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Republic of the Philippines DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

CENTRAL OFFICE

Manila

MAR 0 4 2019 DEPARTMENT ORDER No. Series of 2019 03. N. 19

SUBJECT: Specification on the Use of Conditional Item 206 (3) – Perma-Zyme as Soil Stabilizer

In line with the continuing efforts to upgrade the construction technology thru adoption of successful research studies, this Department has approved the use of **Conditional Item 206 (3)** – **Perma-Zyme as Soil Stabilizer** subject to the specifications hereto attached. A Certificate of Conditional Approval has been issued by this Department accrediting its use in DPWH road projects from December 6, 2018 until December 5, 2023.

This Order takes effect immediately.

MARK A. VILLAR

Secretary

14.1.2 FET/RPF

Department of Public Works and Highways Office of the Secretary

WIN9U01712

Specification on the Use of Conditional Item 206 (3) – PERMA-ZYME AS SOIL STABILIZER

206(3).1 Description

This Item shall consist of application of Perma-Zyme (enzyme-based soil additive) to improve the strength and other properties of ordinary soil for use as road base/sub-base/subgrade in accordance with this Specification and in conformity with the requirements shown on the Plans.

206(3).2 Material Requirements

206(3).2.1 Perma-Zyme Soil Stabilizer

It shall be an enzyme-based chemical soil additive that is non-hazardous. Toxicology reports are required from both of the following certified laboratories:

- a. An environmental impact analysis from a laboratory certified and licensed by a government environmental protection agency.
- b. A toxicology analysis from a laboratory certified and licensed by a government environmental protection agency; a government agriculture department; and a government food & drug administration department.

206(3).2.2 Soil Aggregate

It shall consist of any combination of gravel, sand, silt and clay or other approved combination of materials free from vegetable or other objectionable matter. It may be materials encountered in the construction site or materials obtained from approved sources. It is the intent of this Specification to utilize soils existing on the roadbed if the quality is satisfactory. If the quantity is deficient, the soil aggregate shall be obtained wholly or partly from approved outside sources.

The ideal soil specification for the use of an enzyme soil stabilizer to strengthen soil consists of the following gradation and Atterberg Limits:

Sieve	% Passing	ng % Retained	
25 mm	100%	0%	
19 mm	90-100%	0-10%	
12.5 mm	60-85%	15-40%	
4.75 mm	50-70%	30-50%	
2.36 mm	35-55%	45-65%	
0.075 mm	12-20%	80-88%	
Liquid Limit	30 Max.		
Plastic Index	2 - 10		

206(3).2.3 Salvaged Soil Aggregate

Where the quality of existing soil-aggregate required is already in place, the Contractor shall not be responsible for its grading or quality except for removal of oversized materials. In

general, salvaged soil-aggregate to be used for soil stabilization shall consist of material meeting the requirements given in Sub-section 206(2).2.2, Soil Aggregate.

206(3).2.4 Water

It shall conform to the requirements of Item 714, Water.

206(3).2.5 Proportioning of Mixture

Perma-Zyme stabilization product shall be less than 0.5% by weight of soil to be treated and the mixture ratio will be less than or equal to 0.5% by volume when mixed with water which is 1-part Perma-Zyme soil stabilizer to 200-parts of water.

A Soil Design Plan shall be available for inspection prior to the start of construction, during construction, and after construction for a period of three years.

The Soil Design Plan shall include the results of the mandatory soil tests for moisture content, particle size analysis, plasticity and liquid limits, compaction test, and unconfined compression test. The calculations showing the weight of Perma-Zyme soil stabilization product versus the weight of the soil to be treated, as well as the mixture ratio of Perma-Zyme soil stabilization product to water shall be included in the Soil Design Plan.

206(3).2.6 Strength of Mixture

The unsoaked CBR value of treated soil material with Perma-Zyme soil additive shall be greater than the 30% for sub-base application and greater than 80% for base applications as determined by AASHTO T 193, Standard Method of Test for The California Bearing Ratio.

206(3).3 Construction Requirements

206(3).3.1 Weather Limitations

Perma-Zyme soil stabilizer may be mixed and applied on impending bad weather conditions. The mixture ratio of Perma-Zyme soil stabilizer to water may be adjusted to compensate for rainy conditions. In the event rain occurs during operations, the work shall be promptly stopped and the entire section shall be reconstructed in accordance with this Specification. The amount of compensation of the mixture ratio will be annotated on the Soil Design Plan.

206(3).3.2 Construction Equipment

This shall be in accordance to Subsection 206.3.2, Construction Equipment of Item 206, Chemically Stabilized Road Mix Subbase Course.

206(3).3.3 Sub-base/Base Preparation

Existing subgrade/sub-base/base materials shall be scarified to a minimum depth of 30 cm and a maximum depth of 90-centimeters. Railway sub-base/base must be treated to a depth of 90 cm. Airfield sub-base must be treated to a depth of 90 cm. Ponds must be treated to a depth of 30 cm. Roads must be treated to a depth consistent with the expected traffic weight and frequency shown below:

	20 Ton	25 Ton	30 Ton	35 Ton	40 Ton
Light Traffic Frequency	30 cm	40 cm	50 cm	60 cm	70 cm
Moderate Traffic Frequency	35 cm	45 cm	55 cm	65 cm	75 cm
Heavy Traffic Frequency	40 cm	50 cm	60 cm	70 cm	80 cm

Table 206(3).1, Depth of Treatment (cm)

*Varies with Weight of Vehicle and Frequency of Traffic

206(3).3.4 Application, Compacting and Finishing of Perma-Zyme Chemical Soil Additive on Road Subgrade/Sub-base/Base

During the preparation of the subgrade/sub-base/base, any amendments shall be applied and mixed with the existing soil prior to applying the Perma-Zyme soil stabilizer and water mixture in the ratio specified in the Soil Design Plan. If amendments are required, then these are mixed with the existing soil. Next, the Perma-Zyme soil stabilizer and water mixture shall be mixed thoroughly with the existing soil and amended mixture. Compaction of the subgrade/sub-base/base shall follow until the desired compaction is attained. Compaction shall be done in lifts of approximately 10 cm layers until the project site is compacted to the desired grade.

The project site shall be allowed to cure for 72-hours after the last 10 cm layer has been compacted to desired thickness. The project site may be left exposed to the elements during curing.

Silty fines shall be removed from the surface prior to applying a friction surface. A macadam surface using 2 to 5 cm size crushed aggregate or a chip seal surface using 5 to 15 cm crushed aggregate rolled onto a cationic water-based emulsified asphalt can be used as a bituminous binder for chip seal (CRS). The Perma-Zyme soil stabilizer and water mixture shall be sprayed on the surface of the cured road prior to applying either the macadam or the chip seal surface.

206(3).3.5 Trial Sections

Trial sections of the stabilize sub-base/base shall be constructed by the contractor at least 2 weeks prior to actual sub-base/base construction. These shall conform to the applicable requirements of Subsection 200.3.4, Trial Sections of Item 200, Aggregate Subbase Course and Subsection 201.3.4, Trial Sections of Item 201, Aggregate Base Course.

206(3).3.6 Tolerances

The stabilized sub-base/base course shall be laid to the designed level and transverse slopes on the Plans. The allowable tolerances shall be in accordance with Subsection 200.3.5, Tolerances of Item 200, Aggregate Subbase Course and Subsection 201.3.5, Tolerances of Item 201, Aggregate Base Course.

206(3).3.7 Traffic

Vehicle traffic may commence after the 72-hour curing period and after the application of a friction surface. Limits on road and airfield use specifying weight and frequency of the traffic will be noted on the Soil Design Plan.

206(3).3.8 Certification

The manufacturer or authorized distributor/dealer shall file with the purchaser a certificate stating the chemical composition and other pertinent information that may be needed for application and use. The manufacturer or authorized distributor/dealer shall include in the certificate of guarantee stating that the enzyme-based chemical soil additive meets the requirements of the specification. The certificate shall be attested to by a person having legal authority to bind the company.

206(3).3.9 Quality Control

The manufacturer or authorized distributor/dealer shall be responsible for establishing and maintaining a quality control program to assure compliance with the requirements of this Specification.

206(3).4 Method of Measurement

The Perma-Zyme soil stabilizer shall be measured by the liter. The quantity to be paid for shall be the design volume applied in place as shown on the Project Plans and accepted in the completed course.

206(3).5 Basis of Payment

The quantity of Perma-Zyme soil stabilizer determined as provided above shall be paid at the contract unit price for Perma-Zyme soil stabilizer incorporated into the soil material.

Payment shall be made under:

Pay item Number	Description	Unit of Measurement		
206 (3)	Perma-Zyme Soil Additive	Liter		



Republic of the Philippines DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS OFFICE OF THE SECRETARY

Manila

Certificate of Conditional Approval

Product Accreditation

This is to certify that

<u>PERMA-ZYME</u>

Soil Stabilizer

Supplied by:

Compath Technologies 1 Marconi St., Lahug, Cebu City

is duly accredited for use in DPWH projects as stabilizer to ordinary soils for sub-base / base course subject to its specifications (hereto attached) pursuant to the provisions of **Department Order No. 189, series of** 2002.

This accreditation shall remain in force until expiry date printed below, subject to its compliance with the requirements of the aforementioned Department Order.

Conditional Approval Number Date Issued Expiry Date

0029 December 6, 2018 December 5, 2023

EMIL K. SADAIN/CESO I Undersecretary for UPMO Operations and Technical Services