1.3 MEASUREMENT AND PAYMENT (Cont'd)

.3 Embankment: (Cont'd

.3 (Cont'd)

fill will not be included in calculation of embankment fill volumes.

.4 The quoted Unit Price for imported granular embankment fill in place, shall be compensation in full for work, both at the construction site and for ice, snow and water removal; the provision of any temporary or permanent drainage; the stripping and disposal of unsuitable and frozen material at the borrow pit; any haul road construction, maintenance and removal after work completion; any crushing or screening required to ensure conformance with the specified grading envelope; final cleanup and grading at the borrow pit; hauling, placing, scarifying, blending with materials approved by the Engineer that is required to ensure conformance with specified grading envelope, and compaction of the embankment at the optimum moisture content and to the specified density, including compaction of the top 150 mm of the embankment at the optimum moisture content and to the specified density, and all related work even though not specified in minute detail.

In the case of excavation of unsuitable material, payment shall cover excavation, hauling and disposal of such materials.

.5 Only the Engineer shall have the authority to decide whether material excavation may be used as fill somewhere else in the project, or whether it is unsuitable, in which case it will be treated and paid for as excavation of unsuitable material.

PART 2 - PRODUCTS

2.1 Materials

Unsuitable material containing organic matter, frozen lumps, weeds, sod, roots, logs, stumps or any other matter deemed objectionable by the Engineer, shall be disposed of offsite at the Town Dump.

.2 Imported materials require approval of the Engineer

No imported granular material over 200 mm will be allowed. Grading of the material should give a smooth curve without sharp breaks when plotted on a semi-log chart.

2.2 MATERIAL SOURCES AND DISPOSAL AREA

The existing municipal quarry is the source for the materials to be incorporated into this project

Most of the material from this source wil not require processing to meet the specifications.

A permit from the Hamlet is required prior to obtaining granular materials. The Contractor shall contact the authorities having jurisdiction over the material source, confirm the suitability and availability of the aggregates and pay all royalties and associated costs to obtain the required aggregrate. The Contractor shall keep an accurate load count of all aggregate taken from pits and submit to the Engineer and Owner on a daily basis.

2.3 ROAD RIGHT-OF-WAY AND SITE GRADING

Site grading will generally be limited to the road right-of-ways, except where grading is required on a lot to ensure positive drainage

.2 Material from cut areas shall be used prior to importing fill from the borrow areas.

2.3 ROAD RIGHT-OF-WAY AND SITE GRADING (Cont'd)

The site grading shall be achieved by filling with imported material once all onsite generated material has been utilized for roadway fills. Prior to the placement of fills, snow, water, and ice will have to be removed from the area, in particular ice that may be found in several small ponds in the area. All fills including on the roadways may be placed directly on top of any tundra duff which may be present.

.4 Only suitable materials shall be used for filling. No muskeg or other organic material, ice, frozen materials with excess ice or moisture, or other unstable material shall be placed in fills. The material shall be compacted as described herein.

.5 Maximum size of material to be used for filling and site grading except for the top 150 mm of the road structure shall be 200 mm for imported granular.

.6 Material to be used for the top 150 mm of fill on the road subgrade is 19 mm maximum size well graded granular material.

.7 Compaction shall be carried out by a method selected by the Contractor which produces the specified degree of compaction.

.8 Establishment of Standard Proctor Density: The Contractor shall obtain fill material samples to submit to a recognized testing laboratory, as directed, to establish the Standard Proctor Density at optimum moisture content of the material being used for fill and road subgrade construction. Payment for density tests shall be made by the Owner.

. Field Density Tests: Field Density tests shall be carried out by the Engineer where and when required. This testing in no way relieves the Contractor of any responsibilities regarding settlements and maintenance as specified.

.10 Moisture Content for Compaction: Compaction of the fill material for maximum density shall be carried out with material at the optimum

2.3 ROAD RIGHT-OF-WAY AND SITE GRADING (Cont'd)

.10 Moisture Content for Compaction:(Cont'd) moisture content as determined by the laboratory tests. The Contractor shall bear the cost of purchasing, loading, hauling, spraying water, or of aeration of the fill material to achieve the optimum moisture content for compaction.

.11 Compaction of Fill Areas: In areas requiring fill, all material shall be placed in 200 mm lifts then bladed and compacted at optimum moisture content to 90% of the Standard Proctor Density regardless of the depth of fill outside roadway areas. In roadway areas, the top 150 mm shall be compacted at 100% of the Standard Proctor Density and 95% Standard Proctor Density from 400 mm to 250 mm depth.

2.4 TESTING

.1 Inspection

Before accepted by the Engineer,the graded surface shall be true to cross-section and grade and shall conform to the density specified. Field density and moisture content tests may be made by the Engineer or his representative to ensure that the material is being compacted to the moisture content and density specified.

.2 Proof Rolling

The Engineer may further test the compaction by proof rolling. Proof rolling is a method of detecting soft areas is subgrade for fill. It will be accomplished by the use of heavy (15-25 tonne) compaction equipment with high contact wheel pressures on independent axles, or heavily loaded single axle trucks. The procedure requires two complete passes with the test vehicle in one direction. While the passes are being made, any softened, rutted or displaced areas detected should be examined and either recompacted with additional fill or the existing material removed and replaced with better quality material

END OF SECTION 02210

PART 1 - GENERAL

1.1 RELATED WORK . Road Right-of-Way and Site Grading Section 02210

PART 2 - PRODUCTS

2.1 MATERIALS .1 Embankment and gravel course materials require approval of the Engineer.

.2 Material used for the embankment and gravel course must not contain organic matter, frozen lumps, weeds, sod, roots,logs, stumps or any other matter deemed objectionable by the Engineer.

.3 Type 1 Material

Granular base course material to the following grading requirements:

ASTM Sieve Size	Passing
19.0 mm	100
9.5 mm	60 - 95
4.75 mm	45 - 75
2.00 mm	35 - 60
0.425 mm	20 - 40
0.075 mm	10 - 20

Type 2 Material

Imported pit-run fill for the road subgrade below 150 mm from the finished road surface shall be a graded granular material to approximatly the following grading requirements:

ASTM Sieve Size	Passing

2.1 MATERIALS (Cont'd) .4 (Cont'd

200.0 mm	100
150.0 mm	75 - 100
75.0 mm	50 - 100
38.0 mm	35 - 90
25.0 mm	30 - 85
9.5 mm	20 - 75
4.75 mm	15 - 65
2.00 mm	10 - 55
0.425 mm	5 - 30
0.075 mm	- 8

No oversize material will be allowed. Grading of the embankment and gravel course material should give a smooth curve without sharp breaks when plotted on a semi-log chart.

2.2 MATERIAL SOURCES .1 Refer to Section 02210 - Clause 2.2.

PART 3 - EXECUTION

3.1 COMPACTION .1 Compaction shall be carried out by a method selected by the Contractor which produces the specified degree of compaction.

.2 Compaction shall be done to the specified percentage of the Standard Proctor Density as determined by ASTM D 698-00a, Method "C".

3.2 WATER DISTRIBUTORS . Apply water with equipment capable of uniform distribution.

. The Contractor shall bear the cost of purchasing, loading, hauling, spraying water, or of aeration of the embankment or gravel course material to achieve the optimum moisture content for compaction.

.3 EXCAVATING

General:

.1 Maintain crowns and cross slopes to provide good surface drainage.

.2 Notify Engineer whenever unsuitable materials are encountered in cut sections and remove unsuitable materials to depth and extent directed.

.3 Remove materials unsuitable for embankments to lateral limits and depths directed.

.4 Dispose of waste material at the Town Dump or as directed by the Engineer.

.5 Where road is on transition from excavation to embankment, treat ground slopes at grade points as directed.

.6 Advise the Engineer sufficiently in advance of excavation operations for initial cross-sections to be taken.

.7 If during excavation, material appearing to conform to classification for rock is encountered, notify Engineer in sufficient time to enable measurements to be made to determine volume of rock.

3.4 EMBANKMENT AND GRAVEL COURSE CONSTRUCTION

When directed, scarify or bench existing slopes in side hill or sloping sections to ensure a proper bond between new materials and existing surfaces. Obtain prior approval of method to be used.

Do not place material which is frozen or place material on frozen surfaces.

Maintain a crowned surface during construction to ensure ready runoff of surface water.

Placement and Compaction:

.1 Place and compact to full width in uniform layers not exceeding 200 mm loose thickness. Engineer may authorize thicker lifts if specified compaction can be achieved.

.2 Compact each layer of the lower section of the road embankment deeper than 400 mm to a minimum 90% Standard Proctor density.

.3 Compact the subgrade/embankment to 100% Standard Proctor density.

3.4 EMBANKMENT AND GRAVEL COURSE CONSTRUCTION (Cont'd)

Placement and Compaction: (Cont'd)

.4 The embankment shall be levelled and dressed prior to the application of the 150 mm depth of granular base course (Type 1) material. Do not place any road section material until the Engineer has checked the elevation, inspected and approved the preceding course. On approval by the Engineer, the compacted subgrade and granular base course gravel shall be placed uniformly. Place materials using methods which do not lead to segregation or degradation. The Contractor shall supply batter boards suitable for the checking of road crowns. Compact the 150 mm depth of subgrade (Type 1) to 100% Standard Proctor density.

.5 Field Density tests may be carried out by the Engineer where and when required. This testing in no way relieves the Contractor of any responsibilities regarding settlements and maintenance as specified.

.6 The Engineer may further test the compaction by proof rolling. Proof rolling is a method of detecting soft areas in the road embankment or gravel course. It will be accomplished by the use of heavy (15-25 tonne) compaction equipment with high contact wheel pressures on independent axles, or heavily loaded single axle trucks. The procedure requires two complete passes with the test vehicle in one direction. While the passes are being made, any softened, rutted or displaced areas detected should be examined and either recompacted with additional fill or the existing material removed and replaced with better quality material.

.5 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.

3.5 FINISHING

Shape and compact the gravel subgrade embankment to within 30 mm of the design embankment elevations (finished road level minus gravel course thickness) but not uniformly high or low.

3.5 FINISHING (Cont'd)

Shape and compact gravel surface course to within 20 mm of design finished road levels, but not uniformly high or low. The finished gravel course shall measure the specified thickness from the highest areas of the subgrade.

.3 Do scarifying, blading, compacting or other methods of work as necessary to provide a thoroughly compacted roadbed shaped to grades and cross-sections indicated or directed.

. Finish side slopes to a neat condition, true to lines and grades indicated.
.1 Remove boulders encountered in cut slopes and fill resulting cavities.
.2 Hand finish slopes that cannot be finished satisfactorily by use of machine.

3.6 MAINTENANCE

.1 Maintain finished embankment in a condition conforming to this section until the gravel course is constructed.

.2 Maintain the finished gravel course in a condition conforming to this section until it has been accepted by the Engineer.

END OF SECTION 02215

PART 1 - GENERAL

1.1 RELATED WORK	.1	Rock Excavation	Section 02316
		Trenching, Backfilling and Compaction	Section 02221

1.2 MEASUREMENT FOR PAYMENT	.1	Supply and installation of pipe culvert including common excavation and backfill will be measured in lineal metres in place for each size and type of pipe.

PART 2 - PRODUCTS

2.1 FULL-ROUND CORRUGATED STEEL PIPE TO:	.1	CAN 3-G401-M81, and 1.60 mm thickness for culverts up to and including 800 mm and 2.0 mm for 900 mm and 1,000 mm culverts.
	.2	Nestable culverts with bolted joint connections are acceptable as an alternate. The unit price payment covers all costs for the culverts supply and installation, including assembly.
2.2 GRANULAR BEDDING AND BACKFILL	.1	Granular bedding and backfill material shall be composed of sound, hard, durable particles, free from injurious quantities of flaky particles, soft shale, organic and other foreign substances and frozen lumps, and meet the gradation requirements as per Section 02215 Clause 2.1.4 (Type 2 material).

PART 3 - EXECUTION

3.1 TRENCHING AND BACKFILLING

.1 Do trenching and backfill work to Section 02221 and rock excavation to Section 02202.

Place minimum 200 mm thick layer of compacted granular mate on bottom of excavation. Place material in uniform layers r exceeding 200 mm thickness (measured loose), and compact ea layer to at least 95% Standard Proctor Density before placi succeeding layer.

Protect installed culvert with minimum 600 mm cover of compacted fill before heavy equipment is permitted to cross during construction of project. Width of fill, at its top, be at least twice diameter or span or pipe and with slopes steeper than 1:2.

.2 Trench line and depth requires the Engineer's approval prior to placing bedding material or pipe.

.3 Do not backfill until pipe grade and alignment are checked and accepted by the Engineer

3.2 LAYING CORRUGATED STEEL PIPE CULVERTS

.1 Commence pipe placing at downstream end.

.2 Ensure bottom of pipe is in contact with shaped bed or compacted fill throughout its length.

.3 Lay pipe with outside circumferential laps facing upstream.

.4 Do not allow water to flow through pipes during construction except as permitted by the Engineer.

3.3 JOINTS: CORRUGATED STEEL PIPE CULVERTS

.1 Match corrugations or indentations of coupler with pipe sections before tightening.

3.3 JOINTS: CORRUGATED STEEL PIPE CULVERTS (Cont'd)

.2 Tap couplers firmly as they are being tightened, to take up slack and ensure a snug fit

.3 Insert and tighten bolts.

3.4 CULVERT ENDS

.1 Field cut the culvert ends to match the embankment slopes.

.2 Install culvert end markers as supplied by Hi Signs or equivalent.

END OF SECTION 02220

PART 1 - GENERAL

1.1 Source Approval

. Inform Engineer of proposed source of aggregates and provide access for sampling at least 2 weeks prior to commencing production.

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

Should a change of material source be proposed during work, advise Engineer 2 weeks in advance of proposed change to allow sampling and testing.

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

1.2 Production Sampling

Submit samples in accordance with Section 01301 - Submittals.

.2 Aggregate will be subject to continual sampling by Engineer during production.

.3 Provide Engineer with ready access to source and processed material for purpose of sampling and testing.

Install adequate sampling facilities at discharge end of production conveyor, to allow Engineer to safely obtain representative samples of items being produced. Stop conveyor belt when requested by Engineer to permit full cross section sampling.

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

1.3 Measurement for Payment

No measurement for payment will be made under this section.

PART 2 - PRODUCTS

2.1 Materials

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

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

Fine aggregates satisfying requirements of applicable section shall be one, or a blend of following:

.1 Natural sand.
.2 Manufactured sand.
.3 Screenings produced in crushing of quarried rock, boulders, gravel or slag

Coarse aggregates satisfying requirements of applicable section shall be one of or blend of following:

.1 Crushed rock.
.2 Gravel and crushed gravel composed of naturally formed particles of stone.
.3 Light weight aggregate, including slag and expanded shale.

PART 3 - EXECUTION

3.1 Processing

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

Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Engineer.

3.1 Processing (Cont'd)

Wash aggregates, if required to meet specifications. Use only equipment approved by Engineer.

When operating in stratified deposits use excavation equipment and methods that will produce uniform, homogeneous aggregate.

3.2 Handling

Handle and transport aggregates to avoid segregation, contamination and degradation

3.3 Stockpiling

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

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

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

Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of the aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into work.

5 Separate stockpiles far enough apart to prevent intermixing.

Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Engineer within 48 h of rejection.

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.

3.3 Stockpiling (Cont'd)

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

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

10 Do not use conveying stackers.

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

3.4 Aggregate Stockpile Cleanup

- Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

END OF SECTION 02230

PART 1 - GENERAL

1.1 References

.1 ASTM C 117-95, Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing

ASTM C 131-01, Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

ASTM C 136-01, Method for Sieve Analysis of Fine and Coarse Aggregates.

.4 ASTM D 698-00a, Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 2.49 kg Rammer and 304.8 mm Drop.

.5 ASTM D 4318-00, Test Method for Liquid Limit. Plastic Limit and Plasticity Index of Soils.

.6 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire.

.7 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.

.8 ASTM D 1883-99, Test Method for CBR (California)

1.2 Measurement for Payment

.1 Granular base will be square metres of material incorporated into work and accepted by Engineer Payment will be made at the unit price tendered and shall include supply, delivery, placing, water for compaction, compaction, final grading and maintenance of surface until acceptance.

PART 2 - PRODUCTS

2.1 Materials

Granular base: material to Section 02230
Aggregates: General and following requirements:
.1 Crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, and other deleterious materials.
.1 Gradation to: Type 1, Section 02223

PART 3 - EXECUTION

3.1 Inspection of Underlying Embankment/Sub-base

Place granular base after embankment/sub-base surface is inspected and approved by Engineer.

3.2 Placing

.1 Ensure no frozen material is used in placing.

Place material only on clean unfrozen surface, properly shaped and compacted and free from snow and ice.

Place using methods which do not lead to segregation or degradation of aggregate.

Place material to full width in uniform layers not exceeding 150 mm compacted thickness.

Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

Remove and replace that portion of layer in which material becomes segregated during spreading.

3.3 Compaction Equipment

.1 Compaction equipment must be capable of obtaining required densities in materials on project.

3.4 Compacting

.1 Compact to density not less than 100% maximum dry density in accordance with ASTM D 698-00a

.2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.

.3 Apply water as necessary during compacting to obtain specified density. If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.

.4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Engineer.

3.5 Finish 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.

.2 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.6 Maintenance

.1 Maintain finished base in condition conforming to this section until succeeding material is applied.

END OF SECTION 02233