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EARTHWORK (GENERAL)

3-1-A-1 Description

This work shall consist of clearing and grubbing, stripping, removal of unsuitable soil, excavation, fill and backfill, and other specified works related to the earthwork.

3-1-A-2 General Requirements

Prior to any excavation in the streets, a license request together with all detailed drawings showing the locations of the excavations and a written commitment to restore the street to its initial condition shall be submitted to the Engineer.

Excavation in streets and roads shall not commence without written approval from the Engineer.

Before the commencement of any earthworks or demolition the sites shall be surveyed as necessary in conjunction with the Engineer's representative to establish existing ground levels.

The Contractor shall not start any earthwork before getting the Engineer's approval on the cross sections.

The Contractor shall correct all disapproved cross sections and resubmit them for approval.

The Contractor shall excavate, refill and restore in advance of his program such trial holes as he may require for determining the nature of the subsoil and the location of existing underground services and obstructions.

The Contractor shall ensure that there are no pipes, cables, mains or other services or property which may be disturbed or damaged by its use. He will take all precautions not to damage these services and restore these services if damaged on his own expense.

3-1-A-2-1 Clearing & Grubbing

3-1-A-2-1-1 Description

This work shall consist of clearing, grubbing, removing and disposing of all vegetation and debris within the limits specified. This work shall also include the preservation from injury or defacement of all vegetation and objects designated to remain.

3-1-A-2-1-2 General Requirements

The areas to be cleared and grubbed shall be as shown on the Plans, as designated in the Specifications or as directed by the Engineer. The Engineer will designate all trees, shrubs, plants and other things to remain. The Contractor shall preserve all things designated to remain.

Before carrying out work, the Site shall be inspected by the Contractor in conjunction with the Engineer to establish its general condition which shall be agreed and recorded in writing, and where in the opinion of the Engineer it is deemed necessary, by means of photography.

Details recorded shall include the location of all boundary and survey beacons, the condition of buildings, surfaces terracing (if any), ditches, watercourses roads, tracks, fences, and other information relating to the Site and elsewhere which may be affected by the works.

In the case of wayleaves for pipelines, the boundaries of the wayleave will be defined by the Employer and the Contractor shall provide, erect, and maintain in position from commencement to final completion of the Works, in every section substantial timber stakes or similar approved markers not less than 1.5m high indicating the position of the boundary at 50m or other such intervals as the Engineer may direct. In the event of any boundary or survey mark established for the purpose of land title being disturbed or displaced, the Contractor shall forthwith replace the beacon. Where necessary the Contractor shall employ the services of an approved licensed surveyor for the purpose of setting out boundaries.

Before beginning clearance in any area the Contractor shall give seven days written notice of his intention to the Engineer who will determine the extent and limits of such clearance.

All surface objects and all trees, stumps, roots, sod and vegetable matter, other protruding obstructions, not designated to remain shall be cleared and grubbed.

Within the limits of clearing and grubbing, all stumps, roots 4 cm in diameter or larger, buried logs, and all other objectionable material shall be removed 90 cm below the existing ground surface or subgrade, whichever is deeper.

Except in areas to be excavated, stump holes and other holes from which obstructions are removed shall be backfilled with suitable material and compacted to 90% of Maximum Dry Density.

Topsoil shall mean the surface layer of soil which by its humus content supports vegetation and is unsuitable, as a formation to roads and concrete structures or as a backfill or bedding material. The extent and depth of topsoil that needs removal shall be agreed with the Engineer.

Topsoil shall be set aside for re-use or disposal off site as directed by the Engineer.

Trees to be removed shall be uprooted or cut down as near to the ground level as possible.

Bushes, undergrowth, small trees, stumps and tree roots shall, where directed by the Engineer, be grubbed out. All holes left by the stumps or roots shall be backfilled with suitable material in a manner approved by the Engineer.

Materials arising out of site clearance shall be disposed by the Contractor off the Site, or where approved by the Engineer on the Site in a manner and place approved by the Engineer.

The Engineer may require that individual trees, shrubs and hedges are preserved and the Contractor shall take all necessary precautions to prevent their damage.

In the case of wayleaves for pipelines and the like, the Contractor shall preserve as far as practicable all grass and other vegetation outside the limits of trenches and permanent works and shall not unnecessarily destroy crops or any vegetation whose removal would not be essential to his operations.

The Contractor shall take care at all times to prevent erosion on every site and elsewhere on land which may be affected by his operations and the Engineer may impose such reasonable limitations and restrictions upon the method of clearance and upon the timing and season of the year when clearance is carried out as the circumstances warrant.

3-6-A AGGREGATES

3-6-A-1 Sources of Materials

All aggregates for use in the construction of the base course shall be obtained only from sources approved by the Engineer. The quarry pits or quarry extracted gravel shall be in all cases approved by the Engineer.

The Contractor shall determine the location, suitability and quantity of material available as well as the cost and the amount of work required to obtain the material available.

The Contractor shall provide the Engineer prior to the schedule beginning operations with a complete statement of the origin and composition of all stone and/or gravel aggregates to be used in the work. All materials shall comply with the specified requirements for the various aggregates.

The locating and the manufacture of aggregates which will meet the requirements of the specifications are the sole responsibility of the Contractor.

The approval of the Engineer shall in no way relieve the Contractor of the responsibility of producing aggregates which meet the specifications.

No aggregate producing equipment shall be put into operation prior to the approval of the equipment by the Engineer. If after the equipment is put into operation it fails to perform as proposed, the Contractor shall provide additional approved equipment or replace the original equipment with more suitable equipment, as may be directed by the Engineer.

3-6-A-2 Testing

In order to ascertain the properties of all aggregate materials, the Contractor shall submit, for approval by the Engineer, test certificates from an approved testing laboratory for all materials intended for incorporation in the work prior to starting quarry or pit operations.

Representative samples for such testing shall be taken by the Contractor, at his expense, in the presence of the Engineer, and duplicate samples shall be submitted to the Engineer for future reference.

The Contractor may, if approved by the Engineer, conduct the necessary tests in the laboratory. The tests shall be conducted in the presence of the Engineer. The resume of the qualifications must be submitted to and approved by the Engineer prior to any testing operations.

This testing, whether performed at an approved testing laboratory or in the project laboratory, shall be solely the Contractor's responsibility and will be at the Contractor's expense.

3-6-A-3 Approval and Inspection

All sources of materials shall be approved by the Engineer prior to procuring or processing material from such sources. Test certificates obtained by the Contractor or performed by the Contractor at his expense are intended to assist the Contractor in his estimate of the location, extent, and quantities which will comply with the specifications when properly processed, and will no way obviate the need for further testing by the Engineer. Only materials from approved sources shall be processed for incorporation into the work. Approval of specific sources of materials shall not be construed as final approval and acceptance of materials from such sources.

All processed materials shall be tested and approved before being stored on the site or incorporated in the work and may be inspected and tested at any time during the progress of their preparation and use. Questionable materials shall not be unloaded and incorporated with materials previously approved and accepted. If however, the grading and quality of the material delivered

to the site do not conform to the grading and quality as previously inspected and tested, or do not comply with the specifications, the Engineer reserves the right to reject such materials at the site of the work. Only materials conforming to the requirements of the specifications shall be used in the work.

Samples must meet all test requirements. The Contractor shall permit the Engineer to inspect any and all material used or to be used at any time during or after its preparation, or while being used during the process of the work or after the work has been completed. All such materials not complying with the required specifications, whether in place or not, shall be rejected and shall be removed promptly from the work. The Contractor shall supply, or arrange with any producer or manufacturer to supply, all necessary materials, labor, tools and equipment for such inspection.

3-6-A-4 Storage

Materials shall be stored so as to insure preservation of their specified quality and fitness for the work. They shall be placed on hard, clean surfaces and, when required by the Engineer, they shall be placed under cover. Stored materials shall be located as to facilitate prompt inspection and control. Private property shall not be used for storage purposes without written consent of the owner or lessee and payment to him, if necessary.

The center of the storage area shall be elevated and sloped to the sides so as to provide proper drainage of excess moisture. The material shall be stored in such a way to prevent segregation and coning to insure proper control of gradations and moisture. Course aggregate storage piles shall be built-up in layers not exceeding one (1) meter. The height of a stockpile shall be limited to a maximum of five (5) meters.

The equipment and methods used for stockpiling aggregates and for removing aggregates from the stockpiles must be approved by the Engineer and shall be such that no detrimental degradation of the aggregate will result and no appreciable amount of foreign material will be incorporated into the aggregate.

3-6-B AGGREGATE BASE COURSE

3-6-B-1 Description

This work shall consist of furnishing and placing well graded aggregate aggregate base course in successive layers of 15 cm, including additives if required, on a prepared surface in accordance with the specifications, and in conformity with the lines, grades, thicknesses and typical cross sections given in the drawings or as required by the Engineer.

3-6-B-2 Materials

Materials shall conform to the requirements for the class of "Aggregate Base Course", specified on the plans or directed by the Engineer. All aggregates for base course shall consist of clean, tough, durable, sharp angle fragments free of any excess of thin or elongated pieces, and reasonably free of soft, disintegrated or decomposed stone, dirt or other deleterious matter.

3-6-B-2-1 Physical Requirements

All base course aggregate shall conform to the following physical requirements:

Loss of Sodium Sulfate Soundness

Test

10 percent maximum

Loss of Magnesium Sulfate Soundness

Test	12 percent maximum
Loss by Abrasion Test	35 percent maximum
Thin and Elongated Pieces, by	
Weight (larger than 1-inch, thickness less than 1/5 length)	5 percent
Friable Particles	0.25 percent maximum

3-6-B-2-2 Aggregate Base Course - Class A

Material for class A shall consist of crushed gravel or stone fragments conforming to the following requirements:

<u>AASHTO SIEVE</u>	<u>PERCENT PASSING</u>
2 inch	100
1-½ inch	90 - 100
¾ inch	50 - 80
No. 4	25 - 45
No. 40	10 - 20
No. 200	2 - 7

- Sand equivalent: 40% minimum (Aggregates passing through AASHTO SIEVE no: 4)
- Regular graded aggregate curve
- Loss of abrasion test: 40 % maximum

3-6-B-2-3 Aggregate Base Course - Class B

(a) Materials for Class B shall be crushed rock or crushed gravel conforming to the following grading requirements:

<u>AASHTO SIEVE</u>	<u>PERCENT PASSING</u>
2-½ inch	100
2 inch	90 - 100
1-½ inch	35 - 70
1 inch	0 - 15
½ inch	0 - 5

(b) Fine materials for Class B base course shall be quarry screenings or natural material and of suitable binding quality as approved by the Engineer. The material shall be free from foreign or organic matter, dirt, shale, clay and clay lumps, or other deleterious matter and shall conform to the following requirements :

<u>AASHTO SIEVE</u>	<u>PERCENT PASSING</u>
3/8 inch	100
No. 4	85 - 100

No. 100	10 - 30
Plasticity Index (AASHTO T 90)	6 maximum
Sand Equivalent (AASHTO T 176)	30 minimum

- (c) The combined material shall consist of a mixture of all aggregates uniformly graded from course to fine to conform to the following gradation requirements:

<u>AASHTO SIEVE</u>	<u>PERCENT PASSING</u>
2-½ inch	100
2 inch	90 - 100
1-½ inch	60 - 90
1 inch	42 - 77
¾ inch	35 - 70
½ inch	25 - 60
No. 4	15 - 40
No. 10	10 - 26
No. 40	5 - 15
No. 200	2 - 9

3-6-B-2-4 Aggregate Base Course - Class C

Material for Class C base course shall consist of uniform mixture of crushed rock and/or gravel with sand, silt and clay, conforming to the following requirements

<u>AASHTO SIEVE</u>	<u>PERCENT PASSING</u>
1-½ inch	100
1 inch	60 - 100
¾ inch	55 - 85
No. 4	35 - 60
No. 10	25 - 50
No. 40	15 - 30
No. 200	8 - 15

The grading is based on aggregates of uniform specific gravity, and the percentage passing the various sieves are subject to correction by the Engineer, when aggregates of varying specific gravities are used.

Liquid Limit (AASHTO T 89)	25 maximum
Plasticity Index (AASHTO T 90)	4-8 maximum
Sand Equivalent (AASHTO T 176)	50 minimum

3-6-B-2-5 Aggregate Base Course Class D

- Density >2.45 kg/dm³
- Resistance of compression = 500 kg/cm² on a test cube 7cm x 7cm x 7cm
- Sand equivalent: 40 min (Aggregates passing through AASHTO SIEVE No. 4)

<u>AASHTO SIEVE</u>	<u>PERCENT PASSING</u>
2 inch	100
1 inch	40 - 95
1/2 inch	40 - 75
No. 4	30 - 60
No. 10	20 - 60
No. 40	15 - 30
No. 200	5 - 20

3-6-B-2-6 Acceptance

The aggregate will be accepted immediately following mixing, based on periodic samples taken. When the aggregate is a total aggregate, it may be accepted at the crusher. Acceptance of the material by the Engineer does not constitute acceptance of the base course, only that the material is approved for use in the base course.

3-6-B-3 Construction Requirements

3-6-B-3-1 Subgrade Preparation

The subgrade shall be well compacted, smooth, hard and uniform, all irregularities having been bladed out and rolled down for construction.

At all special grade control points, the subgrade shall be leveled to such depth that the proper thickness of base course may be constructed flush with the existing surface. The transition from normal to special section shall be of sufficient length to present no abrupt or noticeable change of grade and shall be excavated in accordance with the grades and lines shown on the plans or directed by the Engineer.

3-6-B-3-2 Maintenance of Subgrade

The roadbed being prepared shall be maintained true to cross section and grade until the base course is completed.

3-6-B-3-3 Method of Construction

3-6-B-3-3-1 Combining Aggregates and Water

Aggregates for base course shall be combined into a uniform mixture and water added either in a central mixing plant or by watering in a manner approved by the Engineer, before final placement of the material. When binder is to be added, if approved by the Engineer, it may be combined with the aggregate base by thoroughly mixing separate quantities of binder and aggregate base or

it may be combined in the central mixing plant. Adding binder by spreading it will not be permitted.

The moisture added to the aggregates shall be that required, as designated by the Engineer, to obtain the specified density thereby preparing an aggregate completely ready for compaction after spreading on the subgrade. In no case will the wetting of aggregates in stockpiles or trucks be permitted.

3-6-B-3-3-2 Spreading and Combining Aggregates

Unless otherwise specified, aggregate for base courses shall be delivered to the roadbed as a uniform mixture and shall be placed on the site prepared subgrade, in a uniform layer. Spreading shall be done by means of approved self-propelled stone spreaders, distributing the material to the required width and loose thickness.

The material shall be so handled, as to avoid segregation. If an aggregate spreader causes segregation in the material, or leaves ridges or other objectionable marks on the surface which cannot be eliminated easily or prevented by adjustment of the spreader operation, the use of such spreader shall be discontinued and replaced. All segregated material shall be removed and replaced with well-graded material. No "skin" patching shall be permitted.

3-6-B-3-3-3 Compaction

Immediately after placing, the base course material shall be compacted as required by AASHTO or equivalent.

The surface of the finished base course will be tested with a three (3) meter straightedge at selected locations. The variation of the surface from the testing straightedge between any two (2) contacts with the surface shall at no point exceed ten (10) millimeters, unless otherwise specified, when placed on or parallel to the centerline or when placed perpendicular to the centerline.

3-6-B-3-3-4 Maintenance

Following the construction of the aggregate base course, the compacted course shall be maintained by the Contractor at his expense. The Contractor shall, broom and maintain the base, keeping it free from raveling and other defects until such time as the bituminous prime or other surface is applied.
