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REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
MANILA

04 MAR 2016

DEPARTMENT ORDER)
)
No. 61)
Series of 2016 03.07.16)

SUBJECT: Standard Specification on the Use of Promptis as Concrete Accelerating Admixture to One (1)-Day Portland Cement Concrete Pavement

In line with the continuing efforts to upgrade the construction technology thru adoption of successful research studies, this Department has approved the use of **Promptis** as Concrete Accelerating Admixture to One (1)-Day Portland cement concrete pavements, subject to the specifications hereto attached. A Certificate of Conditional Approval had been issued by this Department accrediting the use of Promptis accelerating admixture in DPWH road projects from February 24, 2016 until February 23, 2021.

This order takes effect immediately.

ROGELIO L. SINGSON
Secretary

Department of Public Works and Highways
Office of the Secretary
WIN6U01230

5.5.2 FET/JFS

STANDARD SPECIFICATION ON THE USE OF PROMPTIS AS CONCRETE ACCELERATING ADMIXTURE TO ONE (1)-DAY PORTLAND CEMENT CONCRETE PAVEMENT

1. Description

This Specification shall consist of one (1)-day concrete pavement with Promptis accelerating admixture, with or without reinforcement, constructed on the prepared base in accordance with this Specification and in conformity with lines, grades, thickness and typical cross-section shown on the Plans.

2. Material Requirements

2.1 Portland Cement

Cement shall conform to the applicable requirements of Subsection 311.2.1, Portland Cement of the DPWH Standard Specifications for Highways, Bridges and Airports.

2.2 Fine Aggregate

Fine Aggregates shall conform to the applicable requirements of Subsection 311.2.2, Fine Aggregate of the DPWH Standard Specifications for Highways, Bridges and Airports.

2.3 Coarse Aggregate

Coarse Aggregates shall conform to the applicable requirements of Subsection 311.2.3, Coarse Aggregate of the DPWH Standard Specifications for Highways, Bridges and Airports.

2.4 Water

Water shall conform to Specification ASTM C 1602M, *Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.*

Water used in mixing, curing or other designated application shall be reasonably clean and free of oil, salt, acid, alkali, grass or other substances injurious to the finished product. Water will be tested in accordance with and shall meet the requirements of Item 714, Water. Water which is drinkable may be used without test. Where the source of water is shallow, the intake shall be so enclosed as to exclude silt, mud, grass or other foreign materials.

2.5 Reinforcing Steel

Reinforcing Steel shall conform to the applicable requirements of ASTM A 615M, *Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.*

2.6 Joint Fillers

Poured joint fillers shall be mixed asphalt and mineral or rubber filler conforming to the applicable requirements of Item 705, Joint Materials of the DPWH Standard Specifications for Highways, Bridges and Airports.

Preformed joint filler shall conform to the applicable requirements of Item 705. It shall be punched to admit the dowels where called for in the Plans. The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint.

2.7 Chemical Admixtures

Chemical Admixture shall conform to Specification ASTM C 494M, *Standard Specifications for Chemical Admixtures for Concrete* or ASTM C 1017M, *Standard Specifications for Chemical Admixtures for Use in Producing Flowing Concrete.* Quantity of admixture mixed shall depend on the performance that will provide the designed strength.

2.8 Curing Materials

Curing Materials shall conform to the applicable requirements of Subsection 311.2.9, Curing Materials of the DPWH Standard Specifications for Highways, Bridges and Airports.

2.9 Calcium Chloride/Calcium Nitrate

It shall conform to AASHTO M 144, *Standard Specification for Aggregate for Masonry Mortar* if specified or permitted by the Engineer, as accelerator.

2.10 Storage of Cement and Aggregate

Storage of Cement and Aggregate shall conform to the applicable requirements of Subsection 311.2.11, Storage of Cement and Aggregate of the DPWH Standard Specifications for Highways, Bridges and Airports.

2.11 Proportioning, Consistency and Strength of Concrete

The Contractor shall prepare the design mix based on the absolute volume method as outlined in the American Concrete Institute (ACI) Standard 211.1, "*Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete*".

It is the intent of this Specification to require at least 450 kg of cement per cubic meter of concrete with 0.40 kg maximum water-cementitious ratio to meet the minimum strength requirements. The Engineer shall determine from laboratory tests of the materials to be used, the cement content and the proportions of aggregate and water that will produce workable concrete having a slump between 100 to 150 mm vibrated with at least two (2) vibrators simultaneously used, and a flexural strength of not less than 3.8 MPa when tested by the third-point method or 4.5 MPa when tested by the mid-point method at twenty four (24) hours in accordance with ASTM C 78, *Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)* and ASTM C 293, *Standard Test*

Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading), respectively; or, a compressive strength of 24.1 MPa for cores taken at twenty four (24) hours and tested in accordance with ASTM C 42, *Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.*

Slump shall be determined using AASHTO T 119, *Standard Test Method for Slump of Hydraulic Cement Concrete.*

The mix design shall be submitted to the Engineer for approval and shall be accompanied with certified test data from an approved laboratory demonstrating the adequacy of the mix design. A change in the source of materials during the progress of work may necessitate a new design mix.

To achieve smooth pavements with values for International Roughness Index (IRI) of not more than 3.0 m/km, the Contractor shall consider tightening the ranges and tolerances of mix design components to produce a more consistent mix, and include revised target values in the Contractor's Quality Control Plan and Method Statement.

3. Construction Requirements

3.1 Quality Control of Concrete

Quality Control of Concrete shall conform to the applicable requirements of Subsection 311.3.1, Quality Control of Concrete of the DPWH Standard Specifications for Highways, Bridges and Airports.

When the concrete does not meet the target initial slump upon arrival at site, it can be adjusted using the water-reducing and plasticizing admixture. The maximum quantity of admixture to be added should follow the Manufacturer's recommendation to gain the target slump.

3.1.1 Site Information

a. Before batching, the information of the travelling time shall be available.
b. The empty truck mixer shall go to the site using the designated truck road to determine the actual travel time.
c. Batching shall not start without the actual travel time information.

3.1.2 Plant Check

a. After batching, the loaded truck mixer shall go to the plant checking area for quality control check.
b. The truck shall be kept in checking area for 10 minutes to allow the raw materials to absorb water required for Saturated Surface Dry (SSD).
c. Allow the concrete to mix in the truck mixer for 1 minute before sample is taken.
d. The Engineer shall take samples for slump, temperature, density and yield test.
e. The target initial slump shall depend on actual weather and traffic condition.

f. The concrete shall be rejected in case it does not comply with the specified properties.
g. Only concrete that passed the specification shall be released from the plant.

3.2 Equipment

Equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer as to design, capacity and mechanical condition. The equipment shall be at the jobsite sufficiently ahead of the start of construction operations to be examined thoroughly and approved.

1. Batching Plant and Equipment

   a. General. The batching shall include bins, weighing hoppers, and scales for the fine aggregate and for each size of coarse aggregate. If cement is used in bulk, a bin, a hopper, and separate scale for cement shall be included. The weighing hopper shall be properly sealed and vented to preclude dusting operation. The batch plant shall be equipped with a suitable non-resettable batch· counter which will correctly indicate the number of batches proportioned.

   b. Bins and Hoppers. Bins with adequate separate compartments for fine aggregate and for each size of coarse aggregate shall be provided in the batching plant.

   c. Scales. Scales for weighing aggregates and cement shall be of either the beam type or the springless-dial type. They shall be accurate within one half percent (0.5%) throughout the range of use. Poises shall be designed to be locked in any position and to prevent unauthorized change.

      Scales shall be inspected and sealed as often as the Engineer may deem necessary to assure their continued accuracy.

   d. Automatic Weighing Devices. Unless otherwise allowed on the Contract, batching plants shall be equipped with automatic weighing devices of an approved type to proportion aggregates and bulk cement.

2. Mixers.

   a. General. Concrete may be mixed at the site of construction or at a central plant, or wholly or in part in truck mixers. Each mixer shall have a manufacturer's plate attached in a prominent place showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

   b. Mixers at Site of Construction. Mixing shall be done in an approved mixer capable of combining the aggregates, cement and water into a thoroughly mixed and uniform mass within the specified mixing period and discharging

and distributing the mixture without segregation on the prepared grade. The mixer shall be equipped with an approved timing device which will automatically lock the discharge lever when the drum has been charged and released it at the end of the mixing period. In case of failure of the timing device, the mixer may be used for the balance of the day while it is being repaired, provided that each batch is mixed 90 seconds. The mixer shall be equipped with a suitable nonresettable batch counter which shall correctly indicate the number of the batches mixed.

c. Truck Mixer and Truck Agitators. Truck mixers used for mixing and hauling concrete, and truck agitators used for hauling central-mixed concrete, shall conform to the requirements of AASHTO M 157, *Standard Specification for Ready-Mixed Concrete.*

d. Non-Agitator Truck. Bodies of non-agitating hauling equipment for concrete shall be smooth, mortar-tight metal containers and shall be capable of discharging the concrete at a satisfactory controlled rate without segregation.

3. Paving and Finishing Equipment

The concrete shall be placed with an approved paver designed to spread, consolidate, screed and float finish the freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finishing will be necessary to provide a dense and homogeneous pavement in conformance with the Plans and Specifications.

The finishing machine shall be equipped with at least two (2) oscillating type transverse screed.

Vibrators shall operate at a frequency of 8,300 to 9,600 impulses per minute under load at a maximum spacing of 60 cm.

To achieve smooth pavements with values for International Roughness Index (IRI) of not more than 3.0 m/km, the Contractor shall ensure that the paver control system is capable of smooth adjustments to automatically follow the surface shape (elevations and grades) required. The preferred method is laser control following a surface shape input to the onboard computer.

4. Concrete Saw

The Contractor shall provide sawing equipment in adequate number of units and power to complete the sawing with a water-cooled diamond edge saw blade or an abrasive wheel to the required dimensions and at the required rate. He shall provide at least one (1) stand-by saw in good working condition and with an ample supply of saw blades.

5. Forms

Forms shall be of steel, of an approved section, and of depth equal to the thickness of the pavement at the edge. The base of the forms shall be of sufficient width to provide necessary stability in all directions. The flange braces must extend outward on the base to not less than 2/3 the height of the form.

All forms shall be rigidly supported on bed of thoroughly compacted material during the entire operation of placing and finishing the concrete. Forms shall be provided with adequate devices for secure setting so that when in place, they will withstand, without visible spring or settlement, the impact and vibration of the consolidation and finishing or paving equipment.

3.3 Preparation of Grade

After the subgrade of base has been placed and compacted to the required density, the areas which will support the paving machine and the grade on which the pavement is to be constructed shall be trimmed to the proper elevation by means of a properly designed machine extending the prepared work areas compacted at least 60 cm beyond each edge of the proposed concrete pavement. If loss of density results from the trimming operations, it shall be restored by additional compaction before concrete is placed. If any traffic is allowed to use the prepared subgrade or base, the surface shall be checked and corrected immediately ahead of the placing concrete.

The subgrade or base shall be uniformly moist when the concrete is placed.

To achieve smooth pavements with values for International Roughness Index (IRI) of not more than 3.0 m/km, the Contractor shall ensure that the subgrade or base is prepared using equipment with a control system capable of smooth adjustments to automatically follow the surface shape (elevations and grades) required. The preferred method is laser control following a surface shape input to the onboard computer.

3.4 Setting Forms

1. Base Support

The foundation under the forms shall be hard and true to grade so that the form when set will be firmly in contact for its whole length and at the specified grade. (Any roadbed, which at the form line is found below established grade, shall be filled with approved granular materials to grade in lifts of three (3) cm or less, and thoroughly rerolled or tamped.) Imperfections or variations above grade shall be corrected by tamping or by cutting as necessary.

2. Form Setting

Forms shall be set sufficiently in advance of the point where concrete is being placed. After the forms have been set to correct grade, the grade shall be thoroughly tamped, mechanically or by hand, at both the inside and outside

edges of the base of the forms. The forms shall not deviate from true line by more than one (1) cm at any point.

3. Grade and Alignment

The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete. To ensure compliance to the maximum International Roughness Index (IRI) set by the Department, checking using appropriate surveying instruments shall be done at 5.0 m intervals along the top portion of the forms with a tolerance of +/- 0.001 m.

When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked. Also, when any form has been badly deteriorated which could affect the smoothness of the surface, the form shall be replaced and not be used in any future paving works.

3.5 Conditioning of Subgrade or Base Course

When side forms have been securely set to grade, the subgrade or base course shall be brought to proper cross-section. High areas shall be trimmed to proper elevation. Low areas shall be filled and compacted to a condition similar to that of surrounding grade. The finished grade shall be maintained in a smooth and compacted condition until the pavement is placed.

Unless waterproof subgrade or base course cover material is specified, the subgrade or base course shall be uniformly moist when the concrete is placed. If it subsequently becomes too dry, the subgrade or base course shall be sprinkled, but the method of sprinkling shall not be such as to form mud or pools of water.

3.6 Handling, Measuring and Batching Materials

Handling, Measuring and Batching Materials shall conform to the applicable requirements of Subsection 311.3.6, Handling, Measuring and Batching Materials of the DPWH Standard Specifications for Highways, Bridges and Airports.

The aggregates raw materials should be tested in accordance to Test Method ASTM C 566, *Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying* prior to batching the 24-hour concrete. Mix design should consequently be corrected based on the moisture content test.

3.7 Mixing Concrete

The concrete may be mixed at the site of the work in a central-mix plant, or in truck mixers. The mixer shall be of an approved type and capacity. Mixing time will be measured from the time all materials, except water, are in the drum. Ready-mixed concrete shall be mixed and delivered in accordance with requirements of AASHTO M 157, except that the minimum required revolutions at the mixing speed for transit-mixed concrete may be

reduced to not less than that recommended by the mixer manufacturer. The number of revolutions recommended by the mixer manufacturer shall be indicated on the manufacturer's serial plate attached to the mixer. The Contractor shall furnish test data acceptable to the Engineer verifying that the make and model of the mixer will produce uniform concrete conforming to the provision of AASHTO M 157 at the reduced number of revolutions shown on the serial plate.

When mixed at the site or in a central mixing plant, the mixing time shall not be less than fifty (50) seconds nor more than ninety (90) seconds for drum type mixers, unless mixer performance tests prove adequate mixing of the concrete in shorter time period.

The operation and mixing time for pan, twinshaft and other type of central mixers shall be based on the mixer manufacturer's instructions.

Four (4) seconds shall be added to the specified mixing time if timing starts at the instant the skip reaches its maximum raised positions. Mixing time ends when the discharge chute opens. Transfer time in multiple drum mixers is included in mixing time. The contents of an individual mixer drum shall be removed before a succeeding batch is emptied therein.

The mixer shall be operated at the drum speed as shown on the manufacturer's name plate attached on the mixer. Any concrete mixed less than the specified time shall be discarded and disposed off by the Contractor at his expense. The volume of concrete mixed per batch shall not exceed the mixer's nominal capacity in cubic metre, as shown on the manufacturer's standard rating plate on the mixer, except that an overload up to ten (10) percent above the mixer's nominal capacity may be permitted provided concrete test data for strength, segregation, and uniform consistency are satisfactory, and provided no spillage of concrete takes place.

The batches shall be so charged into the drum that a portion of the mixing water shall be entered in advance of the cement and aggregates. The flow of water shall be uniform and all water shall be in the drum by the end of the first fifteen (15) seconds of the mixing period. The throat of the drum shall be kept free of such accumulations as may restrict the free flow of materials into the drum.

Mixed concrete from the central mixing plant shall be transported in truck mixers, truck agitators or non-agitating truck specified in Subsection 3.2, Equipment. The time elapsed from the time water is added to the mix until the concrete is deposited in place at the Site shall not exceed forty five (45) minutes when the concrete is hauled in non-agitating trucks, nor one hundred twenty (120) minutes when hauled in truck mixers or truck agitators, except that in hot weather or under other conditions contributing to quick hardening of the concrete, the maximum allowable time may be reduced by the Engineer.

Retempering concrete by adding water or by other means shall not be permitted, except that when concrete is delivered in truck mixers, additional water may be added to the batch materials and additional mixing performed to increase the slump to meet the specified requirements, if permitted by the Engineer, provided all these operations are performed within forty-five (45) minutes after the initial mixing operation and the water-cement ratio is not exceeded. Concrete that is not within the specified slump limits at the

time of placement shall not be used. Admixtures for increasing the workability or for accelerating the setting of the concrete will be permitted only when specifically approved by the Engineer.

3.8 Limitation of Mixing

No concrete shall be mixed, placed or finished when natural light is insufficient, unless an adequate and approved artificial lighting system is operated.

During hot weather, the Engineer shall require that steps be taken to prevent the temperature of mixed concrete from exceeding a maximum temperature of 32°C.

Concrete not in place within ninety (90) minutes from the time the ingredients were charged into the mixing drum or that has developed initial set shall not be used. Retempering of concrete or mortar which has partially hardened, that is remixing with or without additional cement, aggregate, or water, shall not be permitted.

In order that the concrete may be properly protected against the effects of rain before the concrete is sufficiently hardened, the Contractor will be required to have available at all times materials for the protection of the edges and surface of the unhardened concrete.

3.9 Placing Concrete

Concrete shall be deposited in such a manner to require minimal rehandling. Unless truck mixers or non-agitating hauling equipment are equipped with means to discharge concrete without segregation of the materials, the concrete shall be unloaded into an approved spreading device and mechanically spread on the grade in such a manner as to prevent segregation. Placing shall be continuous between transverse joints without the use of intermediate bulkheads. Necessary hand spreading shall be done with shovels, not rakes. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or foreign substances.

Unloading should be 30 minutes upon dosing of the Concrete Accelerating Admixture on site in the truck mixer.

When concrete is to be placed adjoining a previously constructed lane and mechanical equipment will be operated upon the existing lane, that previously constructed lane shall have attained the strength for one (1)-day concrete. If only finishing equipment is carried on the existing lane, paving in adjoining lanes may be permitted after twenty (20) hours.

Concrete shall be thoroughly consolidated against and along the faces of all forms and along the full length and on both sides of all joint assemblies by means of vibrators inserted in the concrete. Vibrators shall not be permitted to come in contact with a joint assembly, the grade, or a side form. In no case shall the vibrator be operated longer than fifteen (15) seconds in any one location.

Concrete shall be deposited as near as possible to the expansion and contraction joints without disturbing them, but shall not be dumped from the discharge bucket or hopper into a joint assembly unless the hopper is well centered on the joint assembly. Should any concrete material fall on or be worked into the surface of a complete slab, it shall be removed immediately.

3.10 Test Specimens

As work progresses, at least one (1) set consisting of three (3) concrete beam test specimens, 150 mm x 150 mm x 525 mm shall be taken from each 330 m^2 of pavement, 230 mm depth, or fraction thereof placed each day. Test specimens shall be made under the supervision of the Engineer, and the Contractor shall provide all concrete and other facilities necessary in making the test specimens and shall protect them from damage by construction operations. Cylinder samples shall not be used as substitute for determining the adequacy of the strength of concrete.

The beams shall be made, cured, and tested in accordance with AASHTO T 23, *Standard Method of Test for Making and Curing Concrete Test Specimens in the Field* and AASHTO T 97, *Standard Method of Test for Flexural Strength of Concrete.*

3.11 Strike-off of Concrete and Placement of Reinforcement

Strike-off of Concrete and Placement of Reinforcement shall conform to the applicable requirements of Subsection 311.3.11, Strike-off of Concrete and Placement of Reinforcement of the DPWH Standard Specifications for Highways, Bridges and Airports.

3.12 Joints

Joints shall conform to the applicable requirements of Subsection 311.3.12, Joints of the DPWH Standard Specifications for Highways, Bridges and Airports.

Saw cutting the 24-hour concrete should be done 13 hours upon completion of the pouring or once the concrete has attained sufficient strength and hardness so that the bond between the mortar and aggregates will not be disturbed.

3.13 Final Strike-off (Consolidation and Finishing)

Final Strike-off (Consolidation and Finishing) shall conform to the applicable requirements of Subsection 311.3.13, Final Strike-off (Consolidation and Finishing) of the DPWH Standard Specifications for Highways, Bridges and Airports.

3.14 Surface Test

The introduction of minimum values for *International Roughness Index (IRI)* as part of the basis for acceptance of newly constructed concrete and asphalt road projects requires more accurate process control on the Contractor's part. The Contractor's Quality Control Plan shall include for the Engineer's review and acceptance, a process control flow chart,

and a Method Statement covering all activities in the process, describing how the activities will be managed and undertaken to deliver the specified IRI values.

International best practice indicates that factors critical to success include:

- a well-chosen concrete mixture
- reasonable grades and alignment to suit the paver
- tight level control or stringline management
- continuous supply of concrete to the paver
- consistent concrete workability
- well-maintained paving equipment
- proper operation of paving equipment
- controlled density of concrete – just the right vibration and finishing
- a skilled and dedicated team

Paved shoulders shall be subjected to surface test using a 3-m straight-edge. All areas within the carriageway shall be subjected to surface test using an approved profiling system. The profiling system shall qualify as Class 1 roughness measurement device and shall conform to the latest version ASTM E 950M, *Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference.*

The components of the profiling system shall be validated on regular basis per manufacturer's recommendations to ensure that the system is properly calibrated. Validation reports shall be generated, for presentation to the Engineer, confirming that the validations are current, and within tolerances specified by the manufacturer.

The acceptable International Roughness Index (IRI) for concrete pavements shall be not more than 3.0 m/km for National Primary Road, measured in 100 meter sections, at the time of completion.

Prior to any testing, the road surface for test shall be cleaned of loose or deleterious material by brooming or other approved means. Survey shall only be conducted on dry pavement surfaces only. Wide-beam lasers are recommended for textured surfaces like diamond ground, diamond grooved or tyned surfaces where they yield lower IRI values than single point or spot lasers.

Prior to data collection, a test segment with a length of 500 meters will be selected at site for repeatability test. The repeatability test shall be witnessed by the authorized representative of the Contractor and the Engineer. Five profile runs will be made on the test segment for repeatability test. The profile runs for repeatability are acceptable if the average IRI of the two wheelpaths satisfy the following criteria:

a. The IRI values of each of the five (5) runs are within 1% of the mean IRI of the selected runs.
b. The standard deviation of IRI of the selected runs are within 2% of the mean IRI.

If the runs do not meet the above criteria, the Profiling Team shall determine if the variability between runs are due to operator or equipment error, and make additional runs until five (5) runs free of equipment or operator errors are obtained. Where necessary an accuracy calibration test shall be conducted in comparison with a Class 1 Profiler (SSI Walking Profiler CS8800 or similar) to resolve said errors.

If the IRI values from the profile runs (for repeatability) meet the above criteria, three (3) runs per lane per site should be conducted for acceptance measurement. The IRI value for the lane shall be the average IRI of the two wheelpaths for the three (3) runs combined.

If the IRI value of the whole concrete pavement meets the required value regardless if there are areas found to have exceeded the required IRI value, no correction shall be required, provided that the areas with exceedance have an IRI value within the tolerance limit of 0.5 m/km.

However, if the IRI value of the whole concrete pavement falls beyond the prescribed IRI of 3.0 m/km for National Primary Roads and exceeds the allowable tolerance, the Contractor may opt to undertake corrective action, otherwise, no payment shall be made. The alternatives of diamond grinding to permit correction of the IRI, reduced payment or remove and replace shall also be considered by the Implementing Office, provided that the design thickness is not compromised. Correction by diamond grinding shall be done with approved equipment.

After the correction has been undertaken by the Contractor, further IRI Survey will be conducted to validate if the pavement irregularities had been eliminated. Only one IRI survey will be done after the corrective action takes place. If the IRI value of the whole asphalt pavement meets the prescribed IRI value of 3.0 m/km for National Primary Road and any 100 m sections exceeding the prescribed value are within the allowable tolerance after correction, no reduction in payment will be made; otherwise, no payment shall be made.

As soon as the concrete has hardened sufficiently, and achieved 14-day design strength, the pavement surface shall be tested with a 3-m straight-edge (shoulder) or approved profiling system (all areas within carriageway). Areas showing high spots of more than 1.5 mm but not exceeding 9 mm in 3 m shall be marked and immediately ground down with approved diamond grinding equipment.

Diamond grinding shall be done with an approved equipment. Grinding shall be done using diamond blades mounted on a self-propelled machine designed for grinding and texturing pavement. The equipment shall have an automatic grade control that will grind a strip of minimum 0.45 m width. Grinding equipment that causes ravelling, aggregate fractures, or deterioration at joints and cracks shall not be permitted. The grinding operation shall produce a pavement surface that is true in grade and uniform in appearance. The grinding depth for corrective action must not compromise the design depth of the pavement. Project data such as design thickness, actual thickness, coring data and field survey will serve as reference in the determination of the grinding depth. Where the

departure from correct cross-section exceeds 10.5 mm, the pavement shall be removed and replaced by and at the expense of the Contractor.

Any area or section so removed shall be not less than 1.5 m in length and not less than the full width of the lane involved. When it is necessary to remove and replace a section of pavement, any remaining portion of the slab adjacent to the joints that is less than 1.5 m in length, shall also be removed and replaced.

3.15 Curing

Immediately after the finishing operations have been completed and the concrete has sufficiently set, the entire surface of the newly placed concrete shall be cured in accordance with either one of the methods described herein. Failure to provide sufficient cover material of whatever kind the Contractor may elect to use, or the lack of water to adequately take care of both curing and other requirements, shall be a cause for immediate suspension of concreting operations. The concrete shall not be left exposed for more than ½ hour between stages of curing or during the curing period.

In all congested places, concrete works should be designed so that the designed strength is attained.

1. Cotton of Burlap Mats

   The surface of the pavement shall be entirely covered with mats. The mats used shall be of such length (or width) that as laid they will extend at least twice the thickness of the pavement beyond the edges of the slab. The mat shall be placed so that the entire surface and the edges of the slab are completely covered. Prior to being placed, the mats shall be saturated thoroughly with water. The mat shall be so placed and weighted down so as to cause them to remain in intimate contact with the covered surface. The mat shall be maintained fully wetted and in position for 24 hours after the concrete has been placed unless otherwise specified.

2. Waterproof Paper

   The top surface and sides of the pavement shall be entirely covered with waterproof paper, the units shall be lapped at least 45 cm. The paper shall be so placed and weighted down so as to cause it to remain in intimate contact with the surface covered. The paper shall have such dimension but each unit as laid will extend beyond the edges of the slab at least twice the thickness of the pavement, or at pavement width and 60 cm strips of paper for the edges. If laid longitudinally, paper not manufactured in sizes which will provide this width shall be securely sewed or cemented together, the joints being securely sealed in such a manner that they do not open up or separate during the curing period. Unless otherwise specified, the covering shall be maintained in place for 24 hours after the concrete has been placed. The surface of the pavement shall be thoroughly wetted prior to the placing of the paper.

3. Straw Curing

When this type of curing is used, the pavement shall be cured initially with burlap or cotton mats, until after final set of the concrete or, in any case, for 12 hours after placing the concrete. As soon as the mats are removed, the surface and sides of the pavement shall be thoroughly wetted and covered with at least 20 cm of straw or hay, thickness of which is to be measured after wetting. If the straw or hay covering becomes displaced during the curing period, it shall be replaced to the original depth and saturated. It shall be kept thoroughly saturated with water for 24 hours and the cover shall remain in place until the concrete has attained the required strength.

4. Impervious Membrane Method

The entire surface of the pavement shall be sprayed uniformly with white pigmented curing compound immediately after the finishing of the surface and before the set of the concrete has taken place, or if the pavement is cured initially with jute or cotton mats, it may be applied upon removal of the mass. The curing compound shall not be applied during rain.

Curing compound shall be applied under pressure at the rate 4 L to not more than 14 m^2 by mechanical sprayers. The spraying equipment shall be equipped with a wind guard. At the time of use, the compound shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle. During application, the compound shall be stirred continuously by effective mechanical means. Hand spraying of odd widths or shapes and concrete surface exposed by the removal of forms will be permitted. Curing compound shall not be applied to the inside faces of joints to be sealed, but approved means shall be used to insure proper curing at least 24 hours and to prevent the intrusion of foreign material into the joint before sealing has been completed. The curing compound shall be of such character that the film will harden within 30 minutes after application. Should the film be damaged from any cause within the 24 hour curing period, the damaged portions shall be repaired immediately with additional compound.

5. White Polyethylene Sheet

The top surface and sides of the pavement shall be entirely covered with polyethylene sheeting. The units used shall be lapped at least 45 cm. The sheeting shall be so placed and weighted down so as to cause it to remain intimate contact with the surface covered. The sheeting as prepared for use shall have such dimension that each unit as laid will extend beyond the edges of the slab at least twice the thickness of the pavement. Unless otherwise specified, the covering shall be maintained in place for 24 hours after the concrete has been placed.

3.16 Removal of Forms

Forms for concrete shall remain in place undisturbed for not less than twenty four (24) hours after concrete pouring. In the removal of forms, crowbars should be used in pulling out nails and pins. Care should be taken so as not to break the edges of the pavement. In case portions of the concrete are spalled, they shall be immediately repaired with fresh mortar mixed in the proportion of one part of Portland Cement and two parts fine aggregates. Major honeycomb areas will be considered as defective work, and shall be removed and replaced at the expense of the Contractor. Any area or section so removed shall not be less than the distance between weakened plane joint nor less than the full width of the lane involved.

3.17 Sealing Joints

Joints shall be sealed with asphalt sealant soon after completion of the curing period and before the pavement is opened to traffic, including the Contractor's equipment. Just prior to sealing, each joint shall be thoroughly cleaned of all foreign materials including membrane curing compound and the joint faces shall be clean and surface dry when the seal is applied.

The sealing material shall be applied to each joint opening to conform to the details shown on the Plans or as directed by the Engineer. Material for seal applied hot shall be stirred during heating so that localized overheating does not occur. The pouring shall be done in such a manner that the material will not be spilled on the exposed surfaces of the concrete. The use of sand or similar material as a cover for the seal will not be permitted.

Preformed elastomeric gaskets for sealing joints shall be of the cross-sectional dimensions shown on the Plans. Seals shall be installed by suitable tools, without elongation and secured in placed with an approved lubricant adhesive which shall cover both sides of the concrete joints. The seals shall be installed in a compressive condition and shall at time of placement be below the level of the pavement surface by approximately 6 mm.

The seals shall be in one piece for the full width of each transverse joint.

3.18 Protection of Pavement

The Contractor shall protect the pavement and its appurtenances against both public traffic, and traffic caused by his own employees and agents. This shall include watchmen to direct traffic, and the erection of and maintenance of warning signs, lights, pavement bridges or cross-overs, etc. The Plans or Special Provisions will indicate the location and type of device or facility required to protect the work and provide adequately for traffic.

All boreholes after thickness and/or strength determinations of the newly constructed concrete pavement shall be immediately filled/restored with the prescribed concrete after completion of the drilling works.

Any damage to the pavement, occurring prior to final acceptance, shall be repaired or the pavement be replaced.

3.19 Concrete Pavement - Slip Form Method

If the Contract calls for the construction of pavement without the use of fixed forms, the following provisions shall apply:

1. Grade

   After the grade or base has been placed and compacted to the required density, the areas which will support the paving machine shall be cut to the proper elevation by means of a properly designed machine. The grade on which the pavement is to be constructed shall then be brought to the proper profile by means of properly designed machine. If the density of the base is disturbed by the grading operation, it shall be corrected by additional compaction before concrete is placed. The grade should be constructed sufficiently in advance of the placing of the concrete. If any traffic is allowed to use the prepared grade, the grade shall be checked and corrected immediately before the placing of concrete. Slip form paver requires a guidance system. The preferred method is laser control following a surface shape input to the onboard computer. Where the alternative of guide wires are to be used, they should be properly tensioned, installed parallel to the edges of the construction at both sides of the work area and maintained at fixed height and tension in order to meet the maximum IRI set by the Department. Checking using appropriate surveying instruments of the guide wire elevations shall be done at 5.0 m intervals with a tolerance of +/- 0.001 m.

2. Placing Concrete

   The concrete shall be placed with an approved slip-form paver designed to spread, consolidate, screed and float-finish the freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finish will be necessary to provide a dense and homogenous pavement in conformance with the Plans and Specifications. The machine shall vibrate the concrete for the full width and depth of the strip of pavement being placed. Such vibration shall be accompanied with vibrating tubes or arms working in the concrete or with a vibrating screed or pan operating on the surface of the concrete. The sliding forms shall be rigidly held together laterally to prevent spreading of the forms. The forms shall trail behind the paver for such a distance that no appreciable slumping of the concrete will occur, and that necessary final finishing can be accomplished while the concrete is still within the forms. Any edge slump of the pavement, exclusive of edge rounding, in excess of 6 mm shall be corrected before the concrete has hardened.

   The concrete shall be held at a uniform consistency, having a slump of not more than 40 mm. The slip form paver shall be operated with as nearly as possible a continuous forward movement and that all operations of mixing, delivering and spreading concrete shall be coordinated so as to provide uniform progress with stopping and starting of the paver held to a minimum. If, for any reason, it is necessary to stop the forward movement of the paver the vibratory

and tamping elements shall also be stopped immediately. No tractive force shall be applied to the machine, except that which is controlled from the machine.

3. Finishing

The surface smoothness and texture shall meet the requirements of Subsections 3.13 and 3.14.

4. Curing

Unless otherwise specified, curing shall be done in accordance with one of the methods included in Subsection 3.15. The curing media shall be applied at the appropriate time and shall be applied uniformly and completely to all surfaces and edges of the pavement.

5. Joints

All joints shall be constructed in accordance with Subsection 3.12.

6. Protection Against Rain

In order that the concrete may be properly protected against rain before the concrete is sufficiently hardened, the Contractor will be required to have available at all times, materials for the protection of the edges and surface of the unhardened concrete. Such protective materials shall consist of standard metal forms or wood planks having a nominal thickness of not less than 50 mm and a nominal width of not less than the thickness of the pavement at its edge for the protection of the pavement edges, and covering material such as burlap or cotton mats, curing paper or plastic sheeting materials for the protection of the surface of the pavement. When rain appears imminent, all paving operations shall stop and all available personnel shall begin placing forms against the sides of the pavement and covering the surface of the unhardened concrete with the protective covering.

7. Guide Wires

For flat terrain, guide wire shall be supported at 10.0 m intervals. For, curves and tie-ins to existing pavement, guide wires shall be supported at 5.0 m intervals.

3.20 Acceptance of Concrete

No acceptance and final payment shall be made for the completed concrete pavement unless core test for thickness determination is conducted, except for Barangay Roads where the Implementing Office is allowed to waive such test, and for National Primary Roads where the concrete pavement shall also meet the International Road Roughness (IRI) criteria at the time of completion. The concrete pavement shall only be considered accepted if it meets the specified IRI value at the time of completion.

The strength level of the concrete will be considered satisfactory if the averages of all sets of three (3) consecutive strength test results equal or exceed the specified strength, f_c' and no individual strength test result is deficient by more than 15% of the specified strength, f_c'. A set shall consist of a minimum of three (3) concrete beam specimens.

Concrete deemed to be not acceptable using the above criteria may be rejected unless the Contractor can provide evidence, by means of core tests, that the quality of concrete represented by failed test results is acceptable in place. At least three (3) representative cores shall be taken from each member or area of concrete in place that is considered deficient. The location of cores shall be determined by the Engineer so that there will be at least impairment of strength of the structure. The obtaining and testing of drilled cores shall be in accordance with AASHTO T 24, *Standard Method of Test for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.*

Concrete in the area represented by the cores will be considered adequate if the average strength of the cores is equal to at least 85% of, and if no single core is less than 75% of, the specified strength, f_c'.

If the strength of control specimens does not meet the requirements of this Subsection, and it is not feasible or not advisable to obtain cores from the structure due to structural considerations, payment of the concrete will be made at an adjusted price due to strength deficiency of concrete specimens as specified hereunder:

Deficiency in Strength of Concrete Specimens, Percent (%)	Percent (%) of Contract Price Allowed
Less than 5	100
5 to less than 10	80
10 to less than 15	70
15 to less than 20	60
20 to less than 25	50
25 or more	0

The concrete pavement shall have an IRI value tolerance of 0.5 m/km. If the IRI value of the whole concrete pavement falls beyond the prescribed IRI of 3.0 m/km for National Primary Road and exceeded the allowable tolerance, and the Contractor opts not to undertake any corrective measure, no payment shall be made.

If the correction had been undertaken by the Contractor, IRI Survey will be conducted to validate if the pavement irregularities had been eliminated. Only one IRI survey will be done after the corrective action takes place. If corrective measure had been made and the IRI value of the whole concrete pavement meets the prescribed IRI of 3.0 m/km for National Primary Road, no reduction in payment will be made. If the IRI value of the whole concrete pavement still falls beyond the prescribed IRI of 3.0 m/km for National Primary Road and any 100 m sections exceeding the prescribed value and within the

allowable tolerance after correction, no reduction in payment will be made; otherwise, no payment shall be made.

3.21 Opening to Traffic

The Engineer will decide when the pavement may be opened to traffic. The road will not be opened to traffic until test specimens molded and cured in accordance with ASTM C 31, *Standard Practice for Making and Curing Concrete Test Specimens in the Field* have attained the minimum requirements in Subsection 2.11 hereof.

If such tests are not conducted prior to the specified age, the pavement shall not be operated to traffic until 24 hours after the concrete was placed. Before opening to traffic, the pavement shall be cleaned and joint sealing completed.

3.22 Tolerance in Pavement Thickness

1. General

The thickness of the pavement will be determined by measurement of cores from the completed pavement in accordance with AASHTO T 148, *Standard Test Method for Measuring Length of Drilled Concrete Cores.*

The completed pavement shall be accepted on a lot basis. A lot shall be considered as 1000 linear meters of pavement when a single traffic lane is poured or 500 linear meters when two lanes are poured concurrently. The last unit in each slab constitutes a lot in itself when its length is at least ½ of the normal lot length. If the length of the last unit is shorter than ½ of the normal lot length, it shall be included in the previous lot.

Other areas such as intersections, entrances, crossovers, ramp, etc., will be grouped together to form a lot. Small irregular areas may be included with other unit areas to form a lot.

Each lot will be divided into five (5) equal segments and one core will be obtained from each segment in accordance with AASHTO T 24, *Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.*

2. Pavement Thickness

It is the intent of this Specification that the pavement has a uniform thickness as called for on the Plans for the average of each lot as defined. After the pavement has met all surface smoothness requirements, cores for thickness measurements will be taken.

In calculating the average thickness of the pavement, individual measurements which are in excess of the specified thickness by more than 5 mm will be considered as the specified thickness plus 5 mm and measurement which are less than the specified thickness by more than 25 mm shall not be included in the average. When the average thickness for the lot is deficient, the contract unit price will be adjusted for thickness in accordance with paragraph (3 below).

Individual areas within a segment found deficient in thickness by more than 25 mm shall be evaluated by the Engineer, and if in his judgment, the deficient areas warrant removal, they shall be removed and replaced by the Contractor with pavement of the specified thickness at his entire expense. However, if the evaluation of the Engineer is that the deficient area should not be removed and replaced, such area will not be paid.

When the measurement of any core is less than the specified thickness by more than 25 mm, the actual thickness of the pavement in this area will be determined by taking additional cores at no less than 5 m intervals parallel to the center line in each direction from the affected location until a core is found in each direction, which is not deficient in thickness by more than 25 mm. The area of slab for which no payment will be made shall be the product of the paving width multiplied by the distance along the center line of the road between transverse sections found not deficient in thickness by more than 25 mm. The thickness of the remainder of the segment to be used to get the average thickness of each lot shall be determined by taking the average thickness of additional cores which are not deficient by more than 25 mm.

3. Adjustment for Thickness

When the average thickness of the pavement per lot is deficient, payment for the lot shall be adjusted as follows:

Deficiency in the Average Thickness per lot (mm)	Percent (%) of Contract Price Per Lot
0 – 5	100% payment
6 – 10	95% payment
11 – 15	85% payment
16 – 20	70% payment
21 – 25	50% payment
More than 25	Remove and replace/ No payment

4. Method of Measurement

The area to be paid for under this Specification shall be the number of square meters (m^2) of concrete placed and accepted in the completed pavement with or without rebar reinforcement. The width for measurements will be the width from outside edge to outside edge of completed pavement as placed in accordance with the Plans or as otherwise required by the Engineer in writing. The length will be measured horizontally along the center line of each roadway or ramp. Any curb and gutter placed shall not be included in the area of concrete pavement measured.

5. Basis of Payment

The accepted quantity, measured as prescribed in Section 4, Method of Measurement, shall be paid for at the contract unit price for One (1)-Day Concrete Pavement which price and payment shall be full compensation for furnishing all materials, for mixing, placing, finishing all concrete, for furnishing and placing all joint materials, for sawing weakened plane joints, for fitting the prefabricated center metal joint, for facilitating and controlling traffic, and for furnishing all labor, equipment, tools and incidentals necessary to complete the Specification.

Payment will be made under:

Pay Item Number	Description	Unit of Measurement
	One (1)-Day Concrete	Square Meter

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

PROMPTIS

(Concrete Accelerating Admixture)

Supplied by:

CEMEX Philippines

Petron Mega Plaza, Makati, 1200 Metro Manila

is duly accredited for use in DPWH projects as an admixture to concrete mix 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	:	**0021**
Date Issued	:	**February 24, 2016**
Expiry Date	:	**February 23, 2021**

ROGELIO L. SINGSON
Secretary

Department of Public Works and Highways
Office of the Secretary

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