BIO-AQUIFER STORM SYSTEM

Specifications for Construction

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Providing labor, materials, tools and equipment to furnish and install a permeable concrete paving stone system as indicated on the plans and as specified herein.

1.02 RELATED SECTIONS

Section ____ -- Earthwork and subgrade preparation

Section ____ -- Concrete curbs

1.03 APPLICABLE STANDARDS AND SPECIFICATIONS

A. American Society for Testing and Materials (ASTM)

1.04 DEFINITIONS

A. *Base Course*: Layer of open-graded, crushed and washed aggregate beneath the bedding course layer, comprised of small- to medium-particle-sized stone (typically 1/2" to 1"). Recommended depth of the sub-base layer shall be 2"-3", but shall not exceed 4".

B. *Bedding Course*: Layer of open-graded, crushed and washed aggregate directly beneath the unit pavers, comprised of small particle-sized stone chips (typically ¼" to 3/8" rock). Also commonly called the "setting bed." Recommended depth of the bedding course layer shall be 1"- 2" not to exceed 2".

C. *Bundle*: Several layers of paver clusters stacked vertically, banded, and tagged for shipment. Also commonly called a "cube."

D. *Chamfer*: A 45-degree beveled edge around the top of a paver unit, usually 1/8" or less. It facilitates snow removal, helps prevent edge chipping, and delineates the paving's individual units.

E. *Cluster*: The group of pavers forming a single layer from a bundle of pavers or the group of pavers held by the clamp of a paver laying machine.

F. *Flats*: The portion of the side faces of a paver other than the spacer bars.

G. *Joint Filler*: washed angular chips 1/8”-1/4” or materials complying with ASTM #8, #89 or #9 crushed stone, could be granite or limestone.

H. *Laying Face*: The working edge of the pavement where the laying of pavers is occurring.

I. *Mechanical Installation*: The use of specialized machines to lift clusters of pavers from the bundles and place them on the prepared bedding course. These specialized machines are designed specifically for this application.

J. *Method Statement*: The paver installer’s and manufacturer’s plan for construction and quality control of the pavers. Contractor must have installed a job of equal size with mechanical installer to qualify for project.

K. *Spacer Bars*: Small protrusions on each side of pavers which are used to keep them uniformly spaced while minimizing chipping and spalling. Mechanically installed pavers must have spacer bars.

L. *Sub-base Course*: Layer of open-graded crushed aggregate beneath the base course layer, comprised of large particle-sized stone (typically 2-1/2” to 3” fractured rock). Depth shall vary depending upon site conditions and specific requirements. Minimum depth of the sub-base course shall be twelve inches (12”).

M. *Sub-g*rade – native soils at an excavated depth where underdrain will be placed, if required, or aggregate layers will be placed on this surface.

N. *Void Filler*: Open-graded aggregate used to fill the openings in the paver units. The bedding course aggregate may be used as the void filler. Smaller particle-sized crushed stone chips (1/8” to ¼”), joint filler, are preferable, if available.

O. *Wearing Course*: The top surface of the paver surrounded by a chamfer.

1.05 SUBMITTALS

A. Submit the following in accordance with Division 1.

1. The dimensions of the manufacturer’s proposed mold assembly including pattern, dimensions of all cavities including radii, spacer bars and the top portion of the mold known as the head or shoe.

2. The Method Statement.

3. The Quality Control Plan.

4. Material samples of pavers, void filler and joint filler aggregate, bedding course aggregate, base and sub-base course aggregate, including a current sieve analysis of each showing conformance to the specifications.

5. A detailed description of the manufacturer's quality control procedures.

6. Examples of the manufacturer's record-keeping forms.

7. Examples of the installer's record-keeping forms.

1.06 QUALITY ASSURANCE

A. Quality Control Plan

The installer and manufacturer shall establish, provide and maintain a quality control plan. The quality control plan shall provide reasonable assurance that the materials and completed construction submitted for acceptance will conform to the contract requirements. Although guidelines are established and certain requirements are specified, they are minimal, and the installer and manufacturer shall assume full responsibility for meeting all requirements.

The installer and manufacturer shall agree upon a method for measuring the clusters at the factory and in the field. That method shall be submitted in writing to the owner for approval.

The Quality Control Plan shall contain at a minimum, but not limited to, the following elements:

1. The manufacturer's quality control procedures.

2. The manufacturer's production records showing at a minimum the date of manufacture, a mix design designation, mold number, mold cycles, and sequential pallet numbers. Copies of such records shall be made available to the owner upon request.

3. A description of the anticipated growth in the cluster size and a plan for managing the growth so as to not interfere with placement by paving machine(s), if mechanically installed.

4. The installer's quality control procedures, including but not limited to, dimensional control methods, paving machine(s) head adjustment,

typical daily work schedule to insure that all pavers placed on the bedding course on any given day are adjusted as required, cut and compacted, and installation of void filler completed at the end of that work day.

5. Provision for identifying and recording actual daily production and the bundle numbers of pavers used in each day's installation.

B. Sampling and Testing

The manufacturer shall employ an independent testing company, qualified to undertake tests in accordance with the applicable standards specified herein. Test results shall be provided to the installer and the owner, upon request.

Pavers shall be checked for density and dimensional variation, compressive strength (ASTM C140), density and absorption (ASTM C140) and abrasion resistance (ASTM C418).

1. The initial testing frequency shall be one set of tests for each 100,000 full-sized pavers delivered to the site or at any time a change in the manufacturing process, mix design, cement, aggregate or other material occurs.

2. The following number of full-sized pavers shall be randomly sampled for each test: five (5) for dimensional variation; three (3) for density and absorption; three (3) for compressive strength; and three (3) for abrasion resistance.

3. If all pavers tested pass all requirements for a sequence of 400,000 pavers, and then the testing frequency may be relaxed to one set of tests for each 200,000 full-sized pavers. If any pavers fail any of the required tests, then the testing frequency shall revert to the initial testing frequency.

4. When any of the individual test results fail to meet the specified requirements, the cluster of pavers represented by that test sample shall be rejected. The manufacturer shall provide additional testing from both before and after the rejected test sample to determine the sequence of the paver production run that should be considered unacceptable.

5. Additional testing, as described above, shall be carried out at no additional expense to the owner. The sequence of pavers found to be defective shall, if they have been delivered to the site, be removed from the site promptly at no expense to the owner or installer.

6. Pavers shall be sound and free from defects that would interfere with the proper placing of the pavers or impair the strength or performance of the construction.

C. Method Statement

The installer and manufacturer shall prepare a Method Statement describing the overall plan to complete the work. This plan shall include at a minimum:

1. The quality control plan.

2. A description of the anticipated mold life, rate and effect of mold wear on pavers produced, individual mold runs, and a mold rotation plan.

3. Clear diagrams showing the proposed starting point of the installation, the proposed direction of installation, progress on a week-by-week basis, and the dimensional controls to be used to maintain specified joint width and straight joint lines.

4. A method of measuring the clusters at the factory and in the field.

5. A description of the anticipated growth in cluster size due to mold wear and a plan for dealing with that growth or other dimensional variances.

6. A description and the personnel and equipment to be employed for each portion of the work including manufacture, installation and quality control.

7. The manufacturer's proposed production rate and mold life for this project and supply data demonstrating experience on similar past projects. Installer shall state the proposed installation rate.

8. The installer's intention to machine-lay or hand-lay the pavers and provide qualifying experience to date for the appropriate method of proposed installation.

D. Qualifications

Every manufacturer and installer shall demonstrate that they have supplied and/or installed ecological permeable pavers for projects of a similar nature and size. The installer shall complete and submit the Paver Installation History Form with their sealed bid, without exception. No bid shall be considered where the installer does not meet the minimum experience requirements, as determined by the accuracy of the information provided in the Paver Installation History Form.

Paver Manufacturer's Qualifications

1. The manufacturer shall demonstrate a minimum of 5 years successful experience in the manufacture of interlocking concrete block pavers.

2. The manufacturer shall have sufficient production capacity and established quality control procedures to produce, transport, and deliver the required number of pavers with the quality specified, without causing a delay to the work.

3. The manufacturer shall have suitably experienced personnel and a management capability sufficient to produce the number of quality pavers as depicted on the contract drawings and as specified herein.

Paver Installer's Qualifications

1. Paver installers shall be required to provide their installation history, including references in writing with contact information for a minimum of 100,000 sf in total of ecological permeable pavers installed.

2. The installer shall have suitably experienced personnel and a management capability sufficient to execute the work shown on the contract drawings and specified herein.

3. The installer's foreman shall demonstrate, including references, a minimum of 5 years experience in the installation of unit paver systems similar in size and nature to this project.

4. Contractor must demonstrate in writing if the mechanical installation utilized (as referenced in past projects) is similar in scope to the work being bid.

1.07 DELIVERY, STORAGE AND HANDLING

1. Concrete paving stones shall be delivered to the site, in a banded condition, with or without pallets, in such a way that no damage occurs to the product during hauling and unloading.

2. All pavers shall be delivered to the site in approximately the chronological order in which they were manufactured. They shall be staged on site, as per the method statement.

3. Each bundle of pavers shall be marked with a weather-proof tag identifying at a minimum the manufacturer, the date of manufacture, the mold number, the project name and phase for which the pavers were manufactured and the sequential bundle number.

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