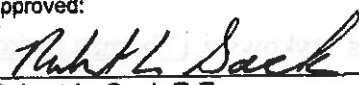


SUPERSEDED BY EB 15-031 EFFECTIVE 9/28/15		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 13-022
Title: SPECIFICATION REVISIONS: 701-01, 701-03, AND 711-12. NEW SPECIFICATIONS: SECTION 701-13 AND SECTION 711-15			
Target Audience: ☒ Manufacturers (18) ☒ Local Govt. (31) ☒ Agencies (32)	☐ Surveyors (33) ☒ Consultants (34) ☒ Contractors (39) ☐ _____ ()	Approved:  Robert L. Sack P.E. Deputy Chief Engineer, Research 3-OCT 13 Date	

ADMINISTRATIVE INFORMATION: This Engineering Instruction (EI) is effective beginning with projects submitted for the letting of May 8, 2014.

- No issuances are superseded by this EI.
- Disposition of Issued Materials: The revisions issued with this EI will be included in the next update of the Standard Specifications.

PURPOSE: The purpose of this EI is to issue revisions to the following Standard Specification Sections:
701-01 PORTLAND CEMENT
701-03 BLENDED PORTLAND CEMENT
711-11 GROUND GRANULATED BLAST FURNACE SLAG
and to add new Standard Specification Sections:
701-13 RAPID HARDENING HYDRAULIC CEMENT
711-15 MISCELLANEOUS SUPPLEMENTARY CEMENTITIOUS MATERIALS.

TECHNICAL INFORMATION: Several changes to the Department's Standard Specifications are necessary due to recent revisions to AASHTO M 85. Other technical changes are being made to provide clarification of terminology in the Blended Cement and Ground Granulated Blast Furnace Slag (GGBFS) specifications. Section 711-15 is being introduced to allow inert supplementary mineral fillers, such as Ground Glass Powder, to be used as a partial replacement for Portland cement in certain concrete mixtures.

Highlights of the changes to the Standard Specifications are:

- §701-01 has been revised to be more consistent with the requirements of AASHTO M 85.
- §701-03 has been revised to be more consistent with the requirements of AASHTO M 240.
- §711-12 is being revised to specify AASHTO M 307 - Grade 100 or Grade 120 slag.
- §701-13 RAPID HARDENING HYDRAULIC CEMENT is being introduced.
- §711-15 MISCELLANEOUS SUPPLEMENTAL CEMENTITIOUS MATERIALS is being introduced.

IMPLEMENTATION: No special provisions are necessary for implementation. Main Office Design Quality Assurance Bureau will insert the revisions to the Standard Specifications into contract proposals beginning with projects submitted for the letting of May 8, 2014.

New Standard Specifications:

- §701-13 RAPID HARDENING HYDRAULIC CEMENT
- §711-15 MISCELLANEOUS SUPPLEMENTAL CEMENTITIOUS MATERIALS

TRANSMITTED MATERIALS: Both metric and USC versions of the revisions to the standard specifications and the new specifications are attached.

REFERENCES: Standard Specification 701-01, 701-03, 711-12, AASHTO M 85 and M 240.

CONTACT: Thomas Izykowski (Thomas.Izykowski@dot.ny.gov) of the Materials Bureau @ (518) 485-5282.

PORTLAND CEMENT

Make the following changes to the Standard Specifications of May 4, 2006 (as addended by EI 08-027 and EB 08-047):

SECTION 701-01 PORTLAND CEMENT

Delete 701-01 PORTLAND CEMENT in its entirety, and **replace** it with the following:

"701-01 PORTLAND CEMENT

SCOPE. This specification covers non-air entrained cements defined by AASHTO M 85. For uniformity with recognized industry terminology, Types I, II, II(MH) III, IV, V and VI may also be designated as Types 1, 2, 2(MH), 3, 4, 5 and 6 respectively. Any cement designated with a combined classification, such as Type I/II, must meet the requirements of both types being offered. The type of cement to be used will be as shown in the plans or specifications for each contract. When specified in the contract documents, Type VI cement shall meet the requirements of AASHTO M 85-Type I cement, and the cement color shall be white.

MATERIAL REQUIREMENTS. All types of cement shall conform to the chemical and physical requirements of those respective types as contained in AASHTO M 85 with the following: Any cement possessing equivalent alkali contents ($\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$) in excess of 0.70% will be considered "high alkali" cement, and will be restricted for use as per the requirements of Section 501. The Department reserves the right to impose the "Optional Chemical and Physical Requirements" of AASHTO M 85 such as *Equivalent Alkalies* (AASHTO T-105) and *False Set* (AASHTO T-186). The temperature of the cement, measured immediately prior to entering the mixing unit at a batching facility, shall not exceed 77° C.

MANUFACTURER. The manufacturer shall declare the commercial name of the additions used and the amount thereof in writing to the Materials Bureau.

STORAGE. The cement shall be stored at its source of supply in approved weather-tight silos. Facilities shall be provided for maintaining such silos under Department seal control when and as directed by the Materials Bureau. All silos shall be completely empty and clean before cement is deposited therein unless the silo contains Department approved cement of the same type.

Cement remaining in bulk storage at the mill and/or distribution terminal for a period greater than one year after completion of tests shall be re-sampled and retested before shipment. However, cement which has been in bulk storage at mills and/or distribution terminals more than two years from the time of original manufacture shall not be used. No cement stored by the Contractor over the winter shall be used until retested by the Materials Bureau. Bagged cement shall not be stored at mill or terminal locations for a period longer 2 calendar years from the date of manufacture when preparing an order for shipment.

PORTLAND CEMENT

SHIPMENT. All shipments of cement shall be made in accordance with Materials Method (MM) 10 or other procedural directives issued by the Materials Bureau. Conveyances for bulk cement shipment shall be of a type approved by the Department. The compartments of all such conveyances shall be completely empty and clean before any cement is loaded therein. Cement may be shipped in paper bags which conform to industry standards which have the manufacturer's brand name, type of cement, and the date of manufacture clearly printed on the outside of the package.

INSPECTION AND TESTING. All inspection and testing shall be in accordance with MM 10 or other procedural directives issued by the Materials Bureau. When required by the Materials Bureau, cement shall be sampled by means of an automatic sampling device constructed so as to obtain continuous samples across the full stream of cement and deliver such samples into a sealed container approved by the Materials Bureau. Tests for chemical and physical properties shall be in accordance with test methods stipulated by AASHTO M 85.

BASIS OF ACCEPTANCE. Portland cement will be considered for acceptance at mill or terminal locations in accordance with MM 10 or other procedural directives issued by the Materials Bureau."

BLENDING PORTLAND CEMENT

SECTION 701-03 BLENDING PORTLAND CEMENT

Delete 701-03 BLENDING PORTLAND CEMENT in its entirety, and **replace** it with the following:

"701-03 BLENDING PORTLAND CEMENT

SCOPE. This specification covers non-air entrained Blended Portland cement for use in Portland cement concrete using Portland cement, Fly ash, Ground Granulated Blast Furnace Slag (GGBFS), Microsilica (Silica Fume), High Reactivity Pozzolan (HRP) or Limestone.

GENERAL. Blended Portland cements shall meet the chemical and physical requirements of AASHTO M 240, unless otherwise noted herein, or as modified in the project plans or specifications. The composition of the blended cement, including the percent of each constituent, shall be clearly stated on the product certification. Any blended cement proposed for use shall be appropriately proportioned with the desired constituents to meet the applicable cementitious requirements of the specified concrete mix design.

Portland-Pozzolan Cement, TYPE IP. A product meeting the requirements of AASHTO M 240 Type IP where the pozzolan portion of the blend is comprised of *Fly Ash* (§711-10) meeting AASHTO M 295, *Microsilica* (§711-11) meeting AASHTO M 307, or *HRP* (§711-14) meeting AASHTO M 321. Typical Type IP blended cements specified for use are:

TYPE IP (21). Whereas the pozzolan portion of the blended product is comprised of 21% (by weight) of either of the following: *Class C, F or N Pozzolan* meeting the requirements of AASHTO M 295.

TYPE IP (8). Whereas the pozzolan portion of the blended product is comprised of 8% (by weight) of either of the following: *Microsilica* (§711-11), or *HRP* (§711-14).

Portland-Blast Furnace Slag Cement, TYPE IS. A product meeting the requirements of AASHTO M 240 Type IS, where the pozzolan portion of the blend is comprised of *Ground Granulated Blast Furnace Slag* (GGBFS) meeting the requirements of AASHTO M 302 (§711-12). The amount of GGBFS is limited to 25% of the total weight of blended product.

Portland-Limestone Cement, TYPE IL. A product meeting the requirements of AASHTO M 240 Type IL, where the Portland cement is blended with *Limestone* meeting the requirements of AASHTO M 240.

Ternary Blend Cement, TYPE IT. A product meeting the requirements of AASHTO M 240 Type IT, where Portland cement is blended with two pozzolans or blended with a combination of pozzolan and Limestone. Such blends may consist of a combination of Portland-Blast Furnace Slag cement, (meeting the requirements of AASHTO M 240 Type IS), and a third pozzolan, meeting the requirements of either; *Fly Ash* (§711-10), *Microsilica* (§711-11), *HRP* (§711-14) or *Limestone* (AASHTO M 240).

BLENDING PORTLAND CEMENT

MATERIAL REQUIREMENTS.

The individual constituents shall meet the following:

Portland Cement	701-01 <i>Type II</i> or <i>Type II (MH)</i> only
Fly Ash	711-10
Microsilica (Silica Fume)	711-11
Ground Granulated Blast Furnace Slag	711-12
High Reactivity Pozzolan (HRP)	711-14
Limestone	AASHTO M 240

The manufacturer shall supply supporting documentation as noted in AASHTO M 240. Blended cement possessing equivalent alkali contents ($\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$) in excess of 0.70% will be considered "high alkali" cement, and will be restricted for use as per the requirements of §501. The blended cement shall remain uniform throughout the blending, shipping and storage process until it is incorporated into the concrete mixture.

STORAGE. The blended cement shall be stored at its source of supply in approved weather-tight silos. Provisions for maintaining the designated silos under Department seal control will be required when directed by the Materials Bureau. All silos shall be completely empty and clean before blended cement is deposited therein unless the silo contains Department approved blended cement of the same type. Blended cement remaining in bulk storage at the mill, blending facility and/or distribution terminal for a period greater than one year after completion of laboratory testing must be re-sampled and tested before shipment. Blended cement that has been in storage at the mill, blending facility or distribution terminal for a period of two years from the original date of cement manufacture may not be used. Blended cement that has been stored by the supplier or batching facility over the winter must be tested by the Materials Bureau. Bagged blended cements shall not be stored at mill or terminal locations for a period longer than two calendar years from the date of blending when preparing an order for shipment.

SHIPMENT. All shipments of blended cements shall be in accordance with Materials Method (MM) 10 or other procedural directives issued by the Materials Bureau. Conveyances for bulk shipment must be of a type approved by the Department. The compartments of all such conveyances must be completely empty and clean before any blended cement is loaded therein. Blended cement may be shipped in paper bags which conform to industry standards which have the manufacturer's brand name, type of cement, and the date of manufacture plainly printed on the outside of the package.

INSPECTION AND TESTING. All inspection and testing shall be in accordance with MM 10 or other procedural directives issued by the Materials Bureau. When required by the Materials Bureau, blended cement shall be sampled by means of an automatic sampling device, constructed to obtain continuous samples across the full stream of blended cement, and deliver such samples into a sealed container approved by the Materials Bureau. Testing of chemical and physical properties shall be in accordance with the methods referenced in the appropriate AASHTO standards. Samples which are obtained for Department testing shall be retained for a period of one calendar year after the date of completion of testing.

BASIS OF ACCEPTANCE. Blended cement will be considered for acceptance at mill or terminal locations in accordance with MM 10 or other procedural directives issued by the Department."

GROUND GRANULATED BLAST- FURNACE SLAG

SECTION 711-12 GROUND GRANULATED BLAST FURNACE SLAG

Delete the paragraph titled **"MATERIAL REQUIREMENTS"**, and **replace** it with the following:

"MATERIAL REQUIREMENTS. Ground Granulated Blast Furnace Slag (GGBFS) shall conform to the chemical and physical requirements for Grade 100 or 120, as classified in AASHTO M 302."

RAPID HARDENING HYDRAULIC CEMENT

Make the following changes to the Standard Specifications of May 4, 2006 (as addended by EI 08-027 and EB 08-047):

add the following new specification:

"701-13 RAPID HARDENING HYDRAULIC CEMENT

SCOPE. This specification covers the material requirements for *Rapid Hardening Hydraulic Cement* for use in concrete placements where the required accelerated strength cannot be achieved using ordinary Portland Cement mixtures.

GENERAL. Supply the *Rapid Hardening Hydraulic Cement* in bulk form as a dry powder. When necessary for testing purposes, or in special placement situations, the product may be supplied in bags or barrels. Any *Rapid Hardening Hydraulic Cement* which contains air entraining or other additives or admixtures will be subject to use limitations as directed by the Materials Bureau.

MATERIAL REQUIREMENTS. For approved list consideration, submit supporting documentation showing conformance to ASTM C1600 "*Standard Specification for Rapid Hardening Hydraulic Cement*". The Chemical composition and declaration of additives must be furnished when requested by the Department.

MONITOR SAMPLING. For monitor sampling of previously approved materials, follow the same procedures as directed in Materials Method 10 for High Reactivity Pozzolans. The Department will monitor the product for conformity with the physical and chemical requirements at its discretion.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have products considered for inclusion on the Approved List shall submit one 19 L (5 gal) sample of the cement for each manufacturing or supply location to the Materials Bureau. Provide a Facility Report for each manufacturing or supply location. The report will be required prior to Departments evaluation of the product. Details of the Facility Report outline plan are available by contacting the Materials Bureau. If the material will be manufactured or supplied from multiple locations, submit a separate sample and Facility Report for each location. Submit laboratory test results from a testing laboratory that is accepted by the Cement and Concrete Reference Laboratory (CCRL) indicating conformance to this specification. For each sample submitted for approved list evaluation, provide a certification declaring conformance to this specification, the production lot number, the date of manufacture, the date tested, a manufacturer's label clearly stating the product and manufacturer's name and a Material Safety Data Sheet. The Department will test the submitted sample in accordance with these specifications and Department instructions. Test procedures are available from the Materials Bureau upon request. Upon approval, the name of the manufacturer and the product will be placed on the Approved List. Any use limitations assigned to the product will be designated on the Approved List.

BASIS OF ACCEPTANCE. Each shipment will be considered for acceptance where it will be incorporated into the concrete. Acceptance will be based on the product name appearing on the Approved List, and a material certification indicating conformance to this specification. The Department reserves the right to monitor the performance of any previously approved cementitious material from actual concrete production. If the monitor test results indicate that the sampled product does not meet this specification, the concrete incorporating the product represented by the sample may be rejected."

CONCRETE CURING MATERIALS AND ADMIXTURES

Make the following changes to the Standard Specifications of May 4, 2006 (as addended by EI 08-027 and EB 08-047):

add the following new specification:

"711-15 MISCELLANEOUS SUPPLEMENTARY CEMENTITIOUS MATERIALS

SCOPE. This specification covers the material requirements for *Miscellaneous Supplementary Cementitious Materials* for use as a partial replacement for ordinary Portland cement (OPC) in enhancing the performance properties of Portland Cement Concrete, shotcrete and other mixtures.

GENERAL. Supply the *Miscellaneous Supplementary Cementitious Materials* in bulk form as a dry powder. When necessary for testing purposes, or in special placement situations, the admixture may be supplied in bags or barrels.

MATERIAL REQUIREMENTS. For approved list consideration, submit supporting documentation showing the beneficial use of the product relative to the enhancement of physical properties of concrete mixtures as per the requirements in Table 711-15-1:

TABLE 711-15 - 1 PHYSICAL AND CHEMICAL PROPERTIES	
PROPERTY	REQUIREMENT
Fineness (AASHTO T 192)	10% maximum percent retained on the 45- μ m (#325) sieve.
Compressive Strength (AASHTO T 22)	Set of 2 cylinders tested at 3, 7, 14, 28, and 56 days. At least two concrete test batches must contain 10% and 20% replacement for OPC and compare to a reference mixture containing 100% OPC. Compressive strength of each test batch must equal or exceed 85% of the reference batch @ 28 days.
Permeability (AASHTO T 277)	Avg. of 3 specimens sampled from each test batch described above. Total average charge passed must be $\leq$ than the reference batch @ 56 days.
Strength Activity Index (ASTM C 311)	85% minimum @ 28 days using 30% replacement for OPC.
Alkali Silica Reactivity (ASTM C441)	35% minimum reduction of mortar expansion @14 days using 10 and 20% replacement for OPC.
Reactive Oxides (Al_2O_3 , + SiO_2 + Fe_2O_3) (AASHTO T105)	70% minimum.
Uniformity of Reactive Oxides	$\pm 7.0\%$ maximum variation between any two samples.
Chloride Content (AASHTO T 260 Proc. B)	0.20% maximum.
LOI (ASTM C 311)	6.0% maximum.
SO ₃ (ASTM C 311)	3.0% maximum.
Moisture Content (ASTM C 311)	3.0% maximum.

CONCRETE CURING MATERIALS AND ADMIXTURES

MONITOR SAMPLING. For monitor sampling of previously approved materials, follow the same procedures as directed in Materials Method 10 for High Reactivity Pozzolans. The Department will monitor the product for conformity with the physical and chemical requirements at its discretion.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have products considered for inclusion on the Approved List shall submit a sample of the admixture for each manufacturing or supply location to the Materials Bureau in accordance with Materials Method 10 (for High Reactivity Pozzolans). Provide a Facility Report for each manufacturing or supply location. The report will be required prior to Departments evaluation of the product, and annually thereafter. Details of the Facility Report outline are available by contacting the Materials Bureau. If the material will be manufactured or supplied from multiple locations, submit a separate sample and Facility Report for each location. Submit laboratory test results from a testing laboratory that is accepted by the Cement and Concrete Reference Laboratory (CCRL) indicating conformance to this specification. For each sample submitted for approved list evaluation, provide a certification declaring conformance to this specification, the production lot number, the date of manufacture, and the date tested. Clearly state the chemical and physical properties as required by this specification, and the pH of the material. Provide supporting data, relative to these specifications, detailing the performance of the product when used in concrete mixtures. Provide a manufacturer's label clearly stating the product and manufacturer's name and a Material Safety Data Sheet for each product submitted for approved list evaluation.

The Department will test the submitted sample in accordance with these specifications and Department instructions. Test procedures are available from the Materials Bureau upon request. Upon approval, the name of the manufacturer and the product will be placed on the Approved List.

BASIS OF ACCEPTANCE. Each shipment will be considered for acceptance where it will be incorporated into the concrete. Acceptance will be based on the product name appearing on the Approved List, and a material certification indicating conformance to this specification. The Department reserves the right to monitor the performance of any previously approved cementitious material from actual concrete production. If the monitor test results indicate that the sampled product does not meet this specification, the concrete incorporating the product represented by the sample may be rejected."

PORTLAND CEMENT

Make the following changes to the Standard Specifications of May 1, 2008 (as addended by EI 08-027 and EB 08-047):

SECTION 701-01 PORTLAND CEMENT

Delete 701-01 PORTLAND CEMENT in its entirety, and **replace** it with the following:

"701-01 PORTLAND CEMENT

SCOPE. This specification covers non-air entrained cements defined by AASHTO M 85.

For uniformity with recognized industry terminology, Types I, II, II(MH) III, IV, V and VI may also be designated as Types 1, 2, 2(MH), 3, 4, 5 and 6 respectively. Any cement designated with a combined classification, such as Type I/II, must meet the requirements of both types being offered. The type of cement to be used will be as shown in the plans or specifications for each contract. When specified in the contract documents, Type VI cement shall meet the requirements of AASHTO M 85-Type I cement, and the cement color shall be white.

MATERIAL REQUIREMENTS. All types of cement shall conform to the chemical and physical requirements of those respective types as contained in AASHTO M 85 with the following:

Any cement possessing equivalent alkali contents ($\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$) in excess of 0.70% will be considered "high alkali" cement, and will be restricted for use as per the requirements of Section 501. The Department reserves the right to impose the "Optional Chemical and Physical Requirements" of AASHTO M 85 such as *Equivalent Alkalies* (AASHTO T-105) and *False Set* (AASHTO T-186). The temperature of the cement, measured immediately prior to entering the mixing unit at a batching facility, shall not exceed 170°F.

MANUFACTURER. The manufacturer shall declare the commercial name of the additions used and the amount thereof in writing to the Materials Bureau.

STORAGE. The cement shall be stored at its source of supply in approved weather-tight silos. Facilities shall be provided for maintaining such silos under Department seal control when and as directed by the Materials Bureau. All silos shall be completely empty and clean before cement is deposited therein unless the silo contains Department approved cement of the same type.

Cement remaining in bulk storage at the mill and/or distribution terminal for a period greater than one year after completion of tests shall be re-sampled and retested before shipment. However, cement which has been in bulk storage at mills and/or distribution terminals more than two years from the time of original manufacture shall not be used. No cement stored by the Contractor over the winter shall be used until retested by the Materials Bureau. Bagged cement shall not be stored at mill or terminal locations for a period longer 2 calendar years from the date of manufacture when preparing an order for shipment.

PORTLAND CEMENT

SHIPMENT. All shipments of cement shall be made in accordance with Materials Method (MM) 10 or other procedural directives issued by the Materials Bureau. Conveyances for bulk cement shipment shall be of a type approved by the Department. The compartments of all such conveyances shall be completely empty and clean before any cement is loaded therein. Cement may be shipped in paper bags which conform to industry standards which have the manufacturer's brand name, type of cement, and the date of manufacture clearly printed on the outside of the package.

INSPECTION AND TESTING. All inspection and testing shall be in accordance with MM 10 or other procedural directives issued by the Materials Bureau. When required by the Materials Bureau, cement shall be sampled by means of an automatic sampling device constructed so as to obtain continuous samples across the full stream of cement and deliver such samples into a sealed container approved by the Materials Bureau. Tests for chemical and physical properties shall be in accordance with test methods stipulated by AASHTO M 85.

BASIS OF ACCEPTANCE. Portland cement will be considered for acceptance at mill or terminal locations in accordance with MM 10 or other procedural directives issued by the Materials Bureau."

BLENDING PORTLAND CEMENT

SECTION 701-03 BLENDING PORTLAND CEMENT

Delete 701-03 BLENDING PORTLAND CEMENT in its entirety, and **replace** it with the following:

"701-03 BLENDING PORTLAND CEMENT

SCOPE. This specification covers non-air entrained Blended Portland cement for use in Portland cement concrete using Portland cement, Fly ash, Ground Granulated Blast Furnace Slag (GGBFS), Microsilica (Silica Fume), High Reactivity Pozzolan (HRP) or Limestone.

GENERAL. Blended Portland cements shall meet the chemical and physical requirements of AASHTO M 240, unless otherwise noted herein, or as modified in the project plans or specifications. The composition of the blended cement, including the percent of each constituent, shall be clearly stated on the product certification. Any blended cement proposed for use shall be appropriately proportioned with the desired constituents to meet the applicable cementitious requirements of the specified concrete mix design.

Portland-Pozzolan Cement, TYPE IP. A product meeting the requirements of AASHTO M 240 Type IP where the pozzolan portion of the blend is comprised of *Fly Ash* (§711-10) meeting AASHTO M 295, *Microsilica* (§711-11) meeting AASHTO M 307, or *HRP* (§711-14) meeting AASHTO M 321. Typical Type IP blended cements specified for use are:

TYPE IP (21). Whereas the pozzolan portion of the blended product is comprised of 21% (by weight) of either of the following: *Class C, F or N Pozzolan* meeting the requirements of AASHTO M 295.

TYPE IP (8). Whereas the pozzolan portion of the blended product is comprised of 8% (by weight) of either of the following: *Microsilica* (§711-11), or *HRP* (§711-14).

Portland-Blast Furnace Slag Cement, TYPE IS. A product meeting the requirements of AASHTO M 240 Type IS, where the pozzolan portion of the blend is comprised of *Ground Granulated Blast Furnace Slag* (GGBFS) meeting the requirements of AASHTO M 302 (§711-12). The amount of GGBFS is limited to 25% of the total weight of blended product.

Portland-Limestone Cement, TYPE IL. A product meeting the requirements of AASHTO M 240 Type IL, where the Portland cement is blended with *Limestone* meeting the requirements of AASHTO M 240.

Ternary Blend Cement, TYPE IT. A product meeting the requirements of AASHTO M 240 Type IT, where Portland cement is blended with two pozzolans or blended with a combination of pozzolan and Limestone. Such blends may consist of a combination of Portland-Blast Furnace Slag cement, (meeting the requirements of AASHTO M 240 Type IS), and a third pozzolan, meeting the requirements of either; *Fly Ash* (§711-10), *Microsilica* (§711-11), *HRP* (§711-14) or *Limestone* (AASHTO M 240).

BLENDING PORTLAND CEMENT

MATERIAL REQUIREMENTS.

The individual constituents shall meet the following:

Portland Cement	701-01 <i>Type II</i> or <i>Type II (MH)</i> only
Fly Ash	711-10
Microsilica (Silica Fume)	711-11
Ground Granulated Blast Furnace Slag	711-12
High Reactivity Pozzolan (HRP)	711-14
Limestone	AASHTO M 240

The manufacturer shall supply supporting documentation as noted in AASHTO M 240. Blended cement possessing equivalent alkali contents ($\text{Na}_2\text{O} + 0.658 \text{ K}_2\text{O}$) in excess of 0.70% will be considered "high alkali" cement, and will be restricted for use as per the requirements of §501. The blended cement shall remain uniform throughout the blending, shipping and storage process until it is incorporated into the concrete mixture.

STORAGE. The blended cement shall be stored at its source of supply in approved weather-tight silos. Provisions for maintaining the designated silos under Department seal control will be required when directed by the Materials Bureau. All silos shall be completely empty and clean before blended cement is deposited therein unless the silo contains Department approved blended cement of the same type. Blended cement remaining in bulk storage at the mill, blending facility and/or distribution terminal for a period greater than one year after completion of laboratory testing must be re-sampled and tested before shipment. Blended cement that has been in storage at the mill, blending facility or distribution terminal for a period of two years from the original date of cement manufacture may not be used. Blended cement that has been stored by the supplier or batching facility over the winter must be tested by the Materials Bureau. Bagged blended cements shall not be stored at mill or terminal locations for a period longer than two calendar years from the date of blending when preparing an order for shipment.

SHIPMENT. All shipments of blended cements shall be in accordance with Materials Method (MM) 10 or other procedural directives issued by the Materials Bureau. Conveyances for bulk shipment must be of a type approved by the Department. The compartments of all such conveyances must be completely empty and clean before any blended cement is loaded therein. Blended cement may be shipped in paper bags which conform to industry standards which have the manufacturer's brand name, type of cement, and the date of manufacture plainly printed on the outside of the package.

INSPECTION AND TESTING. All inspection and testing shall be in accordance with MM 10 or other procedural directives issued by the Materials Bureau. When required by the Materials Bureau, blended cement shall be sampled by means of an automatic sampling device, constructed to obtain continuous samples across the full stream of blended cement, and deliver such samples into a sealed container approved by the Materials Bureau. Testing of chemical and physical properties shall be in accordance with the methods referenced in the appropriate AASHTO standards. Samples which are obtained for Department testing shall be retained for a period of one calendar year after the date of completion of testing.

BASIS OF ACCEPTANCE. Blended cement will be considered for acceptance at mill or terminal locations in accordance with MM 10 or other procedural directives issued by the Department."

GROUND GRANULATED BLAST-FURNACE SLAG

SECTION 711-12 GROUND GRANULATED BLAST FURNACE SLAG

Delete the paragraph titled **"MATERIAL REQUIREMENTS"**, and **replace** it with the following:

"MATERIAL REQUIREMENTS. Ground Granulated Blast Furnace Slag (GGBFS) shall conform to the chemical and physical requirements for Grade 100 or 120, as classified in AASHTO M 302."

RAPID HARDENING HYDRAULIC CEMENT

add the following new specification:

"701-13 RAPID HARDENING HYDRAULIC CEMENT

SCOPE. This specification covers the material requirements for *Rapid Hardening Hydraulic Cement* for use in concrete placements where the required accelerated strength cannot be achieved using ordinary Portland Cement mixtures.

GENERAL. Supply the *Rapid Hardening Hydraulic Cement* in bulk form as a dry powder. When necessary for testing purposes, or in special placement situations, the product may be supplied in bags or barrels. Any *Rapid Hardening Hydraulic Cement* which contains air entraining or other additives or admixtures will be subject to use limitations as directed by the Materials Bureau.

MATERIAL REQUIREMENTS. For approved list consideration, submit documentation showing conformance to ASTM C1600 "*Standard Specification for Rapid Hardening Hydraulic Cement*". The chemical composition and declaration of additives must be furnished when requested by the Department.

MONITOR SAMPLING. For monitor sampling of previously approved materials, follow the same procedures as directed in Materials Method 10 for High Reactivity Pozzolans. The Department will monitor the product for conformity with the physical and chemical requirements at its discretion.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have products considered for inclusion on the Approved List shall submit one 5 gallon sample of the cement for each manufacturing or supply location to the Materials Bureau. Provide a Facility Report for each manufacturing or supply location. The report will be required prior to Departments evaluation of the product. Details of the Facility Report outline plan are available by contacting the Materials Bureau. If the material will be manufactured or supplied from multiple locations, submit a separate sample and Facility Report for each location. Submit laboratory test results from a testing laboratory that is accepted by the Cement and Concrete Reference Laboratory (CCRL) indicating conformance to this specification. For each sample submitted for approved list evaluation, provide a certification declaring conformance to this specification, the production lot number, the date of manufacture, the date tested, a manufacturer's label clearly stating the product and manufacturer's name and a Material Safety Data Sheet. The Department will test the submitted sample in accordance with these specifications and Department instructions. Test procedures are available from the Materials Bureau upon request. Upon approval, the name of the manufacturer and the product will be placed on the Approved List. Any use limitations assigned to the product will be designated on the Approved List.

BASIS OF ACCEPTANCE. Each shipment will be considered for acceptance where it will be incorporated into the concrete. Acceptance will be based on the product name appearing on the Approved List, and a material certification indicating conformance to this specification. The Department reserves the right to monitor the performance of any previously approved cementitious material from actual concrete production. If the monitor test results indicate that the sampled product does not meet this specification, the concrete incorporating the product represented by the sample may be rejected."

CONCRETE CURING MATERIALS AND ADMIXTURES

add the following new specification:

“711-15 MISCELLANEOUS SUPPLEMENTARY CEMENTITIOUS MATERIALS

SCOPE. This specification covers the material requirements for *Miscellaneous Supplementary Cementitious Materials* for use as a partial replacement for ordinary Portland cement (OPC) in enhancing the performance properties of Portland Cement Concrete, shotcrete and other mixtures.

GENERAL. Supply the *Miscellaneous Supplementary Cementitious Materials* in bulk form as a dry powder. When necessary for testing purposes, or in special placement situations, the admixture may be supplied in bags or barrels.

MATERIAL REQUIREMENTS. For approved list consideration, submit supporting documentation showing the beneficial use of the product relative to the enhancement of physical properties of concrete mixtures as per the requirements in Table 711-15-1:

TABLE 711-15 - 1 PHYSICAL AND CHEMICAL PROPERTIES	
PROPERTY	REQUIREMENT
Fineness (AASHTO T 192)	10% maximum percent retained on the 45-μm (#325) sieve.
Compressive Strength (AASHTO T 22)	Set of 2 cylinders tested at 3, 7, 14, 28, and 56 days. At least two concrete test batches must contain 10% and 20% replacement for OPC and compare to a reference mixture containing 100% OPC. Compressive strength of each test batch must equal or exceed 85% of the reference batch @ 28 days.
Permeability (AASHTO T 277)	Avg. of 3 specimens sampled from each test batch described above. Total average charge passed must be ≤ than the reference batch @ 56 days.
Strength Activity Index (ASTM C 311)	85% minimum @ 28 days using 30% replacement for OPC.
Alkali Silica Reactivity (ASTM C441)	35% minimum reduction of mortar expansion @14 days using 10 and 20% replacement for OPC.
Reactive Oxides (Al_2O_3 , + SiO_2 + Fe_2O_3) (AASHTO T105)	70% minimum.
Uniformity of Reactive Oxides	±7.0% maximum variation between any two samples.
Chloride Content (AASHTO T 260 Proc. B)	0.20% maximum.
LOI (ASTM C 311)	6.0% maximum.
SO ₃ (ASTM C 311)	3.0% maximum.
Moisture Content (ASTM C 311)	3.0% maximum.

CONCRETE CURING MATERIALS AND ADMIXTURES

MONITOR SAMPLING. For monitor sampling of previously approved materials, follow the same procedures as directed in Materials Method 10 for High Reactivity Pozzolans. The Department will monitor the product for conformity with the physical and chemical requirements at its discretion.

BASIS OF APPROVAL. Manufacturers or material suppliers desiring to have products considered for inclusion on the Approved List shall submit a sample of the admixture for each manufacturing or supply location to the Materials Bureau in accordance with Materials Method 10 (for High Reactivity Pozzolans). Provide a Facility Report for each manufacturing or supply location. The report will be required prior to Departments evaluation of the product, and annually thereafter. Details of the Facility Report outline are available by contacting the Materials Bureau. If the material will be manufactured or supplied from multiple locations, submit a separate sample and Facility Report for each location. Submit laboratory test results from a testing laboratory that is accepted by the Cement and Concrete Reference Laboratory (CCRL) indicating conformance to this specification. For each sample submitted for approved list evaluation, provide a certification declaring conformance to this specification, the production lot number, the date of manufacture, and the date tested. Clearly state the chemical and physical properties as required by this specification, and the pH of the material. Provide supporting data, relative to these specifications, detailing the performance of the product when used in concrete mixtures. Provide a manufacturer's label clearly stating the product and manufacturer's name and a Material Safety Data Sheet for each product submitted for approved list evaluation. The Department will test the submitted sample in accordance with these specifications and Department instructions. Test procedures are available from the Materials Bureau upon request. Upon approval, the name of the manufacturer and the product will be placed on the Approved List.

BASIS OF ACCEPTANCE. Each shipment will be considered for acceptance where it will be incorporated into the concrete. Acceptance will be based on the product name appearing on the Approved List, and a material certification indicating conformance to this specification. The Department reserves the right to monitor the performance of any previously approved cementitious material from actual concrete production. If the monitor test results indicate that the sampled product does not meet this specification, the concrete incorporating the product represented by the sample may be rejected."