ITEM 610.15XX0108 – SOIL CULTIVATION – ROTOTILLING
ITEM 610.15XX0208 – SOIL CULTIVATION – SUBSOILING

DESCRIPTION
This work shall consist of soil cultivation at the location(s) and to the depths indicated in the contract documents and as directed by the Engineer.

MATERIALS
Subsoiling:
Cultivating equipment specifically designed for the purpose of subsoiling to the depths specified. The equipment shall effectively fracture (vertically and laterally) the physically compressed soil material.

When shanks are used, vertical shank spacing shall not exceed seven hundred and sixty millimeters (760mm). A minimum of three (3) shanks shall be used.

Rototilling:
Cultivating equipment specifically designed for the purpose of rototilling soils to the depths specified shall be used. All equipment shall be approved prior to use.

CONSTRUCTION DETAILS
General:
The work area shall be clearly marked or staked by the Contractor prior to the start of work.

The Contractor shall verify the location of all utilities in the area of work and shall notify the Engineer prior to the start of work if any underground utilities are found that would preclude the work as specified.

Soil cultivation shall not occur:

- (for subsoiling)--over utilities or, (for rototilling) over utilities that are within seven hundred and sixty millimeters (760 mm) of the ground surface,
- within the dripline of any trees to be preserved, and
- when the soil is below the optimum moisture content. The following test method is recommended for use (unless an alternative method is approved) to determine whether or not the moisture level of the soil is low enough for cultivation.
  - The Contractor shall collect soil sample(s) from a minimum depth of one hundred millimeters (100 mm) below the soil surface in the area that is to be cultivated. One (1) sample for each 8 square meters (8.0sqm) cultivated, or a minimum of three (3) samples.
  - The samples shall be hand-rolled between the palms down to a three millimeter (3.0 mm) diameter thread. If the respective soil sample crumbles apart in segments no greater than nine millimeters (9.0 mm) long by the time it is rolled down to a three millimeter (3.0 mm) diameter, it is low enough in moisture for cultivation to occur.

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The Contractor shall demonstrate to the Engineer that the soil in areas to be cultivated passes the test method(s) chosen (above method or approved alternative). Soil moisture level test sites shall be dispersed randomly throughout the cultivated area. Acceptance will be achieved when a least eighty percent (80%) of the test sites, or a minimum of three (3) test sites, meet the acceptance criteria.

Prior to the start of work, all above ground, existing herbaceous and woody vegetation may require removal. The removal of existing vegetation will be paid for under a separate pay item. Refer to the contract documents to determine if additional pay items have been included in the contract at the locations indicated for cultivation.

The work area(s) shall first be cultivated (first pass) perpendicular to the predominant slope of the area and to the depths indicated in the contract documents. If required, a second pass shall be completed that is perpendicular to the first pass. No more than two (2) passes shall be permitted, unless otherwise specified.

After the area has been completely cultivated, the soil shall be raked to remove loose clumps of sod, roots, plant parts, stones larger than one hundred millimeters (100 mm) in diameter and other debris. This debris shall be removed from the site and legally disposed of, unless otherwise specified. The costs for debris removal and disposal shall be included in this pay item.

Cultivated areas shall be maintained as such for subsequent operations, including, but not limited to, the application of topsoil and the preparation of subsoil for seeding.

Rototilling: Refer to the contract documents to determine if ***granular*** soil amendment pay items are to be used in the rototilled area. If so, these products should be broadcast after the first rototill pass, but before a second rototill pass (if required). Soil amendments shall be paid for under a separate pay item.

Subsoiling: The subsoiling equipment shall be operated at the optimal speed (typically no more than eight kilometers per hour (8.0km/h)) to achieve the desired results.

The distance between parallel passes shall not exceed the distance between the individual shanks.

Basis of Acceptance (both Rototilling and Subsoiling): Cultivated areas shall be accepted when the work area(s) is (are) sufficiently loosened to allow a nine millimeter (9.0 mm) diameter steel soil probe to be inserted into the ground, by body weight only, to a depth equal to eighty percent (80%) of the depth specified by the pay item. Body weight shall not exceed eighty two kilograms (82 kg).

The Contractor shall verify that the cultivated area achieves the acceptance criteria **uniformly**. The number of total tests shall be one (1) per eight square meters (8.0sqm) of cultivated area, with no fewer than three (3) test sites. Soil compaction test sites shall be dispersed randomly throughout the cultivated area. Acceptance will be achieved when a least eighty percent (80%) of the test sites, or a minimum of three (3) test sites, meet the acceptance criteria.

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METHOD OF MEASUREMENT

The work will be measured as the number of square meters, to the nearest square meter of area satisfactorily cultivated.

BASIS OF PAYMENT

The unit price bid per square meter shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work. The removal of existing vegetation and/or topsoil, if required, shall be paid for under separate item numbers.

Pay Item	Description	Pay Unit
610.15XX0108	Rototilling	SQM
610.15XX0208	Subsoiling	SQM

Where XX is the depth of cultivation in centimeters.