California DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

Caltrans uses cement conforming to ASTM C150, and blended cement conforming to ASTM C595.

2. Are there additional requirements beyond the national specifications? If so – what are they?

Caltrans has adopted ASTM C150 with 5% limestone content except the C3S content of Type II cement shall not exceed 65 percent. For blended cements, we are encouraging Binary and Ternary blending with supplementary cementitious material (SCMs), such as Fly Ash Class F conforming to AASHTO M295, GGBF Slag conforming to AASHTO M302, GRADE 100 or 120 , Metakaolin conforming to AASHTO M295, class N, Silica Fumes conforming to AASHTO M307, and Rice Hull Ash. However, the suppliers need to be on the approved list of Caltrans.

3. What is your approval process for cements (including certification by other states)?

Beginning July 2009, suppliers need to be on the approved list of Caltrans. For details please refer to the following link:

http://www.dot.ca.gov/hq/esc/approved_products_list/pdf/cementitious_materials.pdf

4. Do you currently allow ASTM C1157 cements? Why or Why Not?

No. Some of the ASR related issues and far too much use of SCMs are some of the reasons to make Caltrans Specifications Part prescriptive and part performance based. Caltrans wants to give freedom to Contractors to meet minimum prescription requirements while arriving at mix designs.

5. Do you currently allow ASTM 595 blended cements? Why or Why Not?

Yes. In fact we are going to encourage use of Blended cements to mitigate impact on the climate change by reducing consumption of cement by adding SCMs while not sacrificing strength and improve quality of concrete and long life.

6. What are your sampling frequency/testing requirements for QC and/or acceptance?

Once in a month the suppliers will submit samples which shall be tested at random to ensure that Cements conform to specification and certificate of compliance.

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

The amount of portland cement and SCM used in cement concrete shall conform to the minimum cementitious material content provisions in Caltrans Standard Specification under Section 90-1.01, "Description," or Section 90-4.05, "optional Use of Chemical Admixtures," and the specifications given in Section 90-2.01 C and calculated per equations mentioned there in.(See the attached spec.)

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

We have allowed use of cement conforming to ASTM C595 blended cement. ASTM C1157 needs greater quality control and at this stage we would not like to go over board.

(Caltrans attachment to be posted on the TTCC/NCC web page.)

Georgia DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

   AASHTO M 85

2. Are there additional requirements beyond the national specifications? If so – what are they?

   GDOT requires low alkali cement. (Equivalent alkalies maximum percent = 0.60)

3. What is your approval process for cements (including certification by other states)?

   Domestic Manufacturer's are required to submit a guarantee letter, an outline of their quality control plan, 6 months of historical test data, and a sample of material. GDOT performs an inspection of the facility.

   Imported Portland Cement is approved on a per shipment basis.

4. Do you currently allow ASTM C1157 cements? Why or Why Not?

   ASTM C1157 is not currently in our specifications. GDOT has no interest in using this cement at this time.

5. Do you currently allow ASTM 595 blended cements? Why or Why Not?

   ASTM C595 (AASHTO M240) is not currently in our specifications for pavements, but it is for cement stabilization. We are currently evaluating ASTM C595 (AASHTO M240) cement.

   What are your sampling frequency/testing requirements for QC and/or acceptance?

   QC/Acceptance: 1 sample per 2000 tons of cement.

6. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

   Fly Ash – up to 15% cement replacement (at a rate of 1.25 to 2.0 lbs of fly ash to 1.0 lb of cement removed)

   Slag – Based on 5-day forecast from the National Weather Service
   If expected temp is >60 °F – replace no more than 50% of cement
   If expected temp is <60 °F but not <40 °F – replace no more than 30% of cement
   If expected temp is <40 °F – use of slag is not allowed.

7. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

   GDOT is currently evaluating ASTM C595 (AASHTO M240) cement (requested by a cement manufacturer).

   ASTM C1157 is not currently in our specifications. GDOT has no interest in using this cement at this time.

Illinois DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

   ASTM C 150 and ASTM C 595

2. Are there additional requirements beyond the national specifications? If so – what are they?

   Portland Cement

   The total of all organic processing additions shall be a maximum of 1.0 percent by weight (mass) of the cement. The total of all inorganic processing additions shall be a maximum of 4.0 percent by weight (mass) of the cement. However, a cement kiln dust inorganic processing addition shall be limited to a maximum of 1.0 percent. Organic processing additions shall be limited to grinding aids that improve the flowability of cement, reduce pack set, and improve grinding efficiency. Inorganic processing additions shall be limited to granulated blast-furnace slag according to the chemical requirements of AASHTO M 302, Class C fly ash according to the chemical requirements of AASHTO M 295, and cement kiln dust.

   Portlan-Pozzolan Cement and Portland Blast-Furnace Slag Cement

   The total of all organic processing additions shall be a maximum of 1.0 percent by weight (mass) of the cement. Organic processing additions shall be limited to grinding aids as defined in Portland Cement above. Inorganic processing additions shall be limited to cement kiln dust at a maximum of 1.0 percent.

3. What is your approval process for cements (including certification by other states)?

   Plants are required to have CCRL inspected laboratory, provide quarterly strength uniformity reports, and provide quarterly split samples. The Districts are required to obtain a few field samples each month for testing by the Central Office.

   Certification by other states is allowed. The Article of Agreement for Portland Cement Plant Acceptance developed by the former Midwest Concrete Consortium is used. This agreement is currently being used with Iowa DOT, and Illinois DOT would like to set up more agreements with other States.

Question: Would any States be interested in proposing cement for inclusion in the National Transportation Product Evaluation Program by using the agreement developed by the former Midwest Concrete Consortium?

4. Do you currently allow ASTM C1157 cements? Why or Why Not?

   No, the specification has too few restrictions on the ingredients.

5. Do you currently allow ASTM 595 blended cements? Why or Why Not?

   Yes, blended cements have performed well.

6. What are your sampling frequency/testing requirements for QC and/or acceptance?

   See question #3.

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

   Class F Fly Ash – 20% typical / 25% maximum

   Class C Fly Ash – 20% typical / 30% maximum

   Ground Granulated Blast-Furnace Slag – 25% typical / 35% maximum

   Silica Fume or High-Reactivity Metakaolin – 5% maximum

   Ternary Mix – 35% maximum cementitious material

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

   There is no information or circumstances that would cause us to specify ASTM C 1157.

Indiana DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

   AASHTO M 85 for Types I, IA, II, III., and IIIA, AASHTO M 240 for Types ISA, IP-A, IS, IP and ISM.

2. Are there additional requirements beyond the national specifications? If so – what are they?

   INDOT exceptions to AASHTO M 240 are: a) The amount of pozzolan shall be limited to 20% ± 5% by weigth of the Portland-pozzolan cement for the Types IP and IP-A; b) The pozzolan in the Portland-pozzolan cements, types IP and IP-A, shall be in accordance with ASTM C 618, class C of class F with the loss on ignition of the pozzolan limited to a maximum of 3%; c) The pozzolan in the Portland-pozzolan cements, types IP and IP-A, shall be interground with the Portland cement clinker.

3. What is your approval process for cements (including certification by other states)?

   Manufacturers or Manufacture/Distributors of cement must obtain INDOT approval to be identified on the Department's list of Qualified Manufacturers and Manufacture/Distributors. For domestic sources, INDOT approval is based on a an acceptable quality control plan, QC testing of cement by a laboratory regularly inspected by CCRL, a year's worth of documented testing and monthly mill test data. The INDOT requirements for approval of foreign cement sources is different.

4. Do you currently allow ASTM C1157 cements? Why or Why Not?

   INDOT does not currently allow hydraulic cement per ASTM C 1157. Although blended cements per AASHTO M 240 have been allowed for many years, there has not been any significant use by contractors or ready mix producers on INDOT contracts. Most all the concrete plants have separate storage silo for pozzolans and cements. This has provided them with flexibility to incorporate a pozzolan into concrete as needed instead and of differing proportions depending on the job requirements.

5. Do you currently allow ASTM 595 blended cements? Why or Why Not?

   INDOT allows blended hydraulic cement in accordance with AASHTO M 240-08, which is essentially the same as ASTM C 595-08. Exceptions are as stated in the answer to question 2 above. Despite allowing blended cements, INDOT has not seen them being used on INDOT work for many years.

6. What are your sampling frequency/testing requirements for QC and/or acceptance?

   QC testing is set up by the cement manufacturer/distributor. For cement sources that are on the INDOT approved source list, INDOT conducts random verification testing of cements that are used on INDOT contracts or by ready mix concrete plants that are considered of active status by INDOT.

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

   See the answer to question 2 above.

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

   INDOT currently allows blended cement per AASHTO M 240.
   Switching to a performance based specification for cement (i.e. ASTM C 1157) is time consuming and problematic. Losing the Chemical Composition requirements is of concern. Even though there may be some benefits as to improved physical properties, these improvements are not with all properties, nor cement type.

Iowa DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)? ASTM C150 and C595

2. Are there additional requirements beyond the national specifications? If so – what are they? None

3. What is your approval process for cements (including certification by other states)? IM 401 and reciprocity with surrounding states. (ATTACHED at end)

4. Do you currently allow ASTM C1157 cements? Why or Why Not? No, not used by many.

5. Do you currently allow ASTM 595 blended cements? Why or Why Not? Yes

6. What are your sampling frequency/testing requirements for QC and/or acceptance? Verification sample for quality 1/100,000 sq. yds. Paving & 1/1000 yd3 structural.

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures? Paving 35% slag & 20% fly ash – Max total replacement 40%. Structural 35% slag & 20% fly ash – Max total replacement 50%.

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

Iowa DOT IM 401 SOURCE APPROVAL

For consideration for approval, the manufacturer shall provide the following to the Materials Office:

1. A quality control program that meets the requirements of Section A.
2. A copy of the latest CCRL inspection report on quality control laboratory, including documentation of resolution of any discrepancies noted.
3. A 3-month strength uniformity report prepared in accordance with the requirements of ASTM C 917, "Standard Test Method for Evaluation of Cement Strength Uniformity From a Single Source".
4. A letter indicating the type of each processing addition, and the percent range that will be used in Type I cement.

The manufacturer shall also prepare a 24-hour composite sample of cement from current production according to ASTM C 183. This sample will be tested by the Central Materials Laboratory for acceptance.

Iowa may approve a source based on another state source approval, provided that state will agree to the terms in Appendix C and the source meets Section 4101 of the Iowa DOT Standard Specifications.

Mixing of cement from different sources, different plants, or of different types in one storage bin or silo will not be allowed.

When limestone is used, the manufacturer shall inform the Office of Materials in writing on the amount of the addition. The manufacturer shall also supply comparative test data on chemical and physical properties of the cement with and without limestone. The amount of limestone used shall be included in the manufacturer's Mill Test Reports.

Reciprocity – Iowa

Iowa DOT will accept cements and cement blends approved or certified by other state transportation agencies, providing that state agrees to the following terms and that source meets Article 4101 of Standards Specifications.

1. The host state agency will require the cement plant within its boundaries to have a laboratory compliant with ASTM C1222, Standard Practice for Evaluation of Laboratories Testing Hydraulic Cement. This laboratory shall be AASHTO accredited and will perform testing on the applicable types of cement produced (ASTM C 150/AASHTO M 85, C595/AASHTO M 240, C 1157) and shipped for state agencies consumption. Agency laboratories used for verification testing must meet the same criteria.

2. The host state agency will require the cement plant within its boundaries to have a printed, agency acceptable quality control/quality assurance plan for the production of cements used by state agencies. The plan must include commitments to comply with ASTM C1222 and ASTM C183, Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement. The host state agency will verify compliance with the quality control plan.

3. The host state agency will require the cement producer to maintain and provide, for each lot (silo) of cement shipped, a compilation of Mill Test Reports in an electronic form (Excel spread sheet). The

applicable data will be provided to the host state agency at least semiannually.

4. The host state agency will require the cement producer to submit split samples of a regular Portland cement (ASTM C150/AASHTO M85) and a blended cement (ASTM C595/AASHTO M240) or performance specification cement (ASTM C1157) if produced, semiannually for verification testing.

5. The host state agency will require the cement producer to submit reports for ASTM C917, Standard Test Method for Evaluation of Cement Strength Uniformity From a Single Source, for both a regular Portland cement and a blended cement, if produced, at least semiannually.

6. The host state agency will require the cement producer to maintain production and quality control/quality assurance records for at least seven years and make those records available if requested.

7. The host state agency will review submittals from the cement producer along with agency test results. If deficiencies are discovered, the state agency will monitor corrective actions taken by the producer until the deficiencies are corrected. The reciprocal agreement state agency will be notified of the deficiencies and of each occurrence.

8. Any test results or submittals collected by the host state agency may be made available to the reciprocal agreement state agency upon request.

9. All cement plant information and data is confidential within the limits of a public agency and is for state agencies information and inspection only.

10. Quality assurance test results of field samples, performed by a reciprocal state, shall be reported to the host state agency when non-compliance occurs. The reciprocal state agency will deal directly with the cement producer. The host state agency will take action as described in Item 7. The host state agency shall notify all reciprocal agreement state agencies when non-compliance occurs.

11. Cement tests or requirements beyond the standards stated above may be provided to reciprocal state agencies by agreement between the host state and reciprocal state agencies.

Kansas DOT

1. **What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?**

   AASHTO M 85 and AASHTO M 240

2. **Are there additional requirements beyond the national specifications? If so – what are they?**

AASHTO M-85

(1) Determine the fineness of these cements by the air permeability method in accordance with the procedures specified in ASTM C 204.
(2) The fineness of Type II cement is to be in the range of 280 to 400 square meter per kilogram, inclusive.
(3) The time of setting may be determined by use of the Gillmore needles method (AASHTO T 194), or the Vicat needle method (AASHTO T 131). Identify which method is being used on the report. The KDOT will test using the Gillmore method.
(4) The maximum Tricalcium Silicate (C_3S) shown in Table 1 is deleted for Type II cement.
(5) The optional chemical requirement for equivalent alkalis of Table 1A is applicable for Type II cement.
(6) If processing additions are used, report the percentage, composition, and the source of the additions in writing to the KDOT.
(7) Limestone addition: A maximum of 3.0% limestone by mass may be interground with the cement provided that the chemical and physical requirements are met. Only intergrind limestone that is naturally occurring, consisting of at least 70% by mass of one or more of the mineral forms of calcium carbonate. Calculate and report the limestone content in portland cement on the Mill Report as described in ASTM C 150, Annex A1.
(8) Include the CO_2 content of portland cement on the Mill Report. Determine the CO_2 in accordance with ASTM C 114. When the CO_2 content exceeds 1.0% or when any quantity of limestone is added, report the C_3S as calculated in ASTM C 150, Annex A1, using the actual CO_2 value.
(9) Optimized SO_3 – Provide supporting expansion data whenever SO_3 results exceed the requirements stated in AASHTO M 85, Table 1.

AASHTO M 240

(1) Provide a written statement specifying the proportions and materials being blended to produce the blended hydraulic cement, and that the amount of pozzolan or blast furnace slag in the finished cement will not vary more than ± 5.0% by weight of the finished cement from lot to lot or within a lot.
(2) Report the amount retained on the No. 325 sieve, and the fineness by the air permeability method in accordance with the procedures specified in ASTM C 204 at the time of shipment.
(3) Mortar expansion of the finished cement must be within the limits included in Table 2 of AASHTO M240 or the job specific mixture requirements in **subsection 2001.2d.(1)(d).**
(4) The equivalent alkalis, as defined in Table 1A of AASHTO M 85, may not exceed 1.5% in any application. For prequalification, or to increase the equivalent alkalis above current production levels, submit results from ASTM C 441 testing showing mortar expansion within the limits in Table 2 of AASHTO M 240 for the maximum equivalent alkalis level intended for production. Submit a sample to the Engineer of Tests for verification testing. Monthly quality control test reports will be monitored to verify the equivalent alkalis level of regular production remains below this maximum level. If production at a higher level is desired, complete requalification which establishes a new maximum limit will be required.

3. **What is your approval process for cements (including certification by other states)?**

   Prequalification & Certification from manufacturer,

4. **Do you currently allow ASTM C1157 cements? Why or Why Not?**

   No. Something about C-1157 having no control over the foreign material that is not cement that can be added.

5. **Do you currently allow ASTM 595 blended cements? Why or Why Not?**

   Yes. Because it is a good spec.

6. **What are your sampling frequency/testing requirements for QC and/or acceptance?**

   Acceptance is based on manufacturer's certification. No acceptance testing done.

7. **What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?**

   Silica Fume 3% to 7%
   Slag 35% max
   Fly Ash 25% max
   Total Replacement 40% Max

8. **If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?**

   Control over the additions in C1157 like they have over the scms in C595.

Louisiana DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

   We currently use AASHTO M 85 and do allow an ASTM C 595 cement.

2. Are there additional requirements beyond the national specifications? If so – what are they?

   Yes, we generally require one year historical data, but do go to six months in emergency situations.

3. What is your approval process for cements (including certification by other states)?

   Minimum six months of historical data, then rigorous testing by an independent laboratory with a PE licensed in LA signing off on the data and results. After satisfactory laboratory results (independent and in-house), a field trial or two is used to demonstrate its use and satisfactory performance.

4. Do you currently allow ASTM C1157 cements? Why or Why Not?

   No, due to "not enough information" on their performance, and possibly due to the fact that we do not have a locally available source of ASTM C 1157 cement.

5. Do you currently allow ASTM 595 blended cements? Why or Why Not?

   Yes, we have a locally available source that is a IS cement. We also have a couple of sources of IP cements.

6. What are your sampling frequency/testing requirements for QC and/or acceptance?

   Once per month bulk sample analysis (XRD, XRF, Fineness, Soundness)

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

   Limit 50% max grade 100 and grade 20 slag in paving and structural mixtures. Limit 20% max Class C and Class F fly ash in paving and structural mixtures.

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

   More field data showing good performance. Also a detailed cost benefit analysis showing the lower cost of the ASTM C 1157 cements would go a long way.

Michigan DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

   Our current Standard Specifications for Construction reference:
   a. **ASTM C150 for normal Portland cements**
   b. **ASTM C595 for Type I cement blended with Slag Cement and Pozzolans**
   c. **We do not currently permit AASHTO M85, nor ASTM C1157 for Portland cement used in pavement and bridge mixtures**

2. Are there additional requirements beyond the national specifications? If so – what are they?

   Yes – For ASTM C150, the requirements for Gillmore or Vicat setting time and compressive strength for 7 and 28 days apply.

3. What is your approval process for cements (including certification by other states)?

   Portland cement producers may request MDOT certification prior to supplying to department projects. Otherwise, the cement would have to be sampled at the project site and tested in the MDOT central lab on a project-by-project basis. Mill test reports would also be required at the project site. (However, certification is the exclusively preferred method for source acceptance).

   Prior to consideration for certification of a cement production facility, the MDOT central laboratory will review a series of their past monthly mill test reports to assess the continual consistency of quality for the respective cement being produced. The central lab will also request a random sample to be sent to the MDOT central lab for testing.

   MDOT may withdraw a cement producer's certification privilege at any time if cement fails to meet specification requirements, or if the producer fails to comply with biannual certification verification requirements.

4. Do you currently allow ASTM C1157 cements? Why or why not?

   No – See question 8.

5. Do you currently allow ASTM 595 blended cements? Why or why not?

   Yes – We recognize ASTM C595 blended cements as an option, based on economic, environmental, and performance aspects.

6. What are your sampling frequency/ testing requirements for QC and/or acceptance?

   The cement producer is responsible for maintaining control of the quality for their Portland cement during cement production.

   Once a cement plant is certified for use on MDOT projects, random samples are attained in the field from MDOT projects and sent to the central lab for verification testing consideration. A random grab sample representing ten percent of all accumulated samples for each source is then tested for certification verification. In addition, the cement producer must submit biannual mill test reports to the MDOT central lab for review.

   Through an MCC technical task force initiative in the late 1990's, MDOT engaged in a reciprocity agreement with WsDOT to perform random laboratory testing of cement sources that are common to the two Great Lake states.

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

   The MDOT Standard Specifications for Construction permits up to 25 percent Fly Ash (FA) and up to 40 percent Slag Cement (SC) replacement for Type I Portland cement used in both pavement and bridge mixtures. Our Standard Specifications for Construction also permit a ternary blend of FA and SC of up to 40 percent replacement (with the maximum FA proportion of the blend being 15 percent). MDOT is also working with other ternary pre-blended products-currently being addressed through special provision.

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain Portland cement?

   It is MDOT's current technical opinion that the ASTM C1157 performance-based criteria do not place sufficient emphasis toward long-term concrete durability relative to non-restrictive limits on processing additions. In other words, the short-term acceptance criteria described in C1157 may not be interpreted as true "performance-based" as it should, otherwise, correlate to the actual longevity of the in-service concrete.

Minnesota DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

   AASHTO M85

2. Are there additional requirements beyond the national specifications? If so – what are they?

   We have additional restrictions for Blaine Fineness. We also limit the total alkali content for concrete paving.

3. What is your approval process for cements (including certification by other states)?

   Use reciprocity through the original MC2 multi-state agreement. We are in the process of updating the requirements. The current certification process can be found at http://www.dot.state.mn.us/products/concrete/cementandggbfscert.pdf

4. Do you currently allow ASTM C1157 cements? Why or Why Not?

   No, more difficult to verify what the individual components of the cement are. More difficult as DOT is not quite to a performance type specification. Have willingness to try in project specific applications.

5. Do you currently allow ASTM 595 blended cements? Why or Why Not?

   Yes, however our specification needs to be updated. It currently specifies AASHTO M240 and limits the interground fly ash to 20% and the blended fly ash to 15%.

6. What are your sampling frequency/testing requirements for QC and/or acceptance?

   The manufacturers are required to submit monthly interplant samples for verification. In addition, Mn/DOT pulls samples on all projects 1 time every 3 months at ready mix plants or 1 per project, whichever is less.

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

   15% fly ash in general concrete, 30% fly ash in concrete paving and some HPC bridge applications, 35% slag in any concrete. We allow ternary mixes in mass concrete and some precast applications.

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

   Acceptance by AASHTO and additional data showing benefits of use for the Agency including performance characteristics including durability/permeability, strength, etc. We would also like to see consistency of the material properties.

Missouri DOT

1. **What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?**

M85 Type I and III for Portland cements, M240 for Blended cements and C1157 GU for performance based cements.

2. **Are there additional requirements beyond the national specifications? If so – what are they?**

Any additional requirements or modifications are listed in our internal section 1019 of the Missouri Standard Specifications for Highway Construction manual. Our only modification to M85 specifies 420 m^2/kg maximum for all Type I Portland cements using the Air Permeability (Blaine) fineness.

3. **What is your approval process for cements (including certification by other states)?**

Our approval process for cements are listed in section 1019 subsection 1019.3.1 Manufacturer Qualification. It includes a written letter requesting approval from the manufacturer, Quality Control Plan outlying the process from the quarry to the point where the product is sold to the customer. The QC Plan includes all tests required by the specification and includes the testing frequency for each test. A copy of the most recent CCRL inspection report and latest CCRL proficiency sample report for all appropriate manufactured cements. Documentation showing satisfactory resolution of any deficiencies shall be included. The physical layout of the plant, including the number and capacity of finish mills and silos and type of cement stored in each silo. A copy of a typical bill of lading with the required certification statement. Required certification statement is listed under section 1019 subsection 1019.4.1. A split sample of each type of cement proposed for use. Manufacturer test results for the split sample shall also be submitted.

In order to maintain qualification, monthly quality control test results covering the production of cement types proposed for use in MoDOT projects, including the high, low and average of each type shall be forwarded to MoDOT upon manufacturer completion. A copy of the most recent CCRL inspection and proficiency sample reports and any deficiency resolutions shall be forwarded to MoDOT. Semi-annual split samples for each type of approved cement will be obtained for comparison testing with manufacturer. All QC tests shall be available for a minimum of 3 years, for MoDOT review upon request. Only cement in compliance with these specifications shall be allowed into a silo destined for MoDOT projects.

4. **Do you currently allow ASTM C1157 cements? Why or Why Not?**

Yes, C1157 GU cement is listed in our internal section 1019 to accommodate manufacturers producing this type of product and provides a specification for acceptance of the material. MoDOT has utilized C1157 Type HE cement. However, this has been accepted on a project-to-project basis and is not currently listed as an approved product.

5. **Do you currently allow ASTM 595 blended cements? Why or Why Not?**

MoDOT lists blended cements under M240 specification. We allow blended cements with up to 25% slag, Class C and F fly ash. In addition, we allow Type IP cements with silica fume. Since MoDOT allows ternary blends in concrete, this has been accomplished utilizing Type IS (20-25) blended cements with Class C fly ash.

6. **What are your sampling frequency/testing requirements for QC and/or acceptance?**

MoDOT requires 2 semi-annual plant samples to maintain certification of all approved manufacturers. MoDOT personnel at each specific plant collect these samples. All M85 Type I and M240 cements are accepted based off of 3 and 7-day mortar strengths (1 and 3-day mortar strengths for M85 Type III), as well as other applicable physical and chemical requirements. If semi-annual plant samples are manufacturer submitted, a copy of the bill of lading ticket will be requested with the appropriate sample. This verifies sample date, silo #, etc. for authenticity. Also, other types of cement (i.e. blended cements, Type III) might be requested from the manufacturer to maintain status of the appropriate cement for any future concrete mix designs. District inspectors sample cement and other SCM's at concrete producers approved for MoDOT projects on a monthly basis. During MoDOT projects, district inspectors will also sample cement and other SCM's depending on the tons of material used for the project.

7. **What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?**

MoDOT has the following limitations on the use of supplementary cementitious materials:
Slag – Maximum 30% for all concrete classes
Fly Ash Class C – Maximum 25% for all concrete classes
Fly Ash Class F – Maximum 25% for all concrete classes
Silica Fume – Maximum 8% for all concrete classes except Modified B-2
Silica Fume – 6 to 8% for Modified B-2

Ternary mixes are allowed for all concrete classes. Supplementary cementitious materials may be used to replace a maximum of 40 percent of the portland cement. The amount of each supplementary cementitious materials used in a ternary mix shall not exceed the limits specified above.

8. **If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?**

MoDOT specifies AASHTO specifications. If AASHTO specifications do not exist ASTM specifications are used. MoDOT does allow Type GU (General Use) cement as specified in ASTM C1157. When appropriate Type HE cement as been specified to provide contractors options for designing concrete mixes that need to achieve strength quickly. To date, we have little experience with ASTM C1157. Use will probably increase as MoDOT gains experience with this type of cement.

Ohio DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

   For TYPES I, IA, II and III we specify ASTM C 150; We also allow slag modified cement in accordance with ASTM C 595, maximum amount of slag = 25%

2. Are there additional requirements beyond the national specifications? If so – what are they?

   None at this time

3. What is your approval process for cements (including certification by other states)?
   a. The approval process is in ODOT Supplement 1028. The Manufacturer provides the following:
      i. Initial Submittal:
         1. Certify, in writing, that the cement meets ODOT / ASTM requirements
         2. Test data for the last year's production
         3. Test facility must be CCRL inspected
         4. Warrant the department against costs involved in corrective action required in the case of a non-spec cement being used
         5. 1 gallon sample
      ii. Once the cement is certified:
         1. The producer submits (electronic) monthly summary of daily test data for each type of certified cement produced.
         2. The producer maintains CCRL inspection for each tour. Submit a copy of the report and corrections on footnoted items.
         3. Producer maintains records for 5 years
         4. The Producer indicates on the Bill-Of-Lading that the material is ODOT Certified
         5. ODOT samples cement twice a year from each active Ready Mix plant for testing at the central lab.
      iii. A plant can be removed from certification if:
         1. Failure to submit monthly data / data does not meet specifications
         2. Lab not CCRL inspected
         3. Failure of samples
            a. 2 failures of ASTM requirements in a series of 10 samples
            b. 3 failures for air content in 10 samples

4. Do you currently allow ASTM C1157 cements? Why or Why Not?

   No - C 150 seems to be working fine… How does changing to C 1157 benefit the Department?

5. Do you currently allow ASTM 595 blended cements? Why or Why Not?

   Yes – only on a limited basis – maximum 25% slag. Generally separate constituent materials are used and batched at the Ready mix plant.

6. What are your sampling frequency/testing requirements for QC and/or acceptance?

   ODOT samples cement twice a year from each active Ready Mix plant for testing at the central lab. Samples are sent to the Central Lab for testing in accordance with ASTM C 150.

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

   Our QC/QA mixes allow:

   - 30% (max) Slag Cement
   - 25% (max) Fly Ash
   - 10% (max) Silica Fume
   - 50% (max) Blend of above cementitious materials (ie: 30 slag; 15% FA; 5%SF; & 50% Cem)

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

   Explain how it benefits the Department to change

Oklahoma DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

   ODOT uses AASHTO M85, AASHTO M240 and ASTM C1157.

2. Are there additional requirements beyond the national specifications? If so – what are they? Yes.

   M85

   Report 325 Sieve results.
   Total equivalent alkalis ≤ 0.95 % or meet Option R of C1157
   Type I cement $C_3A \leq 15\%$
   Type IV and Type V Cements shall meet optional physical requirements.
   Optimum SO_3 allowed when supporting data is provided.

   M240

   Report 325 Sieve and Fineness by air permeability (Blaine) results.
   Total equivalent alkalis ≤ 0.95 % or meet Option R of C1157
   $C_3A \leq 15\%$
   Test and report SiO_2, Al_2O_3, and CaO.
   Optimum SO_3 allowed when supporting data is provided.
   Cement substitutions limited by addition type

   C1157

   Report 325 Sieve and Fineness by air permeability (Blaine) results.
   Total equivalent alkalis ≤ 0.95 % or meet Option R of C1157
   $C_3A \leq 15\%$
   Loss on ignition $\leq 5.0\%$
   Cement substitutions limited by addition type.

3. What is your approval process for cements (including certification by other states)?

   A written request must be submitted by a domestic cement manufacturer that produces a cement meeting the requirements of M85, M240 or C1157.

   The cement manufacturer shall send a copy of their detailed quality system manual to ODOT for review, a 1 gallon sample of each type of cement to be approved, the results of their last CCRL audit, and a list of other State DOT's that have approved their facility.

   An onsite inspection of the facility will be made unless ODOT deems the visit would not be economical.

   When all issues have been resolved, a quality control agreement will be established between the cement manufacturer and ODOT.

4. Do you currently allow ASTM C1157 cements? Why or Why Not?
   Yes. There was a series of meetings between the Cement industry and ODOT about 10 years ago and the result of those meetings was the adoption of C1157.

5. Do you currently allow ASTM C595 blended cements? Why or Why Not?
   Yes. There was a series of meetings between the Cement industry and ODOT about 10 years ago and the result of those meetings was the adoption of M240.

6. What are your sampling frequency/testing requirements for QC and/or acceptance?
   The Cement plant must run a daily composite sample. It must report by email or letter to ODOT each month the high, low and average test result for each required parameter.
   The cement plant is to send a sample of the cement it produces to ODOT quarterly.
   ODOT pulls random test samples in the field during projects.

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

   Substitution limits for portland cements:

Fly ash only	20%
Slag only	50%
Silica Fume only	10%
Combinations	50%, with the same individual limits above.

Substitution limits for Blended cements:

IP (XX)

Fly ash only	30% - (XX)
Slag only	50% - (XX)
Silica Fume only	10%
Combinations	50%, with the same individual limits above.

IS (XX)

Fly ash only	20%
Slag only	50% - (XX)
Silica Fume only	10%
Combinations	50%, with the same individual limits above.

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

   ODOT does allow blended cements, but with the changes to M85 (C150) there really are no plain portland cements any longer.

Pennsylvania DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)? **AASHTO M 85 and AASHTO M 240**

2. Are there additional requirements beyond the national specifications? If so – what are they? **No**

3. What is your approval process for cements (including certification by other states)?
   Each producer wishing to have their cement approved must fill out an application which requires the following information:
   1) **General Product Information**
   2) **Plant and Product Quality Control Plan**
   3) **Independent Test Result showing that the material meets the departments requirements for the product**
   4) **Other state DOT's FHWA or any other National Transportation Agency where the product is approved.**

   Once all of the required information is accepted the suppler must submit a sample of the cement for our lab to test (to see if it meets the specifications).

4. Do you currently allow ASTM C1157 cements? Why or Why Not? **No**

5. Do you currently allow ASTM 595 blended cements? Why or Why Not? **Yes**
   It reduces mixing water, enhances sulfate resistance, helps prevent alkali-silica reaction and lessons heat of hydration.

6. What are your sampling frequency/testing requirements for QC and/or acceptance?
   We require each approved cement supplier to submit a split sample of each type of approved cement every month for testing. We also randomly collect field samples for testing. The samples must meet the required AASHTO test method.

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?
   If fly ash is used, the Portland cement portion can be reduced by a maximum of 15%. If ground granulated blast furnace slag is used, the Portland cement portion can be reduced by a minimum of 25% to a maximum of 50%. We do not allow fly ash and ground granulated blast furnace slag to be placed in the same mix.

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

South Dakota DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

M85

2. Are there additional requirements beyond the national specifications? If so – what are they?

All cements shall have a max of 0.6 % Alkalies.

3. What is your approval process for cements (including certification by other states)?

We have them supply multiple certifications with the mix design for new or different cements.

4. Do you currently allow ASTM C1157 cements? Why or Why Not?

No – no chemical requirements.

5. Do you currently allow ASTM 595 blended cements? Why or Why Not?

No – testing of final product and getting % of blend desired.

6. What are your sampling frequency/testing requirements for QC and/or acceptance?

One sample per 12,500 yd3 of paving. Structures require one sample per type per contract.

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

Fly Ash (type F Mod.) 15 to 20%

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

Enough need or benefit.

Texas DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

ASTM C 150 and C 595

2. Are there additional requirements beyond the national specifications? If so - what are they?

Additions to ASTM C 595. Type IP Portland-pozzolan cements must have a pozzolan constituent between 20 and 40% by mass. The pozzolan must be a Class F fly ash. Type IS Portland blast-furnace slag cements must be Type IS (>35).

3. What is your approval process for cements (including certification by other states)?

Review of producers' previous 6 months physical and chemical data and quality control program along with testing of pre-qualification samples to verify compliance.

4. Do you currently allow ASTM C1157 cements? Why or why not?

TxDOT does not specify ASTM C 1157 cement because the performance base tests for durability do not provide adequate assurance of long term performance of the concrete.

5. Do you currently allow ASTM 595 blended cements? Why or why not?

Yes we allow ASTM C 595.

6. What are your sampling frequency/ testing requirements for QC and/or acceptance?

After initial pre-qualification sampling and approval, monthly samples are required.

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

20 to 35% for Class F fly ash

35% to 50% GGBF slag or MFFA

35% to 50% with a combination of Class F fly ash, GGBFS, MFFA, UFFA, metakaolin, or silica fume. However, no more than 35% may be fly ash, and no more than 10% may be silica fume.

35% to 50% with a combination of Class C fly ash and at least 6% of silica fume, UFFA, or metakaolin. However, no more than 35% may be Class C fly ash, and no more than 10% may be silica fume.

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

With the direction ASTM c 150 has taken over the last several years by allowing more "filler" materials, TxDOT does not see a need to begin specifying ASTM C 1157 cements.

Wisconsin DOT

1. What cement specifications are used in your state (e.g. ASTM C150, AASHTO M 85, ASTM C1157, ASTM C595)?

WisDOT specifications currently recognize the use of cement conforming to ASTM C150 and ASTM C595.

2. Are there additional requirements beyond the national specifications? If so – what are they?

There are no additional materials requirements for the cements themselves. However, we do have the recordkeeping requirement that shipping documents must show limestone addition and process addition contents (if either is above 1%).

3. What is your approval process for cements (including certification by other states)?

- **We have a plant certification process directly with the cement plants.**
- **We use test data from MDOT to verify cement quality from plants in Michigan.**
- **We pull random field samples of cement on a very limited basis for certified sources.**

4. Do you currently allow ASTM C1157 cements? Why or Why Not?

No. All cements marketed in our area have been certified under traditional C150 or M85 specifications.

5. Do you currently allow ASTM 595 blended cements? Why or Why Not?

Yes. We require or allow the use of supplementary cementitious materials in most of our concrete mixes. Allowing C595 blended cements helps concrete producers with limited silo capacity to achieve binary or ternary mixes. Also, with the blended cements, the SCM's are very well blended as received, while contractors have sometimes had difficulty with achieving uniform mixes with field addition of GGBFS, especially at high replacement rates.

6. What are your sampling frequency/testing requirements for QC and/or acceptance?

- **One sample per 2000 tons for non-certified sources.**
- **Random and fairly infrequent for certified sources (Once/year/Region/mill/type)**

7. What are your current limitations on amounts of supplementary cementitious materials, including ternary mixtures?

Up to 30% replacement of Portland cement by weight at a 1:1 replacement ratio. The 30% applies to fly ash, slag, or combination of both.

8. If you do not currently specify an ASTM C1157 cement or an ASTM C595 blended cement, what information or circumstances would cause you to begin specifying either of these alternatives to plain portland cement?

Our current specs have served us well. I think the only thing that would drive us toward the C1157 specs is if the marketplace in our area started switching over to C1157 products, and the C150 products became harder to find. We have nothing against C1157 products in concept, we just see no reason to change right now.