3.8 SPRING CLEAN UP

.1 Where termination of the sod maintenance period has not been achieved in accordance with Clause 3.9 prior to the end of a growing season, the Contractor shall complete all operations related to the clean up of the work area in the following spring. This shall include the cleaning and removal of all dead vegetation, leaves, debris, snow mold and any sand or gravel resulting from winter sanding/deicing operations from turf areas to encourage healthy and uniform grass growth.

.2 All costs for spring clean up operations shall be borne by the Contractor if in the previous year, the termination of the sod maintenance period, in accordance with Clause 3.9 was not achieved in that same year or where the damage was due to defective sod or maintenance not conforming to this Specification.

3.9 TERMINATION OF MAINTENANCE PERIOD

.1 The Contract Administrator will terminate the sod maintenance period after the following criteria has been met:

.1 The work site is clean and the sodded area is free of any visual obstructions such as leaves.

.2 The sod is free of bare and dead spots and without more than 10 broadleaf weeds per 50 square metres.
.3 Grass roots are well anchored into the underlying topsoil and the sodded area has established into a healthy, vigorously growing condition.
.4 Sodded areas are free of visible joints.
.5 The sod has sufficient shoot density that no surface soil is visible when the grass has been cut to a height of 50 – 60 mm.
.6 Sodded area has been cut to a height of 50 – 60 mm within two working days before the final inspection.
.7 Sodded area is free of any turf damaging insects.

.2 If the sodded area does not meet the above criteria, the deficient area shall be resodded within three working days after receiving notification from the Contract Administrator and maintained by and at the expense of the Contractor in accordance with Clauses 3.6 and 3.7 herein.

.3 In situations where the termination of the maintenance period is not granted by the Contract Administrator before the end of a growing season, the maintenance period will commence as described in Clause 3.6.

3.10 SITE CLEAN UP

.1 During both the placement and maintenance of sod, all sidewalks, streets, approaches, driveways and properties near the sodding operation shall be kept clean at all times by the Contractor.

.2 Upon completion of the project, the Contractor shall immediately remove all excess material, debris and equipment from the work site.

End of Section