a. Description.
This special provision establishes Portland Cement Concrete (PCC) Quality Control (QC) and Quality Assurance testing for all Road Commission for Oakland County (RCOC) roads and projects. The Contractor will be responsible for all QC testing and RCOC will be responsible for all acceptance testing. The PCC mixture shall be provided to meet the requirements of the 2012 Michigan Department of Transportation (MDOT) Standard Specifications for Construction except where modified herein.

b. Terminology.
1. Air Content of Fresh Concrete. The recorded total air content of fresh concrete sampled and tested according to this special provision.
2. Concrete Mix Design. The process by which the concrete mixture performance characteristics are defined based on selected materials, performance requirements, environmental exposure considerations, placement methods and other factors that control the plastic and hardened properties of the concrete in efforts to produce an economical and durable product.
3. Job Mix Formula (JMF). The actual batch quantities (mixture proportions) of each constituent included in the concrete mixture, based on adjustments to the target weights from the mix design, necessary to optimize the concrete mixture properties. Submit mix design and JMF on the MDOT Job Mix Formula Concrete Field Communication form or similar form, and include all accompanying documentation.
4. Quality Assurance (QA). Activities administered by the Road Commission for Oakland County (RCOC) dealing with acceptance of the product, including, but not limited to, materials sampling, testing, construction inspection, and review of Contractor QC documentation. All concrete QA sampling and testing will be performed by the Engineer.
5. Quality Control (QC). All activities administered by the Contractor to monitor, assess and adjust production and placement processes to ensure the final product will meet the specified levels of quality, including, but not limited to, training, materials sampling, testing, project oversight and documentation.
6. QC Action Limits. A range of values established by the Contractor and approved by the Engineer in the QC plan that, if exceeded, requires corrective action be taken by the Contractor to restore the continuity and uniformity of the mixture and methods in conformance with specification requirements. The QC action limits must not exceed the QC suspension limits.
7. QC Plan. The project-specific plan developed by the Contractor describing, in detail, all aspects of production and construction for the project to ensure consistent control of quality to meet specification requirements.

8. QC Plan Administrator. An employee of or consultant engaged by the Contractor, responsible for developing and overseeing all aspects of QC for the project. The duties of this individual include, but are not limited to, preparing the QC plan, managing the Contractor QC personnel, communicating routinely with the production personnel to ensure quality, initiating corrective action and suspending operations when the process is found to be producing non-conforming materials, and preparing and submitting all necessary QC documentation to the Engineer within the specified time period.

9. QC Suspension Limits. The Minimum or Maximum values per the specifications for Total Air Content of Fresh Concrete, Concrete Temperature and Slump of Concrete which, if exceeded on a single QC test, requires that the Contractor suspend operations and determine, correct, and document the deficiencies before resuming production. The Engineer must approve all changes prior to resuming production. The QC suspension limits must not exceed specification requirement thresholds.

10. Strength Test Results. An initial strength test result consists of the average 28-day compressive strength of two companion 6-inch by 12-inch, or 4-inch by 8-inch cylinders taken from the same sample of concrete is considered a strength sample test result. 4-inch by 8-inch cylinders are only permitted if the nominal maximum coarse aggregate particle size, as specified for coarse aggregate in mixture is 1-inch or less. If either non-destructive testing or coring is required, a test result is one reading taken with an approved non-destructive test instrument of compressive strength or one concrete core.

11. Supplementary Cementitious Materials. A mineral admixture (slag cement, fly ash) used to replace a portion of the Portland cement, either individually or as a blended cement in the concrete mixture.

12. Small Incidental Quantity. A single day’s placement of 20 cubic yards or less of concrete used for non-structural or non-pavement related applications, including but not limited to curb and gutter, sidewalks and sidewalk ramps (excluding driveways and driveway ramps), installing sign or fence posts, guard rail or cable rail foundations (excluding end anchorage foundations), or other contract items where the small quantity of concrete is not paid for separately as approved by the Engineer.

13. Design strength, 28 day compressive strength, compressive design strength of concrete mixture, required design strength - as specified in Table 1 of this Special Provision.

c. Contractor Administered Quality Control Plan.
Contractor Quality Control Plan: Prepare, implement and maintain a Q/C plan specific to the project for concrete that will provide quality oversight for production, testing and control of construction processes. The Q/C plan must identify all procedures used to control production and placement including when to initiate corrective action necessary to maintain the quality and uniformity of the work.

All concrete placed is required to be tested for Quality Control.
Develop concrete mix designs and JMF(s) as specified and conduct QC sampling, testing and
inspection during all phases of the concrete work at the minimum frequency or at an increased
frequency sufficient to ensure that the work conforms to specification requirements.

Project specific items and quality characteristics required in the Q/C plan include, but are not
limited to, the following:

1. Organization chart.
2. Q/C Plan Administrator and contact information.
3. The name(s) and credentials of the Q/C staff.
4. Methods for interaction between production and Q/C personnel to engage timely
   corrective action, including suspension of work.
5. Coordination of activities.
6. Documentation, procedures and submittals.
7. Project and plant specifics.
8. Concrete production facilities inspections and certifications.
9. Current testing equipment calibration documentation including calibration factor.
10. Testing and initial field curing facilities for Q/C strength specimens.
11. Corrective action plan.
12. Mixing time and transportation, including time from batching to completion of delivery and
    batch placement rate (batches per hour), along with the manufacturer’s documentation
    relative to the batching equipment’s capabilities in terms of maximum mixing capacity and
    minimum mixing time.
13. Placement and consolidation methods including monitoring of vibration, depth checks and
    verification of pavement dowel bar alignment.
    and placement.
15. Hot and cold weather protection considerations and methods.
16. Control charts with action and suspension limits.
17. Stockpile management plan
18. Concrete mix design(s) & JMF(s).
19. The frequency of sampling and testing.
20. Handling, protection and transportation of strength specimens.
22. Ride quality control.
Submit the Q/C plan, for the appropriate items of work, to the Engineer for review a minimum of 10 working days before the start of related work. Do not begin concrete placement before approval or acceptance of the Q/C plan by the Engineer. The Engineer will notify the Contractor of any objections relative to the content of the Q/C plan within 5 working days of receipt of the Q/C plan. Working days include Monday through Friday, excludes Saturday, Sunday and Holidays. If the approved QC plan fails to provide acceptable work or acceptable control of the work, the Engineer may require the Contractor to revise the QC plan. Revisions to the QC plan must be approved by the Engineer prior to resuming work.

Q/C Records: Maintain complete records of all Q/C tests and inspections. Document what action was taken to correct deficiencies. Include sufficient information to allow the test results to be correlated with the items of work represented.

Furnish one copy of all Q/C records and test reports to the Engineer within 24 hours after the date covered in a format acceptable to the Engineer. The Engineer will withhold acceptance of the concrete for failure to provide properly documented and timely Q/C records and reports.

Personnel Requirements: The Q/C Plan Administrator must have full authority and responsibility to take all actions necessary for the successful implementation of the Q/C plan, including but not limited to, the following:

1. Monitoring and utilizing Q/C tests, control charts and other Q/C practices to ensure that delivered materials and proportioning meets specification requirements.
2. Monitoring materials shipped to the project, prior to their use, to ensure their continued compatibility toward producing consistent quality.
3. Periodically inspecting all equipment utilized in transporting, proportioning, mixing, placing, consolidation, finishing, and curing to ensure conformance with specification requirements.
4. Monitoring materials stockpile management, concrete batching, mixing, transporting, placement, consolidation, finishing and curing to ensure conformance with specification requirements.
5. Maintaining and submitting all Q/C records and reports.
6. Directing the necessary corrective action to ensure continual conformance within the Q/C action limits.
7. Suspending production for the project when suspension limits are exceeded.
8. Conducting or monitoring adjustments to the concrete mix design.

Individuals performing designated Q/C tests must be certified concrete technicians through a program certified by the Michigan Concrete Association (Michigan Level I or II) or through the Michigan Concrete Paving Association (Level I or II three year certification program).
d. Concrete Mix Design and Documentation.

All concrete mix designs and JMF’s will be contractor provided. Select proportions for concrete mixtures according to ACI Standard 211.1. Aggregates, water, cement and supplementary cementitious materials shall be combined as necessary to produce a mixture meeting the requirement specified in Table 1 of this Special Provision. Provide the grade of concrete for the section number reference application specified in Table 1, or as specified in the contract documents. Unless specified otherwise, concrete mixtures using optimized aggregate gradation may be used in lieu of standard concrete mixtures for other applications, as approved by the Engineer. The PCC mixes shall also conform to RCOC Special Provision for Alkali-Silica Reactivity also included in this proposal.

Prepare one or more mix designs, JMF’s for each grade of concrete required on the project. Submit mix designs, including all required documentation, to the Engineer for review a minimum of 10 working days before the anticipated date of placement. The Engineer will notify the Contractor of any objections within 5 working days of the mix documentation. Number or otherwise identify each JMF and reference all accompanying documentation to the JMF number. Reference each JMF to the appropriate method of verification. Mix design, JMF submittals that do not include all required documentation will be considered incomplete and the Engineer will return them without review.

Submit each proposed mix design and JMF on the MDOT Concrete Field Communication form (1976) or a form that is similar, and include accompanying documentation. List the source of materials, specific gravity of constituents, aggregate absorption, dry weights, dry loose and dry rodded unit weight of coarse aggregate, aggregate correction factors, batch weights, project specific or historical laboratory test data. The compressive strength of concrete cylinders tested and/or reported as part of the mix design submitted must meet the verification strength requirements. Mix designs and their accompanying JMFs must include a statement signed by a certified concrete technician that all applicable standard test methods have been followed in verifying the mix design and JMF.

All Concrete Grades will require 25 to 40 percent replacement of Portland cement in the concrete mixture with slag cement (Grade 100 minimum) and or fly ash.

Ensure supplementary cementitious materials are from an MDOT Approved Manufacturer. Slag cement must meet the requirements of subsection 901.06 and Fly Ash must meet the requirements of subsection 901.07 of the 2012 Standard Specifications for Construction.

Use the combined weight of all cementitious materials to determine compliance with the maximum water-cementitious ratio and cementitious material content requirements specified in Table 1 of this Special Provision.

Unless otherwise specified in the contract, set accelerating admixtures are prohibited.

Unless otherwise specified in the contract, provide either concrete Grade P1 or Grade D for bridge approach slab applications.
Table 1: Minimum Mix Design Requirements for Concrete

<table>
<thead>
<tr>
<th>Mix Design Parameter</th>
<th>Grade of Concrete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Grade (g)</td>
<td>P1M (a,b,e)</td>
</tr>
<tr>
<td></td>
<td>P1 (a,b)</td>
</tr>
<tr>
<td></td>
<td>D, DM (a,b,e)</td>
</tr>
<tr>
<td></td>
<td>T (a)</td>
</tr>
<tr>
<td></td>
<td>S1 (a)</td>
</tr>
<tr>
<td></td>
<td>S2, S2M (a,b,e)</td>
</tr>
<tr>
<td></td>
<td>S3, P2 (a)</td>
</tr>
<tr>
<td>28-day compressive strength (psi)</td>
<td>3500</td>
</tr>
<tr>
<td>14-day compressive strength (psi)</td>
<td>3000</td>
</tr>
<tr>
<td>Maximum Water / Cementitious Ratio Lb/lb (c)</td>
<td>0.45</td>
</tr>
<tr>
<td>Cementitious Material Content Lb/yd3 (d)</td>
<td>470-564</td>
</tr>
<tr>
<td>Air Content (percent)</td>
<td>5.0 – 8.5</td>
</tr>
<tr>
<td>Slump (inch) (maximum)</td>
<td>(f)</td>
</tr>
</tbody>
</table>

Section Number Reference (h) 602, 603 602, 603, 801, 802, 803, 810 706, 711, 712 706, 718 705 401, 706, 712, 713, 718, 801, 802, 803, 810, 819 402, 403, 602, 803, 804, 806, 808, 810, 813, 814

a. If the local average minimum temperature in the next 10 consecutive days is forecast to be below 40 degrees (F), submit a revised QC plan for the Engineer’s approval, addressing in detail changes in materials, concrete batching and mixing processes, construction methods, curing, and protection of the in situ concrete to ensure that the necessary quality characteristics of the hardened concrete product will not be compromised as a result of the cold weather. The revised QC plan must be approved by the Engineer prior to cold weather concrete placement. Do not remove supplementary cementitious material from the concrete mixture.
b. Use aggregates from only geologically natural sources for pavement, shoulder, miscellaneous pavement (including ramps), concrete pavement overlay, bridge approach slab, structural concrete, drilled shaft, bridge railing, and bridge sidewalk applications.
c. Use admixtures as listed in the Qualified Products Lists to reduce mixing water. Ensure concrete in concrete diaphragms contain a water-reducing admixture, or a water-reducing retarding admixture. For night casting, the Contractor may use a water-reducing admixture instead of water-reducing retarding admixture. When the maximum air temperature is not forecast to exceed 60 degrees F for the day the Contractor may use a water-reducing admixture or a water-reducing retarding admixture. Use the combined weight of all cementitious materials to determine compliance with the maximum water / cementitious ratio.
d. Type III cement is not permitted.
e. For grades of concrete requiring optimized gradation, aggregates must meet the physical requirements specified in subsection 902.03C of the Standard Specifications for Construction and all other contract documents.
f. The maximum slump for P1, P1M, and P2 concrete is 3 inches or as documented on the approved JMF. All other grades of concrete will be according to table 701-1 of the Standard Specifications for Construction.
g. The volume (oven-dry-rodded) of coarse aggregate per unit volume of concrete must be 65 percent minimum. For concrete mixtures using optimized aggregate gradation, the above specified volume of coarse aggregate per unit volume of concrete includes the intermediate aggregate.
h. Section Number Reference:
   401 Pipe Culverts 602 Concrete Pavement Construction
   403 Drainage Structures 705 Foundation Piling
   603 Concrete Pavement Restoration 711 Bridge Railings
   706 Structural Concrete Construction 713 Bridge Rehabilitation-Steel
   712 Bridge Rehabilitation-Concrete 801 Concrete Driveways
   718 Drilled Shafts 803 Concrete Sidewalk, Sidewalk Ramps and Steps
   802 Concrete Curb, Gutter and Dividers 806 Shared Use Paths
   804 Concrete Barriers and Glare Screens 810 Permanent Traffic Signs and Supports
   808 Fencing 814 Paved Ditches
   813 Slope Protection 819 Electrical and Lighting
Methods of verification of proposed concrete mix designs that are acceptable:

1. **Method 1 - Trial Batches.** Produce trial batches with the same materials and proportions proposed for use on the project. Prepare at least one trial batch for each concrete mix design in sufficient time before starting concrete placement to allow for review according to section d. of this special provision. Provide the results of temperature, slump, density (unit weight) and air content of fresh concrete, 28-day compressive strength and age of concrete at the time of strength testing, for a minimum of three independent samples. For concrete mix design trial batch verification purposes only, 7 day compressive strength test results which report at least 70 percent of the specified 28 day compressive strength in table 1 will be sufficient documentation in lieu of 28-day compressive strengths. The average of at least two strength test specimens represents one compressive strength sample test result. A JMF will be considered approved for use only if all of the physical properties of the concrete (as described above) are within specification limits.

2. **Method 2 - Same Mix Design.** Verification based on experience with the same mix design, JMF and same materials. Provide the results of temperature, slump, density (unit weight), air content and 28 day compressive strength and age of concrete at the time of strength testing for a minimum of three independent samples. The average of at least two strength test specimens represents one compressive strength sample test result. Do not substitute material types or sources, including admixtures, cement, slag cement, fly ash or change mix proportions in JMF. A concrete mix will be considered approved for use only if all of the physical properties of the concrete are within specification limits.

3. **Method 3 - Similar Mix Design.** Verification based on experience with a concrete mix design, JMF similar to the proposed mix design that used similar coarse aggregate materials. Substitution of coarse and intermediate aggregate sources is permitted only if the new source is of the same geologic type and meets minimum physical properties as the original aggregate and conforms to the specification requirements for the respective application. Substitution of fine aggregate is permitted only if the new source has been tested for Alkali-Silica Reactivity and meets RCOC ASR Special Provision also included in the proposal.

   Provide the supporting laboratory test documentation as for Method 1. Include all material properties for the original and substituted aggregates. Submit calculations showing how the mix proportions in the mix design were adjusted, based on the documented differences in relative density (specific gravity), Bulk density (unity weight) and absorption of the substituted aggregate sources, to produce a theoretical yield of 100 percent.

4. **Method 4 - Annual Verification.** At the Department’s option, verification may be accepted annually for a concrete producer rather than on a project basis provided the sources and proportions of the constituent materials, including cement, slag cement, fly ash and admixtures do not change. If the project is the continuation of work in progress during the previous construction season and written certification is submitted to the Engineer that materials from the same source and with the same mix design properties are to be used, the Engineer may waive the requirement for verification of mix designs for the project.

e.  Quality Control.
Sampling and Testing. The following are the minimum concrete quality control sampling and testing requirements.

When directed by the Engineer sample and test all material that appears inconsistent with similar material being sampled, unless the material is removed and replaced or corrected.

1.  Concrete Yield Determination. After the start of the first concreting operation for each mix design and immediately after the specified slump and total air content have been attained, determine density (unit weight). The average of the density (unit weight) from three different batches will be the density (unit weight) of the concrete. Determine the actual yield using this density (unit weight) and adjust the mix design to correct the actual yield to correspond to the theoretical yield. The Engineer shall be notified and approve any adjustment to be made to the mix design.

As work progresses, verify the actual yield. If the yield based on a single density (unit weight) determination differs from the theoretical yield (adjusted for differences in air content) more than plus or minus 2 percent of the mix design (JMF) theoretical yield, make two additional density (unit weights) determinations. Use the average of the three determinations as the density of the concrete. Determine the yield from the average unit weight, and again adjust the mix design to correct the actual yield to correspond to the theoretical yield.

2.  Concrete Temperature, Slump and Total Air Content Determination. Conduct sampling and testing for temperature, slump, and total air content on the first load, and on subsequent loads if directed by the Engineer, for each grade of concrete delivered to the work site each day. Do not begin concrete placement until quality control tests verify that the concrete meets specifications.

During concrete placement, test for temperature, slump and air content of the concrete at a minimum of once per hour.

No concrete that is found to be out of specification for temperature, slump or air content shall be placed. Quality control personnel shall stop the concrete placement and if possible, correct the deficiency. If the deficiency cannot be corrected, the load shall be rejected and the next load(s) shall be tested. The RCOC reserves the right to halt concrete production if the quality control personnel are not present, do not have the appropriate equipment at the start of the first concreting operation for each mix design, or are not performing QC tests in accordance with the QC plan at the required frequency and in accordance with the prescribed test methods.

3.  Concrete Strength Determination. Determine the 28 day concrete compressive strength on samples taken at least once every 200 cubic yards of a specific mix design, except that no less than one or more than four samples, evenly spread throughout day, need to be taken for one day’s production of the mix. A single strength test will consist of two 6-inch X 12-inch or 4-inch X 8-inch cylinders. Size of cylinders to be used, see subsection b.10.

4.  Loading on the New Concrete. Loading on the new concrete shall be determined by Contractor-made, early break field cured compressive strength cylinders. The Engineer will establish field curing criteria. The required strength for opening to traffic or adjacent
paving/backfill strengths shall be at least 75% of the 28-day design strength per Table 1 of this Special Provision. RCOC shall follow section 706.03 in the MDOT Standard Specifications for Construction for minimum allowable strength in structural, superstructural and substructural concrete for adjacent concrete placement, form removal, and allowable loading. Refer Table 1 of this Special Provision for minimum compressive strengths of concrete. All compressive strength cylinders to be broken prior to 28 days shall be the responsibility of the Contractor. The early break results shall be submitted to the Engineer electronically or in writing for determination if adjacent work is allowable according to the above referenced standards.

**Table 2: QC Action and Suspension Limits**

<table>
<thead>
<tr>
<th>Quality Characteristic</th>
<th>Action Limits</th>
<th>Suspension Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Content (percent)</td>
<td>See Note Below</td>
<td>&lt; 5.0 or &gt; 8.5</td>
</tr>
<tr>
<td>Air Content Loss (percent)</td>
<td>As Defined in the Contractors QC Plan</td>
<td>See f.5</td>
</tr>
<tr>
<td>Concrete Temp (Deg F)</td>
<td></td>
<td>&lt; 45 or &gt; 90 at time of placement</td>
</tr>
<tr>
<td>Slump (Max) (inch)</td>
<td></td>
<td>See table 1, footnote (f)</td>
</tr>
<tr>
<td>Density (unit weight)</td>
<td>See e.1</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Note: Action limits must be defined in the Contractor QC plan and cannot be < 5.5 or > 8.0 percent.

**f. Quality Assurance.**

1. Acceptance sampling and testing will be performed by RCOC using an appropriate, customary, and generally accepted sampling and testing option selected by the Engineer. Individuals performing designated Q/A tests must be certified concrete technicians through a program certified by the Michigan Concrete Association or through the Michigan Concrete Paving Association Level I or II three year certification program.

2. The Engineer will maintain a complete record of all QA tests and inspections. The records will contain, as a minimum, signed originals of all QA test results and data. QA test results will be given to the Contractor within 5 working days of request as long as Contractor has supplied corresponding QC test result to Engineer.

3. Each day of production, the RCOC will determine the number of 28-day compressive strength samples to be taken for each mix type. The average of at least two 6-inch X 12-inch or 4-inch X 8-inch strength test specimens represents one compressive strength sample test result. Acceptance testing will be performed at a minimum frequency of once per day, per mix design.

At the option of the Engineer, small incidental quantities as defined in subsection b.12 of this special provision may be accepted (visually inspected and noted on the Inspector’s Daily Report) without testing for temperature, slump and air content and daily 28-day compressive strength QA test specimens. One set of compressive strength QA test specimens will be molded along with QA testing for temperature, slump and air content of fresh concrete for each small incidental quantity per JMF at least once per week during production.
The Engineer may require the following corrective action or pay adjustments based on the compressive strength of concrete.

A. Require the Contractor to remove and replace the concrete at no cost to the RCOC or Department, if the compressive strength test result(s) show that the material is more than 500 (PSI) below the required design strength.

B. The Engineer will determine if the concrete has sufficient structural strength and, if so, will adjust the contract unit price for affected pay items and quantity represented based on the following formula, if the tested strength is less than the compressive design strength (CDS):

\[
\text{Adjusted Contract Unit Price} = \text{Contract Unit Price} - (\text{contract Base Price} - \text{Adj. Base Price})
\]

\[
\text{Adj. Base Price} = \frac{\text{Test Strength}}{\text{CDS}} \times (\text{contract Base Price})
\]

\[
\text{CDS} = \text{Compressive Design Strength of Concrete Mixture}
\]

If the tested strength is greater than CDS, no adjustment will be made.

C. Allow the Contractor to submit a plan, for approval by the Engineer for corrective action to be completed at no cost to the Department. If the plan for corrective action is not approved, f.1 A or B may be applied.

D. Re-evaluation of Rejectable Concrete will only be considered if the concrete is more than 500 (PSI) below the required design strength, or if the Engineer determines that the concrete does not have sufficient structural strength. If the Engineer determines that re-evaluation is necessary the contractor will be required to obtain 6 cores for compressive strength testing. The work will be done in the presence of the Engineer within 45 days from concrete placement. The Engineer will take custody of all cores intended for re-evaluation immediately after coring. Based on the core test results, the Engineer may apply f. 1. A, B.

All costs associated with the coring operations and re-evaluation of cores will be at the Contractors sole expense.

4. RCOC shall verify that quality control personnel are on site and performing adequate testing procedures. The RCOC shall also do a side-by-side air content test (ASTM C 231 or ASTM C 173) to verify that both air meters are in working order. If the pressure meter gauges have more than a 0.5% difference, the quality control personnel shall perform ASTM C 173 (volumetric method) to determine which gauge is more accurate. The pressure meter reading(s) must be within 0.5% variance from the roll-a-meter reading(s). If not, the volumetric method must be used.

5. Total Air Content requirements for Paver placed or Pumped Concrete is as follows. Acceptance of the total air content will be ahead of the concrete paver or pump. The required total air content for acceptance will be 5.0% to 8.5%. In addition to this requirement, at least once a day the Contractor, as part of their Quality Control Plan, shall
also test concrete to determine the total in place air content after the concrete has passed through the paver or pump. The target value for total in place air content after passing through the paving machine or pump will be 6.0%. Concrete from the same batch shall be tested for air content both before and after passing through the paver or pump in order to determine the air loss through the paver or pump.

If the in place air content is below 5.0% after it has gone through the concrete paver or pump, the contractor shall adjust the mix to achieve the target 6.0% in place air content. Adjustments to the mix to achieve 6.0% shall not cause the total air content to be greater than 8.5% ahead of the paving operation. If the air loss through the paver or pump cannot be controlled within two hours of the first test below 5.0% behind the paver or pump, or within some other time limit deemed appropriate by the Engineer, the concrete placement operation shall be halted. This time limit may be based upon concrete production rate, the magnitude of deviation from the 6.0% target in place air content, and the potential for significant quantities of in place deficient concrete. The contractor shall then propose mix or construction operation adjustments to the Engineer to reduce the air loss through the paver to no more than 1.5% to achieve the target 6.0% in place air content and to stabilize the air void system behind the paving machine or pumped concrete.

If, during Acceptance testing, the concrete is found to be out of specification for temperature, slump, or air content, the load tested will be rejected and concrete production operations will be stopped. Quality control (QC) personnel will be required to correct any deficiency found, production will not be allowed to begin until deficiency or new deficiency found has been corrected. Any adjustments to the JMF to bring material within specification shall be approved by Engineer before production will be allowed to resume.

Costs associated with testing or the inability to produce concrete with the specified air content will not be paid. Delays for the same will not be considered for extension of time to the contract.

g. Measurement and Payment

The cost associated as described herein shall be included in the respective items of work in which concrete is a material.

Base Price.  
Price established by the Department to be used in calculating incentives and adjustments to pay items and shown in the contract.