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5.1 SECTION 1 – CRUSHED AGGREGATE PRODUCTION

5.1.1 DESCRIPTION

This specification covers the general requirements for the production, gradation, stockpiling and pit operations for the crushed aggregate materials specified.

5.1.2 MATERIALS

5.1.2.1 **Sources**

a) Department Supply Sources

When it is specified in the Contract that the Contractor shall use pits, stockpiles or quarry sites as shown on the plans or as designated by the Engineer for the production of crushed or uncrushed aggregate, these sources shall be termed Department Supply Sources.

Unless otherwise specified, the Department will obtain the necessary Land Use and Quarry permits. Copy of the quarry permit will be made available to the contractor during the pre-construction meeting.

The Contractor shall abide by all Terms and Conditions associated with these permits.

In addition to these Terms and Conditions the Contractor shall also abide to the following conditions:

- i) The Contractor shall ensure that all fuel storage containers with a capacity exceeding 4,000 litres are double-walled tanks.
- ii) Mobile fuel tankers are not permitted for onsite storage and are only permitted for delivering fuel to the main storage tank or to equipment.
- iii) Vehicles and storage tanks shall not be left unattended during refueling.
- iv) Fuel spill kit(s) shall be kept on site at all times.
- v) In addition to reporting chemical and fuel spills immediately to the NWT 24-Hour Spill Report line at 1-867-920-8130, the Contractor shall also complete a spill report form and forward a copy to the appropriate regulatory bodies within 12 hours of a reported incident.
- vi) The Contractor shall ensure that all workers on site are aware of all Terms and Conditions of all Permits. Copies of Permits and Permit Terms and Conditions shall be posted on site for viewing by workers, at the location, that is accessible and frequented by all workers.

The Contractor shall prepare a quarry development plan, indicating location and dimensions of the proposed quarry area to be drilled and blasted, stockpile bases, overburden disposal, and fuel storage facilities (including size and type of storage containers). The contractor shall submit this quarry development plan to the Department of Lands and get their approval before starting the drilling operation.

b) Contractor Supply Sources

When it is specified in the Contract that the Contractor:

- i) Is required to arrange for and supply the entire aggregate commitment for the contract from sources of their own choice or,
- ii) Has the option of supplying the aggregate for part or all of the Contract from Department Supply Sources identified in the Contract or sources of their own choice.

The following shall apply to any aggregate sources used including Department Supply Sources and Contractor Supply Sources identified in the Contract:

- i) The Contractor shall ensure all required permits, licenses and approvals are in place in accordance with the provisions of the Northwest Territories Lands Act, including but not limited to Land Use Permits, Quarry Permits, Water Licenses and Fisheries Authorizations.

The Contractor assumes full responsibility for the quantity and quality of the material in the source.

The Contractor shall specify in their bid submission their designated supplier of all aggregates and the name and location of their proposed aggregate sources and haul routes.

The Contractor shall obtain the necessary rights to take materials from the sources.

The Contractor shall explore and develop the sources.

The Contractor shall save the Department harmless from any and all claims resulting from the use of the aggregate sources.

The Engineer will not consider the use of aggregate from existing stockpiles unless the Contractor can satisfy the Engineer that the material meets all required specifications.

Agreement by the Engineer that such pre-prepared aggregates can be used will not constitute acceptance of the material in stockpile. Acceptance of such material will be based on quality control testing done by the Contractor or quality assurance testing performed by the Engineer as the material is incorporated into the Work.

5.1.3 **CONSTRUCTION**

5.1.3.1 General

Aggregate produced from all sources shall comply fully with the specifications and the Contractor shall recognize and satisfy himself as to the type and amount of work that may be necessary to produce the required material.

The aggregate shall meet the requirements for the Designation and Class of material specified. The Contractor shall adjust and modify aggregates as required in order to meet the specification requirements.

The crushed aggregate shall be composed of sound, hard and durable particles of sand, gravel and rock and shall be free from elongated particles, injurious quantities of flaky particles, soft shales, organic matter, clay lumps, deleterious materials, and other foreign matter.

A tolerance of 3% in the amount passing the maximum size sieve will be permitted providing all oversize material passes the next larger standard sieve size.

The Contractor shall be entirely responsible for the quantity and quality of crushed aggregate produced but shall also be responsible for organizing production and stockpiles on designated base and survey those with record of time, date, materials type, volume and chronological pile number in order.

5.1.3.2 Quality Control and Quality Control Testing

a) **General**

In all sources, quality control and quality control testing are the responsibility of the Contractor throughout every stage of the work.

Tests performed by the Department will not be considered to be quality control tests.

The Contractor shall provide, pay for and maintain equipment and qualified personnel to carry out all field testing necessary to determine and monitor the characteristics of the materials produced and incorporated into the work and the final product produced.

The Contractor shall provide safe and convenient means for accurately and representatively sampling each aggregate stream being produced during all screening, splitting and crushing processes.

Prior to commencement of the work, the Contractor shall provide the Engineer with their program and schedule of testing for quality control and shall demonstrate to the satisfaction of the Engineer that the program and schedule are adequate to provide reliable quality control within the limits specified.

- i) The Contractor shall retain and utilize Professional Engineering Services to carry out all quality control and quality control testing and to assess and where necessary, modify the aggregate materials being produced to ensure their end use meets all specification requirements. The Professional Engineering Services employed by the Contractor shall be licensed to operate in the Northwest Territories.

The Contractor shall not retain or utilize the Professional Engineer and/or Geoscientist or personnel retained by the Department of Infrastructure with respect to the Contract, for any work on or associated with the Contract.

All quality control tests, and test results shall be calculated and submitted to the Engineer on industry standard worksheets. The tests and test results shall be certified for correctness by the Professional Engineering Services employed by the Contractor to perform the tests and shall be signed by the Contractor's representative. Original copies of all worksheets, including calculations, shall be submitted to the Engineer daily. All worksheets shall be reviewed and certified for correctness by a Professional Engineer from the Professional Engineering Services employed by the Contractor to perform test, on a minimum weekly basis.

- ii) Test Methods

Unless otherwise specified, the most recent version of the following test methods shall be used to determine material characteristics:

Test Description	Standard
(1) Sampling Aggregates	ASTM D75/AASHTO T2
(2) Sieve Analysis of Fine and Coarse Aggregates	ASTM C136 /AASHTO T27
(3) Sieve Analysis of Materials Finer than 75-micron Sieve	ASTM C117/ AASHTO T11
(4) Mineral Filler for Road and Paving	ASTM D546/AASHTO T37
(5) Determining the Liquid Limit of Soils	ASTM D4318/AASHTO T89
(6) Determining the Plastic Limit and Plasticity Index of Soils	ASTM D4318/AASHTO T90
(7) Percent Fracture	ASTM D5821
(8) L.A. Abrasion	ASTM C131/ASTMC535/AASHTO T96
(9) Flakiness Index or Percent Flat and Elongated Particles	ASTM D4791
(10) Detrimental Matter in Coarse Aggregates	TLT-107
(11) Standard Proctor Maximum Dry Density	ASTM D698
(12) Magnesium Sulphate Soundness (coarse and fine)	ASTM C88/AASHTO T104

* The terms "ATT" and "TLT" refer to Alberta Transportation Test methods

iii) Quality control Testing Requirements

The Contractor's Quality Control Testing shall be carried out on a per lot basis using the following lot sizes:

- For aggregates having a maximum aggregate size of 50 mm or higher the lot size shall be 2,000 cubic meters; and
- For aggregates have a maximum aggregate size of less than 50 mm the lot size shall be 1,000 cubic meters.

The Contractor's quality control and quality control testing program shall include the methods at the minimum specified frequencies in the table below.

iv) Lot Testing System

Test	Standard	Minimum Frequency
(A) Sampling		
(1) Sampling Aggregates	ASTM D75/AASHTO T2	4 per lot. (This frequency applies to each fraction being produced for Designation 1 split stockpiles.)
(B) Sieve Analysis		
(1) Crushed aggregates (a) Fine and Coarse aggregates (b) Materials Finer than 75 microns Sieved by washing	ASTM C136/AASHTO T27 ASTM C117/AASHTO T11	4 per lot.
(2) Blend Sand (a) Mineral Filler for Road and Paving Materials	ASTM D546/AASHTO T37	4 per lot.
(3) Manufactured Blend Sand (a) Mineral Filler for Road and Paving Materials	ASTM D546/AASHTO T37	4 per lot.
(C) Other		
(1) Determination of Plastic Limit and Plasticity Index of Soils	ASTM D4318/AASHTO T90	1 per 3 lots.
(2) Percent Fracture	ASTM D5821	1 per lot.
(3) L.A. Abrasion	ASTM C131/ASTM C535/AASHTO T96	1 per source.
(4) Flakiness Index or Percent Flat and Elongated	v) ASTM D4791	1 per source.
(5) Detrimental Matter in Coarse Aggregate	TLT-107	1 for the first lot. Additional tests at rate of 1 per 3 lots if first test indicates deleterious material is $\geq 4\%$.
(6) Magnesium Sulphate Soundness	ASTM C88/AASHTO T104	1 per source.
(7) Standard Proctor Maximum Dry Density	ASTM D698	1 per stockpile.

Note: The terms "ATT" and "TLT" refer to Alberta Transportation Test methods

- b) The Contractor shall perform a minimum of two washed sieve analysis tests from the crusher belt and two washed sieve analysis tests from the stockpile for every lot.

The Engineer will, upon review of the Contractor's submitted test results and the Department's quality assurance test results, accept the lot only if the test results indicate that the granular material has been produced in accordance with the specifications.

If more than one test result per lot from the Contractor's quality control testing reveals that the material is not within acceptable specification criteria, the following shall apply:

- i) The material will be rejected, and the Contractor shall remove the entire lot from the stockpile, and the rejected material will become the property of the Department or:
 - ii) If in the opinion of the Engineer, the material is only slightly out of specification and will not be detrimental to the usage of the material, the material, if requested by the Contractor in writing, may be accepted by the Engineer at a reduced payment of 75% of the unit price bid for the applicable item.
- c) Reporting of Sieve Analysis Test Results and Production Quantities
The Contractor shall record all sieve analysis test results on industry standard grain size curve sheets and work sheets, which provide all test data, calculations, error checks, test results and any additional information requested by the Engineer. The Contractor shall also determine and record on each sieve analysis worksheet, the time and date of sampling, the total quantity of granular material produced at the time of sampling and, where applicable, the test lot that the sample refers to.
- d) Quality Acceptance
Within this specification, certain requirements, limits and tolerances are specified regarding the quality of materials and workmanship to be supplied. Compliance with these requirements, limits and tolerances may be measured and the work accepted or rejected based on the Department's quality assurance test results.

Acceptance of processed aggregates will take place when they are in their final position and have met all the requirements of the Contract. The Engineer may test at any time and reject material that does not meet the specifications. The final position for a crushing and stockpiling Unit Price Table item will be the stockpile as when quantity and quality is certified by the Engineer.

The Engineer and the Engineer's representatives reserve the right to sample, test, inspect and monitor the quality of material being produced and incorporated into the work by the Contractor at any time and as often as the Engineer deems necessary. The Contractor shall cooperate with the Engineer and the Engineer's representatives for such sampling, testing, inspecting and monitoring. The Engineer is under no obligation to provide the Contractor with test results and this testing shall in no way relieve the Contractor of responsibility to produce aggregates that meet the specifications in all respects.

5.1.3.3 Pit Operations

- a) General
All reject and screening materials produced in a Department Supply Source designated in the Contract shall be stockpiled in a neat and regular form separate from the crushed aggregate stockpiles. All such materials are the property of the Department and the Contractor shall have no claim to the materials.
- b) Department Supply Sources
The area from which gravel material is to be obtained shall be as shown on the plans or as designated by the Engineer.

Clearing of material source areas, haul road(s) and stockpile site(s) shall be carried out in accordance with "Clearing" (Division 3, Section 1).

Grubbing of material source areas, haul road(s) and stockpile site(s) shall be carried out in accordance with "Grubbing" (Division 3, Section 2).

Excavation and disposal of material overlaying the gravel source, excavation of the granular material and the construction of haul roads and stockpile sites shall be carried out in accordance with "Borrow Excavation" (Division 3, Section 4).

Excavation and disposal of material overlaying the rock source, drilling, blasting and excavation of rock material shall be carried out in accordance with "Roadway Excavation" (Division 3, Section 3).

The Contractor shall open a sufficient area ahead of the quarrying or excavating operation to positively prevent contamination of aggregate by deleterious materials.

Crushing, blending, screening and loading shall be performed by such methods that a uniform grade of material will be delivered to the stockpile site. In the event of an excessive fines content developing in a deposit of gravel, the Contractor shall provide screening equipment for the removal of fines in excess of that specified.

The Contractor may be required to obtain blending materials from sources other than the pit/quarry site in order to achieve the specified crushed aggregate limits.

The excavation of aggregate shall extend to the full depth of the deposit and shall advance uniformly to obtain maximum yield from the deposit. Under no circumstances will the waste of useable material be permitted.

All material up to and including 600 mm in diameter in Department Supply Sources identified in the Contract shall be crushed.

All material encountered in the gravel pit or stockpile suitable for the production of the gravel specified shall be used.

Plastic soils or other deleterious material encountered in the pit or stockpile shall be eliminated prior to processing the material through the crusher.

All aspects of clearing, grubbing, stripping, removal of overburden, pit management and clean-up shall be carried out in accordance with the provisions of the Northwest Territories Lands Act.

c) Contractor Supply Sources

All aspects of clearing, grubbing, stripping, removal of overburden, pit management and clean-up shall be the responsibility of the Contractor.

5.1.3.4 Aggregate Production

a) General

The Contractor shall produce aggregates conforming to the specifications for the Designations and Classes called for in the Contract.

The Contractor shall notify the Engineer a minimum of two days in advance of the start of aggregate production to allow the visual inspection of the process and testing of the production as deemed necessary by the Engineer. This inspection and testing will not relieve the Contractor of responsibility to produce aggregate materials that meet all specification requirements.

Any recombining of aggregates or addition of blend materials shall be carried out such that a uniform mix of the various sizes is obtained.

Unless otherwise specified, the Contractor shall ensure that manufactured fines are retained in the crushed aggregate stockpile.

b) Production of Aggregates

The Contractor shall split aggregates for all aggregates into coarse and fine fractions prior to crushing the coarse fraction. The crushed coarse and fine fractions shall be stockpiled separately.

The Contractor shall set the screen size at which splitting will take place. Splitting of aggregates shall be controlled such that the coarse aggregate fraction, before crushing, shall contain no more than 5% passing the 5000-micron sieve.

The fine fraction shall contain no more than 20% of material retained on the 5000-micron sieve.

Further splitting of the crushed coarse aggregate into separate stockpiles may be carried out at the Contractor's option. No additional payment will be made for this work.

The combined aggregate fractions shall meet the requirements in the tables below for the Designations and Classes called for in the Contract.

i) Designation: Embankment Rock Fill

Parameter	Sieve Size (micron)	Class: 150 mm	Class: 200 mm	Class: 300 mm
Sieve Analysis (Percent Passing)	400 000			
	300 000			100
	200 000		100	50 - 80
	150 000	100	50 - 80	
	125 000		0	0
	100 000	50 - 97		
	80 000			
	50 000	20 - 90		
	37 500			
	25 000			
	20 000	0 - 60		
	16 000			
	12 500			
	10 000	0 - 30		
	5 000	0 - 10		
	2 500			
	2 000			
	1 000			
	1 250			
	800			
	630			
	400			
	315			
	160			
	80			
	45			
% Fractures by Weight (2 Faces)		N/A	N/A	N/A
Plasticity Index (PI)		N/A	N/A	N/A
LA. Abrasion Loss (Percent Maximum)		50	50	50
Flakiness Index		N/A	N/A	N/A
Coefficient of Uniformity (C _u)		N/A	N/A	N/A

ii) Designation: Granular Base Course

Parameter	Sieve Size (micron)	Class: 12.5 mm	Class: 16.0 mm	Class: 19.0 mm	Class: 20.0 mm
	125 000				
	80 000				
	63 000				
	50 000				
	40 000				
	25 000				
	20 000			100	100
	16 000		100	97 – 100	
	12 500	100	75 - 95	70 – 95	
	10 000	75 – 90	55 – 80	45 – 80	63 – 86
	6 300		22-45		
	5 000	50 – 70	35-55	25 – 50	40 – 67
	2 500	35 – 50	16-26		
	2 000	-	-	13 – 45	
	1 600	-	-		
	1 250	25 – 40	15 – 40		20 - 43
	800	-	-	10 – 37	
	630	20 – 30	13 – 20		14 – 34
	400	-	-	7 – 32	
	315	14 – 23	5 – 22		9 - 26
	160	7 – 14	10 – 16	6 – 18	5 - 18
	80	4 – 8	9-13	5 – 15	2 - 10
	45	-	-		
% Fractures by Weight (2 Faces)		90 (min)	75 (min)	50 (min)	60 (min)
Plasticity Index (PI)		0	4 (max)	NP-8	4 (max)
LA. Abrasion Loss (Percent Maximum)		32	50	N/A	50
Flakiness Index		N/A	N/A	N/A	N/A
Coefficient of Uniformity (C _u)		N/A	N/A	N/A	N/A

iii) Designation: Granular Subbase

Parameter	Sieve Size (micron)	Class: 40 mm	Class: 50 mm	Class: 76 mm	Class: 80 mm	Class: 100 mm
	100 000					100
	80 000			100	100	
	63 000					
	50 000		100	80 - 100	55 - 100	80 - 100
	37 500	100	87 - 100			
	25 000			60 - 100	38 - 100	60 - 100
	20 000	65-100	60 - 95			
	16 000				32 - 85	
	12 500	55 - 95	46 - 80	45 - 100		45 - 100
	10 000					
	5 000	30-- 65	35 - 60	25 - 100	20 - 65	25 - 100
	2 500					
	2 000	20 - 50	25 - 45	15 - 100		15 - 100
	1 600					
	1 250					
	800					
	630					
	400	7 - 35	10 - 20	5 - 95		5 - 95
	315				6 - 30	
	160	6 - 20		3 - 65		3 - 65
	80	2 - 12	2 - 12	2 - 12	2 - 12	3 - 12
	45					
% Fractures by Weight (2 Faces)		50 (min)	50 (min)	50 (min)	NA	NA
Plasticity Index (PI)		6 (max)	6 (max)	6 (max)	6 (max)	6 (max)
LA. Abrasion Loss (Percent Maximum)		50	50	50	50	50
Flakiness Index		N/A	N/A	N/A	N/A	N/A
Coefficient of Uniformity (C _u)		N/A	N/A	N/A	N/A	N/A

iv) Designation: Chip Seal – Seal Coat

Parameter	Sieve Size (micron)	Class: 12.5 mm	Class: 16.0 mm
	125 000		
	80 000		
	63 000		
	50 000		
	40 000		
	25 000		
	20 000		
	16 000		100
	12 500	100	55 - 92
	10 000		18 - 80
	5 000	0 - 60	7 - 30
	2 500		
	2 000	0 - 50	0 - 20
	1 600		
	1 250		
	800		
	630		
	400	0 - 15	
	315		
	160		
	80	0 - 4	0 - 4
	45		
% Fractures by Weight (2 Faces)		60 (min)	60 (min)
Plasticity Index (PI)		4 (max)	4 (max)
LA. Abrasion Loss (Percent Maximum)		30	30
Flakiness Index		N/A	N/A
Coefficient of Uniformity (C _u)		N/A	N/A

v) Designation: Spray Patch Repair

Parameter	Sieve Size (micron)	Class: 12.5 mm
Sieve Analysis (Percent Passing)	125 000	
	80 000	
	63 000	
	50 000	
	40 000	
	25 000	
	20 000	
	16 000	
	12 500	100
	10 000	90 - 100
	5 000	20 - 100
	2 500	5 - 30
	2 000	
	1 600	
	1 250	0 - 10
	800	
	630	
	400	
	315	
	160	
	80	
	45	
% Fractures by Weight (2 Faces)		60 (min)
Plasticity Index (PI)		0
LA. Abrasion Loss (Percent Maximum)		32
Flakiness Index		N/A
Coefficient of Uniformity (C _u)		N/A

c) Production and Addition of Blend Sand

When the aggregate being produced is destined for further processing through a mixing plant, the addition of any required blend sand, natural or manufactured, shall take place at the mixing plant.

All blend sand shall be screened before being incorporated into the mix to remove oversize material, clay lumps, roots and other deleterious materials. All blend sand so screened shall pass the 5000-micron sieve.

Blend sand shall be dried if necessary, to provide a uniform feed.

Manufactured blend sand is defined as material passing the 5000-micron sieve, which is produced by crushing.

All other aggregates requiring the addition of blend sand to meet the specified gradation shall be adjusted at the crushing stage by means of a separate conveyor or other approved device capable of

metering the sand at a specified uniform rate. The blend sand shall be added prior to or onto the crusher screen deck.

5.1.3.5 Stockpiling

Before gravel can be placed in stockpile(s), approval must be received from the Engineer. When aggregate stockpiles are specified or used as part of construction operations, the following will apply:

- a) When stockpiling is specified in the Contract, the stockpile sites shall be located as indicated on the plans or as designated by the Engineer.
- b) If, in order to expedite the operation, the Contractor constructs temporary stockpiles at sites other than that designated by the Engineer, the Contractor shall arrange for such sites and shall be responsible for them in all respects, including all costs for clearing, grubbing, stripping, removal of overburden and other site preparation and reclamation. The Contractor shall also be responsible for obtaining the necessary approvals and clearances for such sites in accordance with the provisions of the Northwest Territories Lands Act.

Stockpiles shall not be constructed at locations or by methods that will interfere with or damage any utility lines, such as power lines, telephone lines, pipelines and underground utilities.

Stockpile site(s) shall be approved and/or designated by the Engineer and shall be cleared, grubbed and stripped to the necessary dimensions. Grubbing, stripping and overburden material shall be excavated to their full depth and disposed of separately.

Stockpile sites shall be firm, level and free of all deleterious material and shall be shaped to a uniform smooth surface and graded to ensure positive drainage.

Stockpiles shall be constructed by first distributing material uniformly over the entire base and building upwards in successive layers not exceeding 1 m in depth.

Construction operations shall be controlled to prevent segregation of the various particle sizes. The crushed aggregate or pit-run material shall not be pushed or dumped over the edges or down the faces of stockpiles.

Radial Telescopic Conveyor/Super Stacker will be permitted for stockpiling 80 mm, 50 mm and 20 mm crushed granular materials except 16 mm and 12.5 mm Surface Treatment Aggregates. Crushed Surface Treatment Aggregate (16 mm and 12.5 mm) shall be stockpiled by spilling aggregate into truck box and stockpiled in a series of piles and layers. The height of the conveyor should be as low as possible to minimize segregation and that layer should be evenly distributed. For blend sand, newly processed material shall be blended into the stockpile.

Completed stockpiles shall be neat and regular in form and shall be constructed to occupy the smallest feasible area taking into consideration the bearing capacity of the foundation soils and the requirements of the Safety Act and the Mine Health and Safety Act.

If different types, Designations or Classes of materials are to be stockpiled, the stockpiles shall be located and constructed such that no intermixing of materials will occur.

Any surplus crushed aggregates produced in a Department Supply Source designated in the Contract shall be stockpiled in a neat and regular form separate from the crushed aggregate stockpiles.

5.1.3.6 Surplus Crushed Aggregates

Surplus crushed aggregates are aggregates that have been produced in a Department Supply Source designated in the Contract, which remain in stockpile after the completion of the Contract. All such aggregates are the property of the Department and the Contractor shall have no claim to the aggregates.

5.1.4 MEASUREMENT AND PAYMENT**5.1.4.1 General****a) Professional Engineering Services**

The Contractor shall retain and utilize professional engineering service provided by an Engineering Firm registered in the Northwest Territories to carry out all quantity control and quantity measurements.

- i) Surveys – General Requirement
- ii) Stockpile bases shall be surveyed prior to stockpiling of produced aggregates.
 - Surveyed perimeter points: 5 metre intervals on tangents and cross-section
- iii) Stockpiles shall be surveyed for measurement for payment upon completion of production of the defined aggregate type.
 - Surveyed perimeter points: 5 metre intervals on tangents and 3 metre intervals at rounded corners.
 - Surveyed interior grid points: 5 metre intervals with additional points gathered at significant grade changes along the top plateau.
 - Unlevelled dumps on the top of the stockpile shall be ignored.
- iv) Sufficient surveyed points shall be gathered over the full extent of the pile to clearly define the shape inclusive of irregular features such as loading ramps, secondary ridges that may be formed at levels between the base and the top of the stockpile and any undulations that may, if not defined, skew the true value of the volume quantity.
- v) A minimum of three control/reference stations shall be established for each stockpile site. Survey reference points shall be clearly visible with an identity marker in the field. The Northing, Easting and Elevation coordinates shall be made available for use by the Engineer where quantity assurance is required.

b) Volume Determinations

The Contractor shall choose the "Average End Area Method" or the "Prismoidal Method" to determine quantities for payment. The following conditions will apply:

- i) For "Average End Area Method": The volume determined for quantity payment shall be accompanied with proof of computation as follows:
 - Plan of survey of the stockpile showing a theoretic or physical baseline (horizontal alignment) to which the cross-sections refer by station and offset, the stockpile and base outlines and contour lines at 0.5 metre interval, the type of aggregate produced and the determined volume quantity.
 - Generated cross-section plots at 10 metre interval stations that show the area of the section and accumulated volume. Additional stations at 3 to 5 metre intervals must be generated to clearly define the beginning and the ending toe of slope for the stockpile.
 - The start station value for each stockpile baseline shall be 0+000 and shall fall on the stockpile

base and before the toe of slope of the stockpile to be measured.

- The end station shall fall on the stockpile base and beyond the toe of slope of the stockpile at its opposite end.

Or,

- ii) For “Prismoidal Method”, the volume determined for quantity payment shall be accompanied with proof of computation as follows:
 - Plan of survey of the stockpile showing the stockpile and base outlines and contour lines at 0.5 metre interval, the type of aggregate produced and the determined volume quantity.
- iii) In addition to the above, the Contractor shall submit the following to the Engineer when making claim for payment.
 - The survey data files for each survey (two per stockpile) in electronic ASCII text file on standard USB in the format Point Number, Northing, Easting, Elevation, Description. Files shall be names in accordance with the survey they are related to. (Example: 20 mmBaseDDMMYYYY.txt) or 20 mm StkDDMMYYYY.txt)
- iv) Any Crushed Aggregates deposited outside of the stockpile base areas shall not be measured for payment.
- v) The stockpile base shall be constructed with 0.3 metres of the specified crushed aggregate. This material will not be included in the measurement for payment and will be considered incidental to the work.

c) Payment

Payment for all items will be at the unit price per cubic metre as specified in the Unit Price Table. The total amount eligible for payment will be the actual total quantity of crushed aggregate produced minus the stockpile base.

i) Unit Price Bid

The unit price bid as given in the Unit Price Table shall be full compensation for all equipment, mobilization, demobilization, signing, clearing, grubbing, removal of overburden, stockpiling of overburden, salvaging and stockpiling of merchantable timber, drilling, blasting, producing and stockpiling of the aggregates, relocation of previous stockpiles to make room for new stockpiles, access road construction (if applicable), labour, accommodations and board, quality and quantity control, site clean-up, tools, rentals, fuel, maintenance, repairs, insurance, licensing, taxes, and any other associated costs necessary, to complete the production of aggregates in accordance with the specifications.

- ii) Unless otherwise specified, the production of aggregates, including the processing or production, hauling and addition of blend sand and any other aggregate gradation adjustments and modifications will not be paid for separately. The cost of this work will be considered included in the unit price of the Contract item for which the aggregates are being produced.
- iii) Payment for Production and Stockpiling of Crushed Aggregate shall be at the Contract unit price per tonne or cubic metre. Payment will not be made for the quantity of any aggregate in excess of unit price table estimates, unless otherwise authorized by the Engineer in writing.
- iv) The Contractor shall be responsible for the cost of all quality control and quality control testing and for the cost of the engineering consulting company and consulting services that it retains.
- v) The applicable unit price shall include all work required to comply with the provisions of the

Northwest Territories Lands Act.

- vi) The haul of material from the deposit or stockpile to the crusher and from the crusher to the stockpile will not be measured separately for payment and shall be considered incidental to the crushing operation.
- vii) Clearing, grubbing, stripping and the removal of overburden at the source and for the upgrading or construction of haul roads will not be measured separately for payment and shall be considered incidental to the crushing operation.
- viii) The upgrading or construction, and maintenance and dust control, of haul roads will not be measured separately for payment and shall be considered incidental to the crushing operation.
- ix) The quantity of blending material required to meet the specified crushed aggregate gradation will not be measured separately for payment and shall be considered incidental to the crushing operation.
- x) Aggregate crushing and breaking of oversize materials and sloping of the quarry walls to 2:1 and staging will not be measured separately and shall be considered incidental to the crushing operation.

5.1.4.2 Department Supply Sources

Unless otherwise specified, the aggregate in Department Supply Sources will be supplied to the Contractor free of cost.

5.1.4.3 Surplus Crushed Aggregates

No payment will be made for any quantity of crushed aggregate produced in a Department Supply Source designated in the Contract, which is in excess of the tendered quantity required for the completion of the Contract item for which the aggregates are being produced, unless otherwise approved by the Engineer in writing. All surplus aggregates are the property of the Department at no additional cost to the Department and the Contractor shall have no claim to the aggregates.

5.1.4.4 Contractor Supply Sources

The cost of obtaining all permits, licenses, approvals and rights to use a source and the exploration, development and reclamation of the source shall be the responsibility of the Contractor. These costs will not be measured separately for payment and shall be considered incidental to the crushing operation.

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5.2 SECTION 2 – GRANULAR BASE AND SUBBASE COURSE CONSTRUCTION

5.2.1 DESCRIPTION

This work consists of the construction of granular base course and granular subbase course placed in layers upon a prepared surface and compacted and finished in accordance with these specifications to the lines, grades and cross-sections shown on the plans or as designated by the Engineer.

5.2.2 MATERIALS

5.2.2.1 **Aggregate**

Unless otherwise specified, the Contractor shall produce crushed aggregate in accordance with "Crushed Aggregate Production" (Division 5, Section 1) for the Designation and Class of materials specified.

5.2.2.2 **Water**

The Contractor shall, at its own expense, supply and haul all water required for the construction and maintenance of the work. Water shall only be extracted from pre-designated sources complying all permits conditions and Acts.

The water shall be free from substances which render it unfit for use.

5.2.3 CONSTRUCTION

5.2.3.1 **General**

- a) Granular base/subbase course material shall be composed of sound, hard and durable particles of sand and/or gravel and/or rock and shall be free from elongated particles, injurious quantities of flaky particles, soft shales, organic matter, boulders, oversize material, clay lumps, deleterious material, and other foreign matter.
- b) The road surface shall be smooth, uniform, true to the specified lines, grades and cross- sections, free of ponded water/ice/snow, and to the required density prior to the application of granular base/subbase course.
- c) Granular base/subbase course shall be placed on the prepared roadway surface to the lines, grades and cross-sections and to the depth(s) or within the limits of the application rate range(s) as specified on the Contract Drawings.

The Contractor is responsible for monitoring the accurate placement and spreading of the granular materials and ensuring that they are placed to the depth(s) or within the limits of the application rate range(s), as specified. There will be no payment for any granular materials placed in excess of the depth(s) or application rate range(s) as specified, without the prior approval of the Engineer.

- d) The granular base/subbase shall be dumped, windrowed and spread uniformly on the roadbed surface without segregation.
- e) The Contractor shall maintain completed granular base/subbase course to the specified lines, grades and cross-sections and to the required density until the application of subsequent material thereon or until the work is accepted by the Engineer.

5.2.3.2 **Quality Control and Quality Control Testing**

a) General

Quality control and quality control testing are the responsibility of the Contractor throughout every stage of the work, from the crushing and production of aggregates to the final accepted product.

Tests performed by the Department will not be considered to be quality control tests.

The Contractor shall provide, pay for and maintain equipment and qualified personnel to carry out all field testing necessary to determine and monitor the characteristics of the materials produced and incorporated into the work and the final product produced.

Prior to commencement of the work, the Contractor shall provide the Engineer with a program and schedule of testing for quality control and shall demonstrate to the satisfaction of the Engineer that the program and schedule are adequate to provide reliable quality control within the limits specified.

The Contractor shall retain and utilize Professional Engineering Services provided by a registered Professional Engineer or a Professional Geologist to carry out all quality control and quality control testing. The Professional Engineer or the Professional Geologist shall be licensed to operate in the Northwest Territories and shall be registered to practice in the NWT.

The Contractor shall not retain or utilize the same Professional Engineer or a Professional Geologist or personnel retained by the Department with respect to the Contract, for any work on or associated with the Contract.

All quality control tests, and test results shall be calculated, recorded and submitted to the Engineer on industry standard worksheets. The tests and test results shall be certified for correctness by the Professional Engineer, or the Professional Geologist employed by the Contractor to perform the tests and shall be signed by the Contractor's representative.

Original copies of all worksheets, including calculations, shall be submitted to the Engineer daily. All worksheets shall be reviewed and certified for correctness by the Professional Engineer, or the Professional Geologist employed by the Contractor to perform the tests, on a minimum weekly basis.

The Contractor shall interpret quality control test results and alter its operation if necessary, so that the product meets all required specifications.

In any section or segment of road work no compaction work shall be carried on any materials and no materials shall be placed on surface when weather forecasts on Environment Canada's website at <https://weather.gc.ca/> for the subsequent 24 hours is projected to be equal to or below freezing, i.e. 0°C, for the project locality or nearest surrounding community.

b) Compaction Testing Requirements

The Contractor's quality control and quality control testing program shall include the carrying out of all compaction density and moisture testing required for the construction of granular subbase and base course in accordance with the specifications.

The Contractor shall carry out compaction testing using nuclear equipment, two tests per 40 m along the roadway randomly; one on left and one on right side of centreline for the subbase and base courses construction and as directed by Engineer. The Contractor shall apply water as necessary during compacting to obtain specified density.

Each layer of material shall be compacted to the specified density and results shall be submitted to the Engineer before the next layer is placed for verification of compliance with the specifications.

i) Compaction of base course and subbase course:

The Contractor shall apply compaction effort sufficient to achieve a uniform density not less than 100% of maximum density at optimum moisture content.

The Contractor shall establish the maximum density at the optimum moisture content in accordance with the latest edition of ASTM D698, for each Classification and Designation of material incorporated into the work. Original copies of all worksheets and laboratory test results shall be submitted to the Engineer prior to the commencement of chipsealing operations.

c) Quality Acceptance

Within this specification, certain requirements, limits and tolerances are specified regarding the quality of materials and workmanship to be supplied. Compliance with these requirements, limits and tolerances may be measured and the work accepted or rejected based on Department quality assurance test results.

The Engineer and Engineer's representatives reserve the right to sample, test, inspect and monitor the quality of material being utilized and incorporated into the work by the Contractor at any time and as often as they deem necessary. The Contractor shall cooperate with the Engineer and their representatives for such sampling, testing, inspecting and monitoring. The Engineer is under no obligation to provide the Contractor with test results and this testing shall in no way relieve the Contractor of responsibility to construct granular base/subbase courses that meet the specifications in all respects.

The Contractor shall provide, at the Contractor's own expense, such stands, sampling devices and other facilities as the Engineer may require to safely obtain representative samples of the materials being utilized and incorporated into the work.

The materials testing laboratory provided by the Professional Engineer or the Professional Geologist utilized by the Department to carry out quality assurance testing will not be located at the project site. Quality assurance test results will therefore not be completed for approximately 10 days from the date of sampling.

5.2.3.3 Survey, Layout, Staking and Grading Requirements

- a) The Contractor shall provide and pay for qualified personnel to carry out all surveying, layout, staking, grading and referencing required for the establishment of centerline, and the accurate placement and control of granular base/subbase course operations.

- b) The Contractor shall place shoulder stakes prior to the application of granular base/subbase course to ensure the placement of the materials to the limits indicated on the Contract Drawings. Materials placed outside of these limits shall be recovered and placed within the specified limits at the Contractor's expense.

If, in the opinion of the Engineer, material placed outside of the specified limits cannot be satisfactorily recovered, the Engineer will estimate the quantity of such material and no payment will be made for this quantity.

- c) Following the completion of the granular base/subbase course, and prior to the application of subsequent material thereon, the Contractor shall utilize an in-place balance grading method to ensure that the granular base/subbase course is placed to the lines, grades and cross-sections indicated on the Contract Drawings. The in-place balance grading method shall include the surveying, staking and setting of grades every 20 m along the roadway.

The Contractor shall blade and shape the granular base/subbase course such that the finished surface

is smooth, uniform, true to grade and cross-section and suitable for the application of subsequent material thereon.

The finished subbase course surface and base course surface shall not deviate more than 30 millimeters from the specified grade and cross section. The tolerance for the cross fall will be +/- 0.3% (upper limit 3.3% & lower limit 2.7%).

- d) The Contractor shall prepare as-built info for every 20 metres along the roadway for the completed subbase and base course and send to the Engineer for verification prior to the application of subsequent material thereon. Production and supply of as built data for subbase and base courses will be incidental to construction of base and subbase courses.

5.2.3.4 Establishing the Control Density

a) General

- i) The control density is the maximum dry density attained on a lift of granular base/subbase course using the equipment and method of compaction prescribed herein for construction of a control strip.
- ii) For establishing the Control Density, a control strip method may be authorized by the Engineer, otherwise the Contractor shall carry out compaction testing using nuclear densometer in accordance with AASHTO T310, with one test performed for every 20 linear meters, for each lift randomly left and right of centerline. The Contractor shall apply compaction effort sufficient to achieve a uniform density not less than 100% of maximum dry density at optimum moisture content to compact the base course and subbase course materials.
- iii) A control strip is a compacted lift of granular base/subbase course constructed on a 400 m section of prepared surface selected by the Engineer.
- iv) The lift thickness of a granular base/subbase course shall be determined by the Contractor but shall not exceed 150 mm. The total design granular base/subbase course thickness may require that more than 1 lift be constructed, in which case each subsequent lift will also require a control strip to determine a control density for that lift.
- v) Aggregate for construction of a control strip shall be spread by means of a motor grader.
- vi) To determine the control density, moisture and density readings shall be taken by the Contractor, using nuclear equipment, during the compaction process until a maximum dry density is reached.
- vii) A new control strip, with its corresponding control density, is required for each lift and for a change in Designation or Class or source of aggregate or when called for by the Engineer.
- viii) The control strip moisture content shall be adjusted as required during spreading of the aggregate. The surface of the granular base/subbase course shall be kept moist until testing is completed.
- ix) Control strips shall not be constructed during freezing ambient temperatures, with frozen aggregate, or on frozen subgrade.

b) Control Strip Minimum Compaction Equipment

The control strip shall be compacted using the following equipment:

- i) Two vibratory steel rollers weighing not less than 10 tonnes and having a vibratory capacity of at least 1,500 vpm with a minimum dynamic or centrifugal force of 8,000 kg, operated in vibratory mode, and at a speed not exceeding 8 km/h; plus one of the following:
 - Six wobbly tired rollers with tires inflated to a pressure of 200 kPa, plus or minus 35 kPa, ballasted with at least a level load of gravel, and towed at speed not exceeding 8 km/h; or
 - Two self-propelled pneumatic rollers, each ballasted to its maximum capacity, weighing not less than 10 tonnes, having a minimum tire pressure of 400 kPa plus or minus 35 kPa, and

traveling at a speed not exceeding 8 km/h; or

- A combination of four wobbly tired rollers and one self-propelled pneumatic roller each of which meets the requirements described above.

c) Control Strip Method of Compaction

- i) A Pass is one complete coverage of the Control strip with at least the minimum compaction equipment specified herein.

As portions of the lift are being spread, the aggregate shall be compacted such that when the entire lift has been spread, a minimum of four complete passes with the specified compaction equipment shall have been made over the Control Strip area.

- ii) Once the aggregate for the Control Strip lift has been completely spread, the measurements for the Control Density shall commence and continue during repeated passes of the specified compaction equipment until a maximum dry density is achieved. This maximum dry density will be the Control Density for subsequent granular base/subbase course construction for the same lift and thickness of the same material. The surface of the granular base/subbase course shall be kept moist until testing is completed.

- iii) If vibratory compaction causes a loss of density during granular base/subbase course construction, vibratory compactors shall operate in the static mode supplemented with the specified pneumatic rollers.

When pneumatic self-propelled or wobbly type rollers are used for compaction the pneumatic self-propelled or wobbly type rollers shall lead the steel vibratory compactor.

5.2.3.5 General Construction of Granular Base and Subbase Course Using the Control Density

- a) Once the Control Density has been established, the Contractor may choose its own combination of compaction equipment.
- b) The granular materials shall be uniformly placed at the same lift thickness as the corresponding Control Strip lift thickness.
- c) Each lift of granular base/subbase course shall be constructed true to grade and cross-section and the finished surface shall be smooth and free of loose material.
- d) Each lift of base course and sub-base course shall be compacted to at least 100% and of the applicable Control Density, at the optimum moisture content established by the Contractor in accordance ASTM D698. The Contractor shall carry out compaction testing using nuclear densometer with one test performed for every 20 linear meters, for each lift randomly left and right of centerline.
- e) Water shall not be added in such quantities that it seeps into the underlying subgrade.
- f) As specified for Control Strip construction, the surface of the granular base/subbase course shall be kept moist until testing is completed.
- g) Materials shall be handled such that segregation of the coarser and finer fractions does not occur and the Contractor shall take all necessary precautions to prevent aggregate segregation. Any segregation shall be corrected by reblending or replacement with new material, at the Contractor's expense.
- h) Granular base/subbase course shall not be spread on frozen subgrade and compaction shall be completed before freezing.
- i) The Contractor shall, at its own expense, repair and/or restore to the specified condition any subgrade or granular material layer which fails, loses specified density or becomes too wet or too dry, or becomes rutted, distorted, loose or rough prior to the placement of subsequent material thereon.

5.2.3.6 Slopes and Ditches

Slopes shall be neatly trimmed and loose or waste material from the sideslopes shall be either neatly bladed against the edge of the granular layer or spread neatly over the sideslope and ditches as directed by the Engineer.

5.2.3.7 Construction Equipment

The completed granular base/subbase course shall be sound and stable and shall not exhibit deflection or consolidation, as determined by the Engineer, under construction equipment loading.

The Contractor shall be responsible for any damage to the existing embankment, design embankment, granular base course or subbase course caused by construction equipment or activities. There will be no compensation for any delays in productivity resulting from such damage or for its repair.

5.2.4 MAINTENANCE OF WORK AND DUST CONTROL

Maintenance and dust control of the entire roadway shall be carried out in accordance with "Execution of Work, Maintenance of Work and Dust Control During Construction" (Division 2, Section 4).

5.2.5 MEASUREMENT

- a) The Contractor shall, at its own expense, provide, install and maintain such approved scales and all suitable facilities as may be required to enable the Engineer to accurately determine the mass of Granular Base Course/Granular Subbase Course loaded in each haul vehicle. Such scales shall be in acceptable condition and will be tested from time to time by the Engineer.
- b) The quantity of Granular Base Course/Granular Subbase Course to be measured for payment will be the number of tonnes or cubic meters of material acceptably placed on the road in accordance with these specifications.
- c) Unless otherwise specified, the haul of granular base course/granular subbase course will not be measured separately for payment and shall be considered incidental to the granular base course/subbase course operation.
- d) Preparation of the roadbed surface, including scarifying and blading, and the maintenance, repair and restoration of haul roads, will not be measured separately for payment and shall be considered incidental to the granular base course/granular subbase course operation.
- e) Water, if required for construction or maintenance of the work, will not be measured separately for payment and shall be considered incidental to the granular base course/granular subbase course operation.

5.2.6 BASIS OF PAYMENT

- a) Payment for Granular Base Course and Granular Subbase Course will be at the Contract unit price per tonne or cubic meter.

The unit price shall be compensation in full for preparation of the roadbed surface, excavating, loading, hauling, dumping, windrowing, spreading, mixing, blading, shaping and compacting the material, construction of Control Strips, the supply and application of water, drying as required, surveying, layout, staking, balance grading, setting grades, referencing, quality control and quality control testing, reporting and certification, upgrading or construction of haul roads, trimming and grading of slopes, ditches and surfaces in the gravel source areas and haul roads, maintenance and dust control of the work and haul roads, traffic control and accommodation and the supply of all equipment, labour, tools and incidentals necessary to complete the work in accordance with the specifications.

Unless otherwise specified, the unit price shall also be compensation in full for the production of crushed aggregate in accordance with "Crushed Aggregate Production" (Division 5, Section 1), for the Designation and Class of materials specified.

- b) Unless otherwise specified, the unit price shall also be compensation in full for the hauling of granular base course/granular subbase course in accordance with "Hauling" (Division 5, Section 3).

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5.3 SECTION 3 – HAULING

5.3.1 DESCRIPTION

This specification applies to the hauling of all granular materials, including blend sand, and the hauling of all mixtures of granular material with asphalt cement as shown on the plans or as designated by the Engineer. This specification covers the following:

- a) The administration of haul roads from both Department Supply Sources and Contractor Supply Sources of granular materials,
- b) Hauling granular materials and mixtures of granular material with asphalt cement Tendered Bid by unit weight or volume, and
- c) Hauling granular materials and mixtures of granular material with asphalt cement bid with haul included in the Contract item for which the granular material has been produced or is required.

5.3.2 DEFINITIONS

For the purpose of this specification, the following definitions will apply:

5.3.2.1 **Hauling**

The process of transporting material from its point of loading to its designated delivery point.

5.3.2.2 **Haul Road**

The route over which materials are hauled for the performance of the Contract and can be either: (a) an approved route from a Department Supply Source, or (b) a Contractor selected route from a Contractor Supply Source.

5.3.2.3 **Dead Haul Road**

The section of the route over which materials are hauled for the performance of the Contract, between the highway or roadway and the loading location.

5.3.2.4 **Loading**

The process of filling a truck at the Department Supply Source or the Contractor Supply Source.

5.3.2.5 **Weighing**

The process of using a calibrated scale to determine the weight of a loaded truck at the Department Supply Source or the Contractor Supply Source prior to traveling on the Haul Road.

5.3.2.6 **Unloading**

The process on emptying the filled truck at the delivery point after it has travelled along the haul road.

5.3.3 MATERIALS

5.3.3.1 **Department Supply Sources**

Unless otherwise specified, material from deposits designated by the Department will be made available to the Contractor for the upgrading or construction of dead haul roads free of cost.

The Contractor shall supply, apply and pay for all water used on haul roads for whatever purpose, including maintenance and dust control.

5.3.3.2 **Contractor Supply Sources**

The Contractor shall supply, apply and pay for all materials required for the upgrading, construction, drainage, maintenance and dust control and restoration of haul roads from Contractor Supply Sources.

5.3.4 CONSTRUCTION**5.3.4.1 General**

Haul vehicles shall comply with all applicable Northwest Territories Acts and Regulations. Haul vehicles shall be registered by the Contractor and bear a project registration number.

Weight certificates will not be issued to overloaded vehicles and there will be no loading tolerance in excess of the allowable GVW limit.

There will be no loading tolerance in excess of the allowable GVW limit for any vehicles or construction equipment which haul over existing or newly constructed granular or asphalt subbase, base or surface courses.

For vehicles hauling on a cubic metre basis, the approved capacity will be the struck measure of the truck box to the nearest zero point one cubic metres (0.1 m³), as calculated by the Engineer.

The Engineer may direct that hauling operations will not be permitted if excessive damage to highways or public roads will occur or when hauling operations cause serious hazards or difficulties to the travelling public. The conditions when this may occur will generally be:

- a) When spring thaw is taking place,
- b) During or after heavy rainfall,
- c) During periods of exceptionally heavy traffic.

The Contractor shall abide by all load restrictions and allowable GVW limits established by the road or bridge authority having jurisdiction.

The Contractor shall repair any damage to public roads caused by its hauling operations.

5.3.4.2 Haul from Department Supply Sources**a) General**

The Department will not consider claims because of conditions imposed by local road authorities.

Approaches required for access to deposits, pits or stockpiles shall be constructed and, if required by the Engineer, removed at no direct expense to the Department.

If clearing is required on specified access or haul road routes, the work shall be carried out in accordance with "Clearing" (Division 3, Section 1) but such activities shall be incidental to hauling and at no cost to the Department.

If grubbing is required on specified access or haul road routes, the work shall be carried out in accordance with "Grubbing" (Division 3, Section 2) but such activities shall be incidental to hauling and at no cost to the Department.

Unless otherwise specified, where the construction of dead haul roads is required, the dead haul road shall be constructed by the Contractor in a manner and at a location as approved by the Engineer, and if required the Contractor may have to remove back access road to original state of ground at no cost to the Department.

b) Maintenance During Haul

Maintenance and dust control of haul roads shall be carried out in accordance with "Execution of Work,

Maintenance of Work and Dust Control During Construction" (Division 2, Section 3).

Existing drainage or drainage constructed during haul road upgrading or construction shall be maintained by the Contractor throughout the hauling operations.

The maintenance and repair of paved haul roads shall be carried out by the Contractor where and as directed by the Engineer, utilizing materials specified by the Engineer.

c) Restoration of Haul Roads

Upon the completion of hauling operations, haul roads shall be restored by the Contractor to a condition equivalent to or exceeding the condition of the road prior to the commencement of hauling operations. Contractor shall take detailed inventory of existing haul road condition survey before commencement of hauling and submit those to the Engineer as record. The Engineer will be the final authority in assessing the restoration required. Hauling shall be considered incidental to Work and will not be measured separately for payment.

5.3.4.3 Haul from Contractor Supply Sources

a) General

The Contractor shall specify in its bid submission the designated supplier of all granular materials and the name and location of its proposed granular material sources and haul routes.

The Contractor shall be responsible for obtaining authority to haul over the proposed haul routes from the agency having jurisdiction. The use of Territorially owned or controlled highways and roads as haul routes is subject to prior approval from the Department.

The Contractor shall upgrade, construct, carry out maintenance and dust control and restore roads used as haul roads to the satisfaction of the agency having jurisdiction, and in the case of Territorially owned or controlled highways and roads, to the satisfaction of the Engineer.

The Contractor shall be responsible for the upgrading, construction and restoration of public and private roads required for its hauling operations. All costs incurred for such work shall be the responsibility of the Contractor.

b) Maintenance During Haul

Where the use of Territorially owned or controlled highways and roads for haul roads has been approved by the Engineer, maintenance and dust control of haul roads shall be carried out in accordance with "Execution of Work, Maintenance of Work and Dust Control During Construction" (Division 2, Section 4).

Where the use of Territorially owned or controlled highways and roads for haul roads has been approved by the Engineer, existing drainage or drainage constructed during haul road upgrading or construction shall be maintained by the Contractor throughout the hauling operations.

Where the use of Territorially owned or controlled highways and roads for haul roads has been approved by the Engineer, the maintenance and repair of paved haul roads shall be carried out by the Contractor where and as directed by the Engineer, utilizing materials approved by the Engineer.

c) Restoration of Haul Roads

Where the use of Territorially owned or controlled highways and roads for haul roads has been

approved by the Engineer, haul roads shall be restored by the Contractor upon the completion of hauling operations to a condition equivalent to or exceeding the condition of the road prior to the commencement of hauling operations. Contractor shall take detailed inventory of existing haul road condition survey before commencement of hauling and submit those to the Engineer as record. The Engineer will be the final authority in assessing the restoration required. Hauling shall be considered incidental to Work and will not be measured separately for payment.

5.3.5 MEASUREMENTS

5.3.5.1 **Haul**

- a) Construction contracts involve hauling of blast rock/pit run and crushed aggregates for construction of embankment, subbase and base courses. Hauling of these materials is included in the payable unit prices of the respective items as per unit price table included in the contract documents. There will be no additional payment for hauling of blast rock/pit run and crushed aggregates.
- b) The Contractor shall, at its own expense, provide, install and maintain such approved scales and all suitable facilities as may be required to enable the Engineer to accurately determine the mass of material loaded in each vehicle. Such scales shall be in acceptable condition and will be tested from time to time by the Engineer.
- c) When a Contract contains Unit Price Table Items for Haul by unit weight or volume, the haul distance will be the measured distance in kilometres and tenths of a kilometre along the designated route, from the junction of the dead haul road to the loading location and the highway or roadway, to the mid-point of the project kilometre or section of a kilometre that the material is acceptably delivered and placed. If a section is shorter than one kilometre, the haul distance will be measured to the mid-point of the section.
If sections within a project kilometre are specified to be constructed at varying application rate ranges, the haul distance will be measured to the mid-point of such sections within the kilometre.
If a dead haul road splits a project kilometre into two sections, the haul distance will be measured to the mid-point of each section within the kilometre.
No payment will be made for the haul distance along the dead haul road from the loading location to the highway or roadway.
- d) The quantity of Haul to be measured for payment will be calculated by multiplying the weight or volume of the material hauled, delivered and place, by the haul distance to the mid-point of each project kilometre or section of a kilometre that the material is acceptably delivered and placed.
- e) When a Contract contains Unit Price Table Items in which Haul is included in the Contract item for which the material has been produced or is required, the haul distance will be measured by the Department for record purposes only.
- f) No payment will be made for hauling to or from stockpiles where the source and the stockpiles are located within the boundary of the site where the granular material is being processed.

5.3.5.2 **Haul Roads**

- a) General
 - i) The repair of any damage to public roads caused by the Contractor's hauling operations will not be measured separately for payment and shall be considered incidental to the Hauling operation.
 - ii) The upgrading and restoration of haul roads will not be measured separately for payment and shall be considered incidental to the Hauling operation.
 - iii) The construction and removal of approaches required for access to deposits, pits or stockpiles will not be measured separately for payment and shall be considered incidental to the Hauling

operation.

- iv) Maintenance and dust control of haul roads will not be measured separately for payment and shall be considered incidental to the Hauling operation.
- v) Maintenance of existing drainage or drainage constructed during haul road upgrading, construction or restoration will not be measured separately for payment and shall be considered incidental to the Hauling operation.
- vi) Unless otherwise specified, the maintenance and repair of paved haul roads will not be measured separately for payment and shall be considered incidental to the Hauling operation.

b) Department Supply Sources

- i) Unless otherwise specified, the clearing, grubbing and construction of dead haul roads will not be measured separately for payment and shall be considered incidental to the Hauling operation.
- ii) Unless otherwise specified, the removal or installation of culverts required for the upgrading, construction and restoration of haul roads will not be measured separately for payment and shall be considered incidental to the Hauling operation.

c) Contractor Supply Sources

- i) The Contractor shall be responsible for all costs for the upgrading, construction, drainage, maintenance and dust control and restoration of all haul roads used from Contractor Supply Sources.
- ii) The Contractor shall carry out maintenance and dust control and restore roads used as haul roads to the satisfaction of the agency having jurisdiction, and in the case of Territorially owned or controlled roads, to the satisfaction of the Engineer, who will be the final authority.

5.3.6 BASIS OF PAYMENT

- a) Payment for Haul will be at the Contract unit price per tonne-kilometre or cubic metre-kilometre. The unit price shall be compensation in full for all work and requirements described in this specification.
- b) Haul will not be paid for separately when the Contract unit price for the item to be hauled includes compensation in full for hauling.

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5.4 SECTION 4 – SUBGRADE PREPARATION**5.4.1 DESCRIPTION**

This work consists of scarifying, blading and preparing the existing road surface to the lines, grades and cross-section as designated by the Engineer.

5.4.2 MATERIALS

Not applicable.

5.4.3 CONSTRUCTION

- a) The existing road surface shall be scarified to a depth of 150 millimeters, unless otherwise specified.
- b) The loosened material shall be windrowed to the side and the exposed surface shall be thoroughly compacted. The windrowed material shall then be mixed and spread uniformly by motor graders or other equipment approved by the Engineer. The material shall be handled such that segregation does not occur and the Contractor shall take all necessary precautions to prevent segregation.
- c) Unless specified otherwise, the Contractor shall compact the material to 100% of the maximum dry density at the optimum moisture content in accordance with the latest edition of ASTM D698. The moisture content shall be adjusted as necessary, by aerating or the addition of water, such that the optimum moisture content designated by the Engineer is uniformly attained throughout. Water shall not be added in such quantities that it seeps into underlying gravel layers or subgrade.
- d) Compaction shall be carried out by the use of tamping rollers or other equipment approved by the Engineer to be of adequate type and capacity to effectively obtain the specified density requirement.
- e) The road surface shall be prepared true to grade and cross-section at the specified density and moisture content. Road surface that does not conform to the requirements as to grade, cross-section or density shall be re-worked until such requirements are met. The finished surface shall be firm and uniform and free of loose material, ruts, waves and undulations.
- f) The Contractor shall maintain the road surface to this standard until the placement of subsequent material thereon or until accepted by the Engineer.
- g) Where required, the road surface shall be prepared to a depth exceeding 150 millimetres on sections of the roadway designated by the Engineer. When such work has been ordered, it shall be carried out in layers not exceeding 150 millimetres in depth. Preparation and compaction shall be carried out as specified herein.
- h) Material encountered in the top 300 mm of the road surface having a dimension exceeding 150 mm in any one direction shall be removed and disposed of at locations approved by the Engineer.

5.4.4 MEASUREMENT

The quantity of Subgrade Preparation to be measured for payment shall be the number of square metres per layer, or linear kilometers measured along centerline of the roadway, of existing road surface acceptably prepared in accordance with these specifications. Measurement for Subgrade Preparation will be made prior to the placement of any materials in these areas.

5.4.5 BASIS OF PAYMENT

Payment for Subgrade Preparation will be at the Contract unit price per square metre or linear kilometers measured along centerline of the roadway measured as provided above.

Separate payment will not be made for leveling, removing ruts or blading the subgrade surface required between the time of preparation and the placement of subsequent material thereon.

The unit price will be compensation in full for scarifying, windrowing, mixing, watering, blading, spreading,

shaping, compacting, trimming, disposal of any surplus material and the supply of all equipment, labour, tools and incidentals necessary to complete the work in accordance with the specifications.