DIVISION 31

EARTHWORK

Part 1 General

1.1 DESCRIPTION

.1 This section specifies requirements for aggregates.

1.2 SOURCE

.1 The Contractor will be responsible for all costs associated with identifying and stockpiling all granular materials, loading, shipping, transportation and all other work required to provide the completed work detailed.

.2 The Contractor is responsible for all permits, licenses and royalties for any other excavated material.

.3 Inform the Contract Administrator of proposed source and provide access for sampling at least four weeks prior to commencing production.

.4 If, in the opinion of the Contract Administrator, materials from the proposed source do not meet or cannot reasonably be processed to meet specified requirements, procure an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.

.5 Should a change of material source be proposed during work, advise the Contract Administrator 4 weeks in advance of proposed change to allow sampling and testing.

.6 Acceptance of material at source does not preclude future rejection if it is subsequently found to lack uniformity, if it fails to conform to requirements specified or if its field performance is found to be unsatisfactory.

1.3 PRODUCTION SAMPLING

.1 Aggregate will be subject to continual sampling during production.

.2 Provide the Contract Administrator with ready access to source and processed material for purpose of sampling and testing.

.3 Bear the cost of sampling and testing of aggregates which fail to meet specified requirements.

1.4 QUALITY CONTROL

.1 Moisture density curves to ASTM D698.

.2 Sieve analyses to ASTM C136.

.3 Minimum quality control test frequencies specified as follows are the minimum number required. The Contractor shall perform as many tests as are necessary to ensure that the Work conforms to the requirements of the Contract regardless of the minimum number required.

Part 2 Products

2.1 MATERIALS

.1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material or other deleterious substances.

.2 Flat and elongated particles are those whose greatest dimension exceeds five times their least dimension.

.3 Aggregates satisfying requirements of applicable section shall be one, or a blend of the following:
- .1 Manufactured Gravel
- .2 Quarried Rock

2.2 GRADATION DESIGNATIONS

.1 Base course (A-Base) shall comply with the following gradation:

Canadian Metric Sieve Size	Percent of Total Dry Weight Passing Each Sieve
25,000	100%
20,000	80% - 100%
5000	40% - 70%
2500	25% - 55%
315	13% - 30%
80	5% - 15%

.2 Sub-base course (C-Base) shall comply with the following gradation:

Canadian Metric Sieve Size	Percent of Total Dry Weight Passing Each Sieve
	50 mm Max Aggregate
150,000	
100,000	
50,000	100%
25,000	
5000	25% - 80%
80	5% - 18%

.3 Sand shall be maximum size 9.5 mm complying with the following gradation:

Canadian Metric Sieve Size	Percent of Total Dry Weight Passing Each Sieve
10,000	100%
5000	90% - 100%
315	20% max

.4 Free draining granular shall comply with the following gradation:

Canadian Metric Sieve Size	Percent of Total Dry Weight Passing Each Sieve
28,000	100%
20,000	90% - 100%
10,000	40% - 60%
5000	5% - 15%
2500	0% - 10%

.5 Pit-run gravel shall comply with the following gradation:

Canadian Metric Sieve Size	Percent of Total Dry Weight Passing Each Sieve
100,000	100%
25,000	80%
5000	60%
80	10%

.6 All road aggregate shall meet the requirements of base course.

Part 3 Execution

3.1 PROCESSING

.1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.

.2 Blend aggregates if required to obtain gradation requirements specified. Use approved methods and equipment.

.3 Blending to increase percentage of crushed particles or decrease percentage of flat and elongated particles is permitted.

.4 Wash aggregates if required to meet specifications. Use only equipment approved by Contract Administrator.

3.2 HANDLING

.1 Handle and transport aggregates to avoid segregation, contamination and degradation.

3.3 STOCKPILING

.1 Stockpile aggregates on site in locations indicated or designated. Do not stockpile on completed pavement surfaces where damage to pavement may result.

.2 Stockpile aggregates in sufficient quantities to meet project schedules.

.3 Stockpiling sites shall be level, well drained and of adequate bearing capacity and stability to support stockpiled materials.

.4 Except where stockpiled on acceptably stabilized areas, provide a compacted sand base to prevent contamination of the aggregate or, if permitted, stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into work.

.5 Separate aggregates by substantial dividers or stockpile far enough apart to prevent intermixing.

.6 Reject intermixed or contaminated materials. Remove and dispose of rejected materials as directed within 48 hours of rejection.

.7 Stockpile materials in uniform layers of thickness as follows:
- .1 Max 1 m for coarse aggregate and base course materials.
- .2 Max 2 m for fine aggregate and sub-base material.
- .3 Max 1.5 m for other materials.

.8 Complete each layer over entire stockpile area before beginning next layer.

.9 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.10 Coning of piles or spilling of material over edges of pile will not be permitted.

.11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.4 STOCKPILE CLEAN-UP

.1 Leave stockpile site in a tidy, well drained condition, free of standing surface water.

.2 Leave any unused aggregates in compact stockpiles as directed.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies requirements for clearing the site, the designated working area and the designated storage area.

.2 The following work is included:

.1 Cutting trees and brush.

.2 Preservation of trees and brush where possible.

.3 Grubbing roots and stumps.

.4 Removal of grass, weeds, concrete, fences and other deleterious material.

.5 Cleanup of debris.

1.2 REGULATIONS

.1 Abide by laws and regulations of the Province of Manitoba and the City of Winnipeg particularly with regard to fire regulations and public safety.

.2 Observe regulations of Manitoba Conservation.

.3 Obtain all permits to burn waste and debris from Manitoba Conservation, and abide by the stipulations of the permits.

.4 The regulations of the Manitoba Workplace Health and Safety Act apply to the work in this section.

1.3 AREA TO BE CLEARED

.1 Areas to be cleared are indicated on the drawings. Additional clearing shall be approved by the Contract Administrator where the contractor requires additional space.

.2 Clearing shall not exceed the limits of rights-of-way, permanent easements and working easements.

.3 Clearing of any trees beyond the limits shown shall be replaced by the Contractor at his expense.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 CLEARING

.1 Cut, remove and dispose of all timber, brush, windfall and any other fallen timber, stumps and rubbish except such trees and shrubs as may be designated for preservation by the Contract Administrator.

.2 Preserve such designated trees and shrubs from scarring, barking or other injury during construction operations.

.3 Cut, remove and dispose of dangerous trees overhanging and off the right-of-way.

.4 Pull down, remove and dispose of any structures, fences and any physical obstructions.

3.2 GRUBBING

.1 Excavate, remove and dispose of all roots, stumps, submerged logs, corduroy and similar objectional matter to a minimum depth of 0.3 m.

.2 Fill holes and level areas disturbed by grubbing.

3.3 DISPOSAL

.1 In areas designated by the Contract Administrator for clearing and grubbing, all timber, logs, trees, stumps, brush, and other rubbish that the Contract Administrator does not deem salvageable must be disposed of as follows:

.1 Pile and burn in accordance with the permit and prevailing local regulations, if the regulations permit burning.

.2 Remove all waste material from the site and dispose of at site designated by the Owner.

.2 Pile and burn only in areas designated and approved by the Contract Administrator.

3.4 FINISH

.1 Leave ground surface in a condition suitable for stripping of topsoil.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies requirements for stripping of topsoil and organic material from the site.

.2 The work includes:

.1 Stripping and hauling to disposal.

.2 Stripping and stockpiling for reuse.

1.2 REGULATIONS

.1 Abide by federal, provincial, and/or municipal regulations with regard to stream crossings, diversions or alterations to drainage patterns.

1.3 LIMITS

.1 Stripping limits for the work shall be in accordance with Section 31 11 00 – Clearing and Grubbing.

.2 Stripping width for pipelines shall be the full width of the trench, plus the width of area to be used for spoil piles and the width of working areas.

.3 Strip all areas designated for roads and paths.

.4 If the topsoil is frozen, only strip the area over the trench and only other areas designated by the Contract Administrator.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOTIFICATION

.1 The Contractor shall notify the Contract Administrator in writing, a minimum of 3 working days prior to commencement of stripping.

.2 The Contract Administrator and the Contractor shall inspect the area to be stripped to establish specific requirements and to review procedures, which shall be confirmed in writing by the Contractor.

3.2 STRIPPING AND STOCKPILING

.1 Load, haul and place in stockpiles in designated areas.

.2 Stockpile in a manner that will not endanger persons, the work or adjacent property.

.3 Keep topsoil stockpiles separate and do not mix with common excavation.

.4 Maintain a minimum of 1.0 m separation between topsoil and common excavation material when stockpiling.

.5 If there is a risk of nutrient leaching or of stockpiled materials impacting water quality, appropriate measures shall be taken to contain the stockpiles.

3.3 STRIPPING AND DISPOSAL

.1 Strip organic material that will not be reused.

.2 Strip unsuitable material.

.3 Load, haul and dispose of stripped material if not designated for use as fill or finish grading.

3.4 DISPOSAL AREAS

.1 Disposal areas shall be marked in the field by the Contract Administrator.

.2 Grade the disposal areas to provide adequate drainage.

3.5 STRIPPING FROZEN TOPSOIL

.1 Frozen topsoil may be stripped by ripping provided a minimum of 2 passes are made, the first of which shall not exceed 50% of the topsoil depth.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies requirements for grading for structures, access roads, lots, easements and general site grading.

.2 The work includes:

.1 Grading, in accordance with contours, cross sections, grades and elevations shown on the drawings and as staked by the Contract Administrator.

.2 Excavation of organic materials and stockpiling or placing in fill areas on site, or hauling to disposal.

.3 Excavation of common excavation materials from areas on site that are to be cut, haul and place in fill areas on site or hauling to disposal.

.4 Placing common borrow material.

.5 Excavation and hauling stockpiled and excess material to disposal areas.

1.2 REGULATIONS

.1 Where applicable, abide by the bylaws and regulations of the Government of Canada, Province of Manitoba and the City of Winnipeg and abide by-laws and regulations with regard to stream crossings, diversions or alternatives to drainage patterns and public safety.

.2 Where applicable, conform with blasting requirements of the Canadian Construction Safety Code and all local, provincial and territorial codes.

.3 Where applicable, obtain the approval of the Contract Administrator and the City and employ a licensed explosive expert to supervise blasting.

.4 The regulations of the Manitoba Workplace Health and Safety Act apply to the work of this section.

Part 2 Products

2.1 ORGANIC MATERIAL

.1 Organic material is peat moss, or other organic soil underlying the topsoil, or topsoil that has not previously been stripped.

2.2 UNSUITABLE MATERIAL

.1 Unsuitable materials are materials other than organic material that, in the opinion of the Contract Administrator, are not suitable for use in subgrade of roads or in embankments or fills.

2.3 COMMON EXCAVATION MATERIAL

.1 Common excavation materials shall be materials excavated from the site, consisting of sand, clay or silty material, other than rock, organic materials or unsuitable material

which can be removed and placed in fill areas, embankments or stock piles for reuse or otherwise disposed of.

2.4 GRANULAR SUB-BASE

.1 Refer to Section 31 05 17 – Aggregate Materials.

2.5 ROCK

.1 Refer to Section 31 23 17 – Rock Removal.

Part 3 Execution

3.1 PREPARATION OF SITE

.1 Complete site clearing and stripping before beginning grading.

.2 Maintain slopes and adequate drainage during grading.

3.2 INSPECTION OF MATERIALS ON SITE

.1 Obtain the Contract Administrator's approval prior to using material on site.

3.3 GRADING PROCEDURES

.1 Excavate to the required subgrade elevation and to cross sections shown on the drawings, or as designated by the Contract Administrator.

.2 Excavate rock and haul to disposal areas.

.3 Excavate organic material and stockpile or place in fill areas, if approved by the Contract Administrator.

.4 Excavate unsuitable material and haul to disposal areas.

.5 Do not mix organic materials, unsuitable materials or rock with other excavated materials.

.6 Overexcavate as required to remove organic and unsuitable material.

.7 Overexcavate to remove organic and unsuitable material such that there is a 3:1 slope between the in situ material and the material to be replaced with gravel.

3.4 EMBANKMENTS AND FILLS

.1 Uniformly grade areas to be filled before placing material.

.2 Place common excavated materials in embankments and fills, and in over-excavated areas, if approved by the engineer.

.3 Construct embankments by depositing, shaping and rolling materials in layers not exceeding 150 mm thickness.

.4 Where compaction of embankments and fill areas is required, place the material in 150 mm lifts and compact to 95% of the maximum density as determined by the Standard Proctor Compaction Test.

.5 In the event that the material is too wet to obtain the specified density, thoroughly work the material by blading, or other acceptable means, until the optimum moisture content is reached. If the material is too dry add water as necessary. Moisture content of the material being placed in fill areas and embankments shall be controlled to within 3% of the optimum condition.

.6 If common excavated materials are not available in sufficient quantity to complete the work, or if borrow materials are required, supply and place either common borrow, sand, crushed gravel or pitrun gravel as specified and compact as specified above.

3.5 FINISHING

.1 Final surfaces shall be reasonably smooth, uniform and free from lumps, loose earth, stones and debris.

.2 Grades shall be within 30 mm of design grades.

3.6 UTILITIES AND APPURTENANCES

.1 Locate, protect and mark all utilities and appurtenances, including manholes, catch basins, valves and hydrants.

.2 Adjust utility structures and appurtenances to final grades and elevations.

3.7 SUBGRADE COMPACTION

.1 Scarify, shape and compact the subgrade to a minimum of 98% of the maximum density as determined by the Standard Proctor Compaction Test.

.2 Total compacted thickness of each layer shall be 150 mm.

3.8 SUBGRADE ELEVATION

.1 Final surfaces shall be within 30 mm of design grades.

.2 Provide and compact 25 mm maximum sized crushed gravel if necessary, to bring the final surface to design grade.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies requirements for removal of rock materials from the site.

.2 The work includes:
- .1 Rock removal without blasting.
- .2 Rock removal by blasting is not expected at this site. The Contractor will notify the Contract Administrator in case blasting is required for rock removal. The Contract Administrator approval is required to start blasting.

.3 Definition:
- .1 Rock is either single boulders, pieces of concrete or masonry with a volume in excess of 0.5 m^3 or any material that cannot be removed by a tracked machine having a bucket capacity of 0.95 to 1.15 m^3, and which requires for its removal, drilling and blasting.
- .2 No soft or disintegrated rock which can be removed with a hand pick; no material which can be ripped with a crawler tractor having a rated horsepower of 200 to 249; no loose or previously blasted rock or broken stone and no rock exterior to the minimum limits for measurement will be considered rock for the purposes of payment.
- .3 Frozen material is not classified as rock.

1.2 RELATED WORK

.1 Section 31 23 33 – Excavating, Bedding, and Backfilling

.2 Section 31 23 33.01 – Trenchless Excavating, Bedding, and Backfilling

1.3 REGULATIONS

.1 The regulations of the Manitoba Workplace Health and Safety Act apply to the work of this section.

1.4 PERMITS

.1 Obtain all permits required for this section of the work, with the exception of those specifically listed as being obtained by the City, and abide by the stipulations of the permits.

.2 Abide by the stipulation of permits obtained by the City.

1.5 PROTECTION

.1 Prevent damage to surroundings and injury to persons. Post guards, sound warnings and display signs as required when blasting is to take place.

.2 Protect existing utilities and structures.

.3 Inspect, photograph and keep an inspection record of all houses and buildings surrounding the work area. All foundation, structural and cosmetic problems should be noted prior to undertaking of blasting to minimize future claims.

.4 No blasting (if required) shall occur on Sunday without permission from the City.

1.6 DISPOSAL

.1 All materials on site, whether stockpiled, stored or excavated, are the property of the City, and the City reserves the right to keep any part or all of the material.

.2 The Contractor shall dispose of debris, waste, unsuitable material, rock or excess material in accordance with the Specifications.

.3 The Contractor shall dispose of all materials at sites to be designated by the City.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 ROCK REMOVAL

.1 If rock removal may interfere with foundations of adjacent buildings, roads and other structures, take photographs to record existing conditions and review with the Contract Administrator before construction has started. Include photographs, if necessary.

.2 Excavate rock to alignments, profiles and cross sections as determined by the Contract Administrator. No pay will be issued for rock excavated outside the limits determined by the Contract Administrator.

.3 Correct any unauthorized rock removal at no extra cost to the City.

.4 Excavated rock bed to be level, sound and free of loose rocks or fragments, earth or debris.

.5 Remove boulders and fragments which may slide or roll into excavated areas.

.6 Excavate to footing depths and to a minimum of 275 mm below the floor elevations.

.7 In case blasting is required, the blasted rock remaining after blasting operations to be 300 mm(maximum dimension) or less.

.8 Remove rock to disposal site as per Article 1.6 - Disposal.

END OF SECTION

Part 1 General

1.1 SITE CONDITIONS

.1 Sub-surface information is detailed in the geotechnical reports included in the appendix.

1.2 PERMITS

.1 Obtain all permits required for this section of the work, with the exception of those specifically listed as being obtained by the City, and abide by the stipulations of the permits.

.2 Abide by the stipulation of permits obtained by the City.

1.3 DESIGN OF TEMPORARY WORKS FOR STRUCTURAL EXCAVATIONS

.1 Engage the services of a Professional Engineer registered in Manitoba, to design and inspect cofferdams, shoring, timbering and bracing required for the Work.

.2 Submit signed and stamped design drawings and supporting data for review by the Contract Administrator. Submittals shall be at least two weeks prior to commencement of construction.

.3 The Contractor shall submit two (2) copies to be retained by the Contract Administrator and as many as required for his own use.

1.4 SHORING, BRACING AND UNDERPINNING

.1 Prevent movement or settlement, safeguard and maintain integrity of adjacent structures, earth, bench marks, services, walks, trees, bearing piles and adjacent grades. Provide bracing and shoring required.

.2 Shore and brace excavations to prevent failure in accordance with National Building Code of Canada Part 8, 1985 and applicable local regulations.

.3 Make good and pay for any damage and be liable for any injury resulting from inadequate shoring, bracing or underpinning.

1.5 UTILITY LANES

.1 Known underground and surface utility lines are indicated on drawings. No guarantee is given on completeness or accuracy.

.2 Maintain existing lines in area of excavation which must remain active.

.3 Record locations of maintained, re-routed and abandoned underground utility lines.

.4 Make good and pay for damage to existing utility lines resulting from work.

1.6 PROTECTION

.1 Protect bottoms of excavations from freezing.

.2 Protect bottom of excavations from softening due to moisture.

.3 Construct banks in accordance with local by laws.

.4 Refer to Section 01 52 00 – Construction Facilities for location and protection of existing utilities and structures.

.5 Refer to Section 01 52 00 – Construction Facilities for Construction Aids including temporary plant, temporary enclosures, falsework, temporary construction supports, winter construction, access roads and Traffic Regulation.

.6 Provide adequate protection around bench markers, layout markers, survey markers and geodetic monuments.

.7 Provide protection to ensure no damage to existing facilities and equipment situated on site.

.8 Effect approved measures to minimize dust as a result of this work.

.9 Do not stockpile excavated material to interfere with site operation or drainage.

1.7 DISPOSAL

.1 All materials on site whether stockpiled, stored or excavated are the property of the City, and the City reserves the right to keep any part or all of the material.

.2 The Contractor shall dispose of debris, waste, unsuitable material, rock or excess material in accordance with the Specifications.

1.8 QUALITY CONTROL TESTING

.1 Refer to Section 01 45 00 - Quality Control.

.2 Moisture density curves to ASTM D698.

.3 Sieve analyses to ASTM C136.

.4 Field densities to ASTM D2167-84 or to ASTM D2922.

.5 Minimum quality control test frequencies specified as follows are the minimum number required. The Contractor shall perform as many tests as are necessary to ensure that the Work conforms to the requirements of the Contract regardless of the minimum number required.

.6 Provide moisture/density curves for each type of material from each source to be compacted to a specified density.

.7 Field Densities:

.1 One field density for every 150 m^2 of 300 mm compacted layers of backfill against wet well.

.2 One field density for every 75 m^2 of 300 mm compacted layers of backfill under slabs.

.8 Tests for concrete are specified in Division 3.

1.9 COMPACTION DENSITIES

.1 Compaction densities are percentages of Standard Proctor maximum dry densities obtainable from ASTM D698-70.

Part 2 Products

2.1 MATERIALS

2.2 DEWATERING EQUIPMENT

.1 Equipment used for dewatering the excavation shall be of a suitable and rugged type to assure continuous operation.

.2 Make provisions as necessary to prevent flotation or damage to the Work in case of accidental stoppage of dewatering equipment.

2.3 CONCRETE

.1 Concrete shall be made with Type 50 sulphate resistant cement.

.2 Maximum slump 110 mm, 32 MPa - structural concrete.

.3 Maximum slump 110 mm, 15 MPa - fill and benching concrete.

.4 In freezing weather, provide concrete with a temperature of not less than 10° C, and maintain this temperature for 72 hours.

.5 For reinforced concrete structures refer to Division 3 – Concrete.

Part 3 Execution

3.1 PREPARATION

.1 Clear the surface of the ground or road within the working area.

.2 Dispose of refuse in a manner satisfactory to the Contract Administrator.

.3 Strip topsoil and stockpile adjacent to, but separate from gravel and sub-soil.

.4 Width of stripping shall be sufficient to permit excavation, pipelaying, backfilling and replacement of topsoil without mixing of materials and without loss of topsoil.

.5 Side slope banks must be cut back, as instructed by the Contract Administrator.

.6 The Contractor shall do all grading at crossings of roads, streams and gulleys, and shall grade so that banks are not unduly damaged and stream floors or surface drainage is not disrupted.

.7 The Contractor shall provide temporary fencing, gates or fence repair as required to secure areas that are presently fenced. Upon completion of construction the Contractor shall make permanent repairs so that fences are restored to original condition.

3.2 EXCAVATING

.1 Structures

- .1 Excavate to elevations and dimensions indicated for installation, construction and inspection of work specified.
- .2 Excavate to well defined lines to minimize quantity of fill material required.
- .3 Bottom of excavation to be free from loose or organic matter.
- .4 Install and operate an adequate dewatering system for construction of the structures in a dry environment.

.5 Excavation must not interfere with normal 450 splay of bearing from bottom of any footing.

.6 When complete, notify Contract Administrator for inspection of excavations to verify soil bearing capacity, depths and dimensions.

.7 Correct unauthorized excavation at no extra cost with Type 2 fill compacted to 95% density.

.8 Remove rubble and other obstructions encountered in the course of excavation.

.2 Trenches

.1 Depth - Excavate the trench to a depth sufficient to lay the pipe as shown on the drawings. If any part of the trench bottom is excavated in error below the specified grade, correct with approved materials compacted as specified under Pipe Bedding, at the Contractor's expense.

.2 Width - Excavate trench width at the bottom such that the pipe can be laid and jointed as specified and backfill placed and compacted as specified. Trench width dimensions are specified under installation of pipe. Increase trench widths to allow placing of timber supports, sheeting and bracing, but do not exceed the maximum trench width shown on drawings. Make trench walls vertical to 300 mm above the top of the pipe and maintain widths above this level within limits shown on the drawings or in accordance with safety regulations. Pipe design is dependent upon the type of bedding specified and the class of backfilling in the pipe zone, as well as the width of the trench. If the Contractor uses trenching equipment or trenching methods that results in a wider trench than specified under the installation of pipe, then corrective work shall be performed as required by the Contract Administrator, at the Contractor's expense. The corrective work may take the form of either or both of the following:

.1 Supply and installation of a higher class of bedding and backfilling in the pipe zone.

.2 Supply and installation of a stronger class pipe.

.3 Length - Excavate trenches only as far in advance of pipelaying as safety and traffic conditions permit and as far as the Contract Administrator shall allow.

.4 Excavate so that the pipe can be laid to the line and grade as shown on drawings, or as established by the Contract Administrator.

.5 Stockpile material excavated alongside the trench in authorized working areas in a manner that will not endanger the work, hinder pedestrian or vehicle traffic, block surface drainage or obstruct access to other utilities. Where excavated material cannot be piled along the trench in compliance with the above restrictions, remove it from the site and stockpile at an acceptable location for return to the trench for backfilling. Do not stockpile excavated material over existing pipelines.

.6 Dispose of waste or surplus material as per Article 1.8 - Disposal.

.7 The expense of removing water from trenches, regardless of origin, is the responsibility of the Contractor.

.8 Common Excavation

.1 Excavation of materials, with the exception of surface gravel, pavement or rock, is classified as common excavation.

.2 In ledge rock, boulders or large stones, overexcavate 150 mm below the pipe level.

.9 Unsuitable Material

.1 Unsuitable material is material in the trench at subgrade that is unstable or which contains ashes, cinders, organic material, and large pieces of inorganic material or is otherwise unsuitable and which in the judgment of the Contract Administrator, should be removed.

.2 Excavate and remove unsuitable material to a width and depth ordered by the Contract Administrator. Backfill the subgrade with an approved material compacted in 150 mm lifts to provide a continuous bearing for pipes. Replacement material shall be granular sub-base as described in Section 31 05 16 – Aggregate Materials.

.3 Disposal of unsuitable material as per Article 1.7 - Disposal.

.4 Material that becomes unstable or unsuitable through the Contractor's failure to divert surface water or control ground water in the trench shall be excavated and removed as waste material and replaced with approved material at the expense of the Contractor.

3.3 WATER/DEWATERING

.1 Keep excavations free of water while work is in progress.

.2 The expense of and all work related to removing water from trenches and excavations, regardless of origin, is the responsibility of the Contractor.

.3 Protect open excavations from flooding and damage due to rainfall and surface run-off.

.4 Divert surface water away from excavations by means of permanent or temporary drainage structures.

.5 Remove water by acceptable means to allow installation of material without detrimental effects on pipes, wet well’s excavation bottom, or adjacent property.

.6 Direct discharge of surface water, pumps or well points away from the work to an acceptable location without damage to the construction, property, structures and/or persons.

.7 Existing sanitary sewers cannot be used to carry away water. Silt or sand laden water cannot be discharged into existing storm sewers.

3.4 PIPE BEDDING

.1 Pipe bedding shall be in accordance with the drawings and with the specifications for installation of the pipe.

.2 Do not proceed with placing pipe bedding until the Contract Administrator has inspected the trench.

3.5 BACKFILLING

.1 Structures

.1 Do not commence backfilling until areas of work to be backfilled have been inspected and approved by Contract Administrator.

.2 Areas to be backfilled shall be free from debris, snow, ice, water or frozen ground. Backfill material shall not be frozen or contain ice, snow or debris.

.3 Prior to placing fill under slabs on grade, compact existing subgrade to obtain same compaction as specified fill. Remove "soft" material and fill with approved material.

.4 Prior to installation of foundations, compact existing subgrade to obtain required bearing capacity. Remove "soft" material and fill with approved material.

.5 Backfill simultaneously each side of walls and other structures to equalize soil pressures.

.6 Obtain Contract Administrator's approval prior to placing backfill against walls below ground.

.7 Where temporary unbalanced earth pressures are liable to develop on walls or other structures, erect bracing or shoring to counteract unbalance and leave in place until removal is approved by Contract Administrator.

.8 Place and compact fill materials in continuous horizontal layers not exceeding 150 mm compacted thickness. Compact to 98% Standard Proctor Density. Use methods to prevent disturbing or damaging buried services, structures, or foundation insulation. Make good any damage.

.9 Do not use frozen material for backfilling or filling.

.10 Keep heavy equipment at least 1.5 m away from structures. Compact this portion using suitable light equipment.

.2 Trenches

.1 Backfilling in the pipe zone

.1 The pipe zone is defined as that part of the trench from the bottom of the pipe bedding to 200 mm above the top of the pipe or above the top of the highest pipe in a combined trench.

.2 Backfilling in the pipe zone shall be in accordance with the drawings and with the specifications for installation of the pipe.

.2 Trench backfill is defined as backfill above the pipe zone.

.3 Do not proceed with trench backfill until the Contract Administrator has inspected and approved the bedding and backfill in the pipe zone.

.4 Place backfill in a dry trench.

.5 Place backfill by rolling down a slope in the trench or lower by machine. Prevent backfill from dropping vertically.

.6 Backfill as close as possible to pipe laying operations so that trenches are left open no longer than absolutely necessary.

.7 Plan the backfilling operation so that exposure of the backfill material to frost is kept to a minimum. Use no large frozen chunks of soil as backfill.

.8 All backfill under municipal roads shall be with granular backfill only for the entire road length on width and depth of the trench.

3.6 FILL TYPES AND COMPACTION

.1 Exterior side of perimeter walls: Use Type 5 fill to subgrade level. Compact to 98% of Standard Proctor density ASTM D698.

.2 Under concrete slabs: provide Type 2 fill compacted to 100% of Standard Proctor Density ASTM D698 except as noted.

.3 General areas:

.1 Place native backfill material in uniform lifts not exceeding 300 mm over the width of the trench each lift compacted using mechanical compaction equipment. Compact to 95% of the maximum density as determined by the Standard Proctor Compaction Test.

.2 Backfill material shall be free of wood, brush or other perishable objectionable material. No rocks larger than 200 mm shall be included in the material.

.3 Moisture content of the backfill material shall be controlled by the Contractor as necessary to achieve compaction as specified at the Contractor's expense. Supply and add water if it is necessary to increase moisture content. Spread and dry backfill material if moisture content is above optimum.

.4 Where in the opinion of the Contract Administrator the excavated material is unsuitable for backfilling purposes, the Contractor shall upon written order from the Contract Administrator use imported material.

.4 If, during progress of work, testing indicates fills do not meet specified requirements, remove defective fills, replace and retest at no extra cost.

3.7 CLEAN UP

.1 Clean up and dispose of all excess material, trash, rocks, boulders and debris as work progresses as per Article 1.8 - Disposal.

.2 In cultivated or improved land, the entire working area shall be thoroughly loosened by ploughing and harrowing.

.3 Restore all public and private roads, temporary access roads, stockpile and storage sites to a condition equal to that in which they were found.

3.8 INSPECTION AND TESTING

.1 Testing of materials and compaction will be carried out by testing laboratory approved by Contract Administrator.

.2 Contractor will pay costs for inspection and testing.

.3 Sieve analysis: proposed fill materials will be tested to confirm suitability for intended use and conformity with specifications.

.4 Density test: tests will be conducted on compacted fill to ASTM D698-70.

3.9 TRENCH SETTLEMENT DURING GUARANTEE PERIOD

.1 During the guarantee period, the Contractor shall replace materials and rectify all failures that occur as a result of settlement of trench backfill or collapse of trench walls.

.2 Trenches in which backfill settles shall be refilled with the specified backfill material. Paved surfaces that are adjacent to trenches or on trench backfill, which fail during this period, shall be replaced or repaired in an approved manner.

.3 Replacement of materials and rectification of failures that occur as a result of settlement of trench backfill or collapse of trench walls, is entirely the responsibility of the Contractor and such repair work shall be done at the Contractor's expense.

3.10 MAINTENANCE DURING GUARANTEE PERIOD

.1 During the guarantee period, the Contractor is responsible for extra road maintenance required as a result of trench settlement or disruption of surface drainage.

.2 The Contractor shall coordinate this extra maintenance with the normal maintenance provided by the City and make whatever arrangements that may be required with the City.

3.11 RELEASES

.1 The Contractor shall submit to the Contract Administrator, prior to the release of holdback, signed clearances on forms approved by the Contract Administrator, from all landowners, tenants and authorities, acknowledging that the Contractor has performed the work to their satisfaction.

3.12 SURPLUS MATERIAL

.1 Dispose of surplus material not required for backfill, grading or landscaping as directed.

.2 Dispose of material unsuitable for fill, grading or landscaping as directed.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 The City of Winnipeg Standard Construction Specification Division 3 – CW 2030 and all other sections and details referenced within CW 2030 in effect on the date of closing shall apply except where otherwise noted in the Contract documents.

Part 2 Products

.1 Bedding

.1 All underground piping shall be installed with Class B bedding in accordance with City of Winnipeg Standard detail SD-001.

.2 Backfill

.1 Class 3 backfill shall be used for all trenchless excavations beneath and within one (1) metre of roads, driveways, sidewalks and any other paved surface.

.2 Class 5 backfill shall be used for all other trenchless excavations.

.3 Class 2 backfill shall be used for open-cut excavations beneath and within one (1) metre of roads, driveways, sidewalks and any other paved surface.

.4 Class 4 backfill shall be used for all other open-cut excavations.

Part 3 Execution

.1 Test hole logs compiled during the design process are appended to these specifications to supplement the Contractor's evaluation of the site conditions. Variations in soil and groundwater conditions can be expected.

.2 All surplus excavated material to be disposed of off-site at a site approved by the Contract Administrator and is incidental to the work.

.3 Trenchless Excavation

.1 Selection of excavation equipment for installation of sewers by trenchless methods shall be the responsibility of the Contractor.

.2 The Contractor shall make allowances in the choice of equipment to account for reasonable and minor deviations in ground conditions and shall have contingency plans for removal of boulders and dealing with minor changes in ground conditions.

.3 The Contractor shall immediately notify the Contract Administrator in the event that there is a substantial change in subsurface soil conditions or obstructions encountered which adversely impact the Contractor's production or construction procedure.

.1 The notice shall provide details of the change in subsurface conditions or obstructions encountered, any proposed construction procedure revision that the Contractor intends to undertake and any other relevant supporting information.

.2 The Contract Administrator shall review the notice to assess whether the change in conditions and revised construction procedures amount to a change in the Work.

.4 Plans for removal of obstructions encountered in trenchless excavations must be approved by the Contract Administrator and may consist of but is not limited to drilling or excavating a shaft at the location of the obstruction and removing the obstruction.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Supply, pick-up, delivery and install piles.

.2 Design Requirements

.3 Design loads as indicated on structural drawings.

.4 Do not splice piles without the Contract Administrator's permission. When permitted, provide details for the Contract Administrator review. Design details of splice to bear signature and stamp of professional engineer registered or licensed in Province of Manitoba.

1.2 QUALITY ASSURANCE

.1 Precast concrete components shall be fabricated by manufacturer certified by CSA as meeting requirements of CSA A23.4.

.2 All work shall be performed by a the Contractor experienced in related type or work and having at his disposal all necessary equipment.

.3 Allowable tolerances:

- .1 Lateral tolerances: units shall be located so as to have maximum lateral deviation at top of unit of 50 mm.
- .2 Vertical tolerance: piles shall be driven without varying more than 2% from vertical.
- .3 Pile cutoffs at elevations indicated ±38 mm.
- .4 Piles not meeting these requirements will be rejected.

.4 Drive units to develop loads as indicated on drawings.

.5 All work shall comply with local and provincial safety codes and regulations.

1.3 TEST REPORTS

.1 Upon request, submit certified copies of quality control tests related to this project as specified in CSA A23.4.

1.4 SITE CONDITIONS

.1 Visit site to ascertain special conditions which may affect work.

.2 Review the Geotechnical Report to identify subsurface conditions that may be encountered.

1.5 DELIVERY AND STORAGE

.1 Minimum size holes are permitted to facilitate handling and lifting to vertical position.

.2 Provide identification for points of lifting by painted stripes or lift hooks set in.

.3 Provide identification for points of support for storage. Store all units at site in such a way as to avoid undue stresses before driving.

.4 During delivery and storage support long piles continuously along their lengths.

.5 All foundation units delivered to site, which do not conform to terms of this specification may be rejected by Contract Administrator or his representative.

1.6 PROTECTION

.1 Protect public and construction personnel, adjacent structures and work of other sections from hazards attributable to pile driving operations.

.2 Protect pile surfaces from damage and spalling.

1.7 SCHEDULING

.1 Submit schedule of planned sequence of driving to the Contract Administrator for review, not less than two (2) weeks prior to commencement of pile driving for structure.

.2 Do not commence pile driving until authorized to proceed by the Contract Administrator.

Part 2 Products

2.1 MATERIALS

.1 Piles: standard hexagonal, precast, prestressed, to sizes indicated on drawings, by an approved supplier.

.2 Cement: Type HS, sulphate resistant.

.3 Concrete strength: 35 MPa at time of driving. Concrete strength at transfer of pre-stress shall be minimum 25 MPa.

.4 Pre-stressing steel: to CSA G279 steel for pre-stressed concrete tendons.

.5 Welded wire mesh: to CSA G30.5.

.6 Spiral reinforcement: to CSA G30.3, cold drawn steel wire.

.7 Pile connections: capable of providing positive means to hold pieces together, maintaining alignment for full depth and transmitting full design load. Submit details of connector for review by the Contract Administrator.

2.2 FABRICATION

.1 Fabricate precast concrete piles to lengths, cross sectional areas, reinforcement pile connectors pile rock points as indicated.

.2 Fabricate piles to following finish tolerances:
- .1 Length: ±3 mm/metre of length.
- .2 Cross section: solid section -6 to +12 mm.
- .3 Deviation from straight line: not more than 3 mm/metre of length, 12 mm in full length.
- .4 Pile head: ±10 mm/metre from true right angle plane. Surface irregularities ±3 mm.
- .5 Location of reinforcing steel main reinforcing cover: -3 to +6 mm. Spacing of spiral ±12 mm.

Part 3 Execution

3.1 INSTALLATION

.1 Provide approved type of protection cap with cushion block to top of pile when driving. Cushion block material softwood such as green hemlock. Plywood not acceptable.

.2 Splice piles, if required, using approved method of splicing.

.3 On completion of driving, cut off pile at required elevation. Make circumferential cut with a concrete saw to prevent spalling of pile below cut-off elevation. Make pile cut off absolutely horizontal.

.4 Drive piles at locations indicated and to depth sufficient to develop required loading.

.5 Minimum prebored depth for piles from ground level: 11.0 meters.

.6 Make prebored holes 50 mm larger in diameter than piles to be placed unless indicated otherwise on the drawings.

.7 Remove boulders or existing concrete foundations encountered in prebored holes using a core barrel or other approved method.

.8 Remove, relocate, re-drive and provide additional piles where directed when boulders or other obstructions prevent driving piles to an adequate bearing strata or within allowable tolerances in locations indicated on the drawings. Perform such work no additional cost to the Contract.

.9 Perform pile driving with a diesel hammer capable of delivering a rated energy of at least 40,600 joules.

.10 Refusal criteria for driving piles shall be established by inspection at time of driving.

.11 Replace piles excessively damaged through driving or which are believed to be broken, with a new pile at a suitable location at no additional cost to Contract.

.12 Piles shall be of sufficient length to allow approximately 460 mm of strand to extend into structure above.

.13 If a pile or piles should be driven below required elevation to accommodate exposed strand requirements, cut off such piles 460 mm below the top of pile (except at single pile caps). Build up piles to details provided by the Contract Administrator at no additional cost to the Contract.

.14 Drive piles to required final set in competent hard glacial till deposit.

.15 Drive piles continuously, without intermission until driven to required final set, at depth adequate to support the loads indicated on the drawings.

.16 Observe and check pile upheaval. Re-drive pile to refusal and final set any piles showing uplift after driving adjacent piles.

3.2 REPAIR/RESTORATION

.1 One or more of the following remedial measures may require:
- .1 Remove rejected pile and replace with a new, and if necessary, a longer pile.
- .2 Remove rejected pile and fill holes as directed.
- .3 Leave rejected pile in place and cut off as directed by the Contract Administrator.
- .4 Leave rejected pile in place, place adjacent pile(s), and modify pile cap as directed.

3.3 FIELD QUALITY CONTROL

.1 Notify the Contract Administrator or his representative sufficiently in advance of pile installation to allow necessary inspections to be carried out.

.2 An accurate driving record of penetration per blow shall be kept by the inspector or in his absence by the piling subtrade. These records shall include final penetration resistance, pile heave and amount of downward movement on redrive.

.3 Inspection of pile driving operations shall be supplied by an independent inspection and testing agency designated by construction manager.

3.4 CLEAN-UP

.1 After installation of foundation units, remove all excess concrete and other debris and leave site in clean condition.

END OF SECTION