ON PAGE 253, SUBSECTION 430.03.B.5.b – COLD IN-PLACE RECYCLED (CIR) PAVEMENT/COMPACTION

Delete 405.03.L and replace with 405.03.O.

ON PAGE 569, SUBSECTION 720.07.1.b – RECYCLED ASPHALT PAVEMENT (RAP)/CATEGORY 2

Delete this sentence: "Submit test results within 10 calendar days before mix design submittal."

ON PAGE 570, SUBSECTION 720.07.3 – RECYCLED ASPHALT PAVEMENT (RAP)

Delete this sentence: "Provide the test results on a spreadsheet with the mix design submittal and update the spreadsheet, if additional RAP is produced before producing HMA."

And replace with this sentence: "Provide the test results on a spreadsheet with the specific gravity of aggregates and RAP submittal as specified in 405.03.A."

ON PAGES 180-207, SECTION 405 – SUPERPAVE® HOT MIX ASPHALT

Delete this section, in its entirety, and replace with the following:

405.01 Description. Construct 1 or more courses of Superpave hot mix asphalt (HMA) plant mix, including leveling courses if applicable, on a prepared surface. References in this section also apply to warm mix asphalt (WMA).

405.02 Materials. Provide materials as specified in:

Aggregate 703

Asphalt 702

Anti-Stripping Additive 702

Hydrated Lime 720.06

Recycled Asphalt Pavement (RAP) 720.07

Test materials in accordance with the following applicable standard methods:

Particle Size Distribution of Aggregate ..... FOP for AASHTO T 27

With Materials Finer than 75um (No. 200) Sieve in Mineral Aggregate by Washing ..... FOP for AASHTO T 11 Method A or B

Mechanical Analysis of Extracted Aggregate ..... FOP for AASHTO T 30

Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor ..... FOP for AASHTO T 312

Superpave Volumetric Design for Hot Mix Asphalt (HMA) ..... AASHTO R 35

Determining the Percentage of Fracture in Coarse Aggregate ..... FOP for AASHTO T 335 Method 1

Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures ..... AASHTO T 269

Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures ..... FOP for AASHTO T 209 Bowl Method

Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens ..... FOP for AASHTO T 166 Method A

Pavement Straightedge Procedures ..... Idaho IR 87

In-Place Density of Asphalt Mixtures by Nuclear Methods ..... FOP for AASHTO T 355
Backscatter mode

Sampling Asphalt Mixtures after Compaction (Obtaining Cores) ..... FOP for AASHTO R 67

Determining Volume of Liquids in Horizontal or Vertical Storage Tanks ..... Idaho IT 120

Acceptance Test Strip for Hot Mix Asphalt (HMA) Pavement ..... Idaho IR 125

Standard Practice for Operating Inertial Profilers and Evaluating Pavement Profiles ..... AASHTO R 57

Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method ..... FOP for AASHTO T 308

Sampling Asphalt Mixtures ..... AASHTO R 97
(See QA Manual Section 270 for sampling method)

Reducing Samples of Hot Mix Asphalt to Testing Size ..... FOP for AASHTO R 47

Moisture Content of Hot Mix Asphalt (HMA) by Oven Method ..... FOP for AASHTO T 329

Plastic Fines in Graded Aggregate and Soils By Use of the Sand Equivalent Test ..... FOP for AASHTO T 176
Alternate Method #2, Mechanical, Pre-wet

Standard Method of Test for Compressive Strength of Hot Mix Asphalt ..... AASHTO T 167

Standard Test Method for Effect of Water on Compressive Strength of Compacted Bituminous Mixtures (Immersion-Compression) ..... ASTM D1075
(Replace ASTM D1074 and ASTM D2726 with AASHTO T 167 and AASHTO T 166)

Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage ..... AASHTO T 283

Uncompacted Void Content of Fine Aggregate, Method A ..... AASHTO T 304

Mixture Conditioning of Hot-Mix Asphalt (HMA) ..... AASHTO R 30

Sampling Asphalt Materials ..... FOP for AASHTO R 66

Determining Rutting Susceptibility of Asphalt Pavement Mixture Using the Asphalt Pavement Analyzer (APA) ..... AASHTO T 340

Superpave Volumetric Mix Design ..... AASHTO M 323

Evaluation of the Superpave Gyratory Compactor (SGC) Internal angle of Gyration Using Simulated Loading ..... AASHTO T 344

Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate ..... Idaho FOP for ASTM D4791 (ratio of length to thickness equal to or greater than 5:1)

Bulk Specific Gravity and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing Method ..... AASHTO T 331

Standard Practice for Rapid Drying of Compacted Asphalt Specimens Using Vacuum Drying Apparatus ..... AASHTO R 79

Standard Test Method for Maximum Specific Gravity and Density of Bituminous Paving Mixtures Using Automatic Vacuum Sealing Method ..... ASTM D6857

Specific Gravity and Absorption of Aggregate Using Automatic Vacuum Sealing Method ..... Idaho IT 144

Quantitative Extraction of Bitumen from Bituminous Paving Mixtures ..... AASHTO T 164

Quantitative Extraction and Recovery of Asphalt Binder from Asphalt Mixtures ..... AASHTO T 319

Lime for Asphalt Mixtures ..... AASHTO T 303

Determination of Recycled Asphalt Pavement (RAP) Aggregate Dry Bulk Specific Gravity (G_{sb}) ..... Idaho IT 146

Standard Test Method for Automated Extraction of Asphalt Binder From Asphalt Mixtures (Asphalt Analyzer™) ..... ASTM D8159

Standard Method of Test for Determination of Cracking Tolerance Index of Asphalt Mixture Using the Indirect Tensile Cracking Test at Intermediate Temperature ..... ASTM D8225

Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA) ..... AASHTO T 324

Stratified Random Sampling ..... Idaho IR 148

Superpave Mix Design ..... Idaho IR 150

Superpave Mix Design Evaluation ..... Idaho IR 151

HMA Quality Control Plan Development and Implementation ..... Idaho IR 152

Split Sample Comparison ..... Idaho IR 153

Nuclear Density Gauge Correlation ..... Idaho IR 154

Procedures for Checking Asphalt Drum Mix Plant Calibrations ..... Idaho IR 155

Method for Determining Rolling G_{mm} ..... Idaho IR 156

NCAT Correction Factor ..... Idaho IR 157

Evaluation and Approval of HMA Plants ..... Idaho IR 160

Provide Superpave HMA composed of a combination of aggregate, approved additives, mineral filler (if required), RAP (if used), WMA additives or process (if used), and performance graded (PG) asphalt binder material. Provide a job mix formula (JMF) reported on ITD-0774 and a Superpave HMA pavement as specified and meeting the requirements in this section, 703, and 720.

Table 405.02-1 – Superpave Mixture Requirements

Mixture Type	SP 2 (50 gyrations)	SP 3 (75 gyrations)	SP 5 (100 gyrations)
Design ESALs [a] (millions)	< 1	1 < 10	≥ 10
Gyratory Compaction Gyrations for N_{ini} Gyrations for N_{des} Gyrations for N_{max}	 6 50 75	 7 75 115	 8 100 160
Relative Density, % G_{mm} @ N_{ini}	≤ 90.5	≤ 89.0	≤ 89.0
Relative Density, % G_{mm} @ N_{des}	96.0	96.0	96.0
Relative Density, % G_{mm} @ N_{max}	≤ 98.0	≤ 98.0	≤ 98.0
Air Voids, % P_a	4.0	4.0	4.0
Dust Proportion Range [b]	0.6 – 1.4	0.6 – 1.4	0.6 – 1.4
Voids Filled with Asphalt (VFA) Range, % 1½" 1" ¾" ½" 3/8" #4	 64 – 80 65 – 78 65 – 78 65 – 78 65 – 78 67 – 79	 64 – 75 65 – 75 65 – 75 65 – 75 73 – 76 67 – 77	 64 – 75 65 – 75 65 – 75 65 – 75 73 – 76 67 – 77
Rut Depth, mm [c]	≤ 10.0 mm	≤ 10.0 mm	≤ 10.0 mm
Stripping, passes [d]	12,500	15,000	15,000
Cracking Test, IDEAL-CT_{Index} [e]	80 (index value)	80 (index value)	80 (index value)

[a] The anticipated project traffic level expected on the design lane over a 20 year period. Regardless of the actual design life of the roadway, determine the design ESALs for 20 years.

[b] For No. 4 nominal maximum size mixtures, the dust proportion is 1.0 to 2.0 for SP 2 mixes and 1.5 to 2.0 for SP 3 and SP 5 mixes. For coarse graded 3/8, ½, and ¾ inch nominal maximum size mixtures, the dust proportion is 0.6 – 1.5. (Fine and coarse graded mixtures are defined in 703.05).

[c] Maximum depth after specified number of stripping passes. The Hamburg must have passing test results in the mix design.

[d] Minimum number of passes with no stripping inflection point. The Hamburg must have passing test results in the mix design.

[e] The Ideal-CT value and the associated data generated will be included in the mix design submittal; the data will only be used for information.

Approved SP 3 mixes may be substituted for SP 2 mixes. Use the binder content corresponding to 3.5 percent air voids. Adjust the SP 3 mix binder content by selecting the binder content that achieves 3.5 percent air voids at 75 gyrations from the binder content versus air voids graph of the approved mix design and target this binder content in the C-JMF. The SP 3 mix will be tested during production and accepted as an SP 2 mix (i.e., measuring binder content and gradation) when a substitution is made and the SP 2 VFA value will be used.

Use a QPL anti-stripping additive, if needed. Determine the amount of liquid anti-stripping additive or lime required by performing AASHTO T 324 during the mix design development.

1. Warm Mix Asphalt (WMA). WMA is defined as HMA that is produced at a target discharge temperature of 275 °F or less using QPL WMA additives or processes. WMA is allowed for use. QPL WMA additives or processes may be used to facilitate mixing and compaction of HMA produced at target discharge temperatures above 275 °F; however, such mixtures will not be defined as WMA.

   Use additives or processes from the QPL. Follow the supplier's or the manufacturer's written instructions for additives and processes when producing WMA mixtures.

   Use equipment and WMA technologies capable of producing an asphalt mixture that meet specifications and is workable at the minimum placement and compaction temperature desired, regardless of storage or haul distance considerations.

   Produce Superpave WMA by 1 or a combination of several QPL-approved technologies including chemical, foaming, and organic processes.

   The Department and the Contractor will prepare Superpave WMA field samples, as recommended by the manufacturer's representative, for WMA mixture testing.

2. Recycled Asphalt Pavement (RAP). The Department will allow RAP in the Superpave HMA. Provide RAP as specified in 720.07. Produce the mixture as specified in 405. Select the mass of RAP, the type of RAP, and the extent of RAP processing necessary to meet specifications. The Department will not change specifications or the contract unit price if RAP is used in the mixture.

   If RAP material is to be used from the project, obtain a representative sample of material for the mix design.

   The mass of RAP used in Superpave HMA is the mass of asphalt binder, in percent that the RAP contributes to the total mass of binder in the mixture.

   RAP Binder Percentages and Binder Grade Selection. Determine the percentage of RAP used and the binder grade required to meet the specified PG binder grade. Select the RAP percentage in the mix by determining the contribution of the RAP binder toward the total binder in the mix, by weight.

   It may be necessary to use a softer virgin PG binder than is specified to account for the age hardened binder in the RAP. Adjust the binder grade specified to account for the stiffening effect of the aged binder in the RAP resulting in a composite binder meeting requirements. The method for determining the binder grade adjustment in Superpave HMA mixtures incorporating RAP is designated as Level 1 or Level 2 as shown in Table 405.02-2. Each level has a range of percentages that represent the contribution of the RAP binder toward the total binder, by weight.

Table 405.02-2 – Grade Adjustment for RAP Usage

Level	RAP binder by weight of the total binder in the mixture, %	Binder Grade Adjustment to account for the stiffness of the asphalt binder in the RAP
1	0 to 17.0	No binder grade adjustment is made.
2	> 17.0 to 30.0	The selected binder grade adjustment for the binder grade specified on the plans is one grade lower for the high and the low temperatures designated. Or determine the asphalt binder grade adjustment using a blending chart. Note: See AASHTO M 323 for recommended blending chart procedure.

Table 405.02-3 identifies the typical binder grades used and the recommended binder grade adjustments for each binder grade at the RAP level described in Table 405.02-2. If the binder grade adjustment is not in Table 405.02-3, use Table 405.02-2 to determine the binder grade adjustment needed.

Table 405.02-3 – Typical Adjusted Binder Grades

	Level 2	Level 1
Binder Grade Specified in Contract	**Adjusted Binder Grade**	**Adjusted Binder Grade**
58-28	58-34	No adjustment needed
58-34	No Adjustment Needed	
64-28	58-34	
64-34	58-34	
70-28	64-34	
76-28	70-34	

Use the following equation to determine the percent of RAP by weight of mix:

X% = c (a/b)

Where:

a = optimum asphalt content, percent in mixture to produce 4.0% air voids.

b = percent asphalt content in the RAP (from chemical extraction and/or FOP for AASHTO T 308 burn with asphalt binder correlation factor).

c = percent of RAP binder by weight of the total binder desired in the mix.

X = desired RAP percent by total weight of mix.

The following is an example of the calculation:

Total RAP binder desired equals 17% of total binder in the mixture. If RAP will contribute 5.1% asphalt content and the optimum asphalt content is 5.8%, then:

X% = 17% * (5.8/5.1) = 19.3% RAP percent by total weight of mix.

3. Recycled Asphalt Shingles (RAS). RAS is not allowed in any Superpave HMA.
4. Re-refined Engine Oil Bottoms (REOB). REOB is not allowed in any Superpave HMA.
5. Crumb Rubber Modifier (CRM). CRM is not allowed in any Superpave HMA.

405.03 Construction Requirements.

A. Specific Gravity of Aggregates and RAP. The Department will determine the bulk dry specific gravity of aggregate, G_{sb}, apparent specific gravity of aggregate, G_{sa}, and water absorption (by percent weight of dry aggregate) of the coarse and fine aggregate for each stockpile used in the mixture using AASHTO T 85 and Idaho IT 144. The Department will evaluate the RAP G_{sb}, if used, by determining the RAP G_{se} in accordance with Idaho IT 146. The Department will determine the specific gravity of aggregates and RAP at a minimum of once a calendar year for each stockpile.

1. Sampling Requirements. The date, time, and location of sampling will be agreed to by the Engineer and the Contractor. The Contractor will sample the aggregate stockpiles and RAP stockpiles to be used in the mix design in accordance with FOP for AASHTO R 90 and reduce in accordance with FOP for AASHTO R

76. Obtain samples from at least 6 distinct locations within each stockpile. When project millings are used, obtain samples of the project millings to be used in the mix design from the sampling location specified in the approved HMA quality control plan. Sample, combine, and reduce the material for each stockpile to the Department's required material submittal size in the Engineer's presence. Immediately give possession of the samples to the Engineer.

2. Submittal Requirements. Provide blend sheets for the mixture proportions and submit the following:

    a. Aggregate Stockpile. For each aggregate stockpile, submit:

        i. 100 pound minimum sample in clean 5-gallon plastic buckets with airtight lids.

            (1) Each bucket must weigh no more than 50 pounds.

        ii. A summary of all QC test data used to develop average stockpile gradation.

        iii. A summary of all QC test data of G_{sb}, G_{sa}, and water absorption (by percent weight of dry aggregate) of the coarse and fine aggregate produced during stockpile production.

        iv. Source number.

    b. RAP Stockpile. For each RAP stockpile, submit:

        i. 100 pound minimum sample in clean 5-gallon plastic buckets with airtight lids.

            (1) Each bucket must weigh no more than 50 pounds.

        ii. All QC test data used to develop average stockpile gradation.

        iii. Report the asphalt binder/aggregate correlation factor for asphalt binder and gradation for each RAP stockpile as specified in 720.

3. Testing Timeframe. The Department will not begin testing until the complete submittal has been received. The Engineer will provide the Contractor with an aggregate test report (i.e., ITD-802 form) within 10 business days after receiving the complete submittal package. A Contractor's representative may be present during the G_{sb} testing, if requested. Retesting, at the Contractor's request, will require an additional 15 business days for re-evaluation. Additional materials and additional information may be required from the Contractor. The Contractor may request a retest only if the QC data submitted supports retesting.

The Contractor will use the established G_{sb} in the mix design calculation, the mix design report, and for production paving testing.

The Engineer will use the established G_{sb} and G_{sa} during the mix design submittal evaluation, acceptance test strip testing, production acceptance testing, and challenge testing.

If the G_{sb} changes during production more than 0.030, as determined by the Engineer, the Engineer will notify the Contractor. The Engineer will establish a new G_{sb} and re-evaluate the mix design as specified in 405.03.B. All subsequent mix produced after the Contractor has been notified of the new G_{sb} will use the newly established G_{sb}. If at any time testing indicates that G_{sa} is greater than or equal to G_{se} and/or G_{se} is greater than or equal to G_{sb} (i.e., $G_{sa} \geq G_{se}$ and/or $G_{se} \geq G_{sb}$) is not true, production will be halted and a new G_{sb} will be established in accordance with this section.

Following bid award, and before HMA mix design submittal, small areas within the project site may be milled to collect RAP for pre-mix design testing. Perform this work according to a 405.03.C. HMA quality control plan, approved by the Engineer, including the plan and methods to sample and process RAP.

At a minimum, for pre-milling the HMA quality control plan will include:

1. An approved traffic control plan that will minimize disturbance to traveling public.

2. Identification of no more than 6 RAP sampling locations within the project site. Each location must be less than 100 feet long with a maximum of 1 lane wide, unless otherwise approved.
3. The milling depth of each location must not be deeper than that shown in the plans for each location.
4. Patching plan.
5. Patch maintenance plan.
6. Detailed narrative of processing of milling and sampling locations to ensure representative samples are obtained.

After processing, sample for G_{sb} and asphalt content testing in accordance with the FOP for AASHTO R 90 and 405.03.A.

B. Mix Design. Develop a Superpave mix design in accordance with Idaho IR 150 to determine the appropriate combination of aggregate, approved additives, mineral filler (if required), RAP (if used), WMA additives or process (if used), and performance graded (PG) asphalt binder material meeting the requirements in 405, 703, and 720. The grade of asphalt is specified on the plans. The Contractor may choose to use the specified PG binder (or an adjusted binder as specified in Table 405.02-3. The Contractor may also "bump" this PG binder with the following restrictions: the selected PG binder may be one grade lower than the low PG grade temperature. A binder may be selected one grade higher than the upper PG grade temperature if it meets the intermediate testing (G*(sin δ)) of the specified binder grade. Binder adjustments/"bumps" must meet the contract requirements at no additional cost to the Department. (Examples: A specified PG 58-28 may be bumped to PG 58-34. A specified PG 58-28 binder may be bumped to PG 64-28 if it meets the G*(sin δ) requirements of the specified binder. A specified PG 58-28 binder may be bumped to PG 64-34 if it meets the requirements of the specified binder.)

1. Approved Mix Design. A mix design must be approved before use using the following process:
    a. Mix Design Submittal. Submit the mix design and all supporting documentation in accordance with Idaho IR 150 a minimum of 5 business days before paving is scheduled to begin. Email to mixdesigns@ITD.idaho.gov and submit to the Engineer. Only 1 mix design per email notification will be accepted.
    b. Mix Design Submittal Evaluation. The Engineer in conjunction with the District Materials Engineer, the Construction and Materials section, and the Central Materials Laboratory will evaluate the mix design in accordance with Idaho IR 151. The Engineer will provide the Contractor with written approval or rejection of the mix design within 5 business days after receiving the full submittal package.
        i. Mix Design Submittal Approval. Once the mix design submittal is approved by the Department, the Contractor may proceed with acceptance test strip placement using the JMF from the approved mix design submittal. The mix design will be approved for use for up to 2 calendar years from the date of test strip acceptance.
        ii. Mix Design Submittal Rejection. Rejection of the mix design will require:
            (1) The mix designer will amend the mix design to address the items noted in the notification of rejection. The Contractor will resubmit the mix design as specified in 405.B.2. The Department will re-evaluate the mix design for approval or rejection as specified in 405.B.3.
            (2) Develop and submit a new mix design as specified in 405.B.
2. Approved Mix Design Expiration. An approved mix design, associated JMF, and any associated C-JMF will be considered expired when one of the following situations occur (but not limited to):

a. More than 2 calendar year has elapsed from the time of test strip acceptance for the mix design.

b. Changes in stockpile gradation.

c. Changes in aggregate specific gravity or absorption.

d. Changes in RAP specific gravity.

e. Changes in aggregate, RAP, or binder sources.

f. Aggregate does not meet physical requirements specified in 703.

g. Changes in additives, including a change in the dosage rates.

h. Repeated non-conformance as defined in 405.03.M.1.

3. Asphalt Analyzer Offset Calibration Determination (see Flowchart 405.03-1).

   a. The Central Materials Laboratory will prepare 11 hand mixed JMF correction factor samples using aggregates and RAP from G_{sb} determination.

      1. Four (4) ITDProdAcceptanceLab (see Flowchart 405.03-1 Box 2.0, for information only).

      2. Three (3) ITDHQ Extractor (see Flowchart 405.03-1 Box 3.0 for Payment B).

      3. Four (4) Contractor CNCF (see Flowchart 405.03-1 Box 4.0).

   b. ITDProdAcceptance lab will determine NCAT Correction Factor (INCF) using AASHTO T 308 (HQ lab produced samples), provide data to the Contractor, for information only.

   c. The Department determines an offset between 3 Central Materials Laboratory Asphalt Analyzer samples and known asphalt content from hand batched blend sheets.

      The offset will be used to help quantify an asphalt binder quantity to be valued at the asphalt invoice price.

      If Asphalt Analyzer Offset is greater than 0.2, adjust bin percentages and target gradations as required to meet specifications and resubmit adjustments as an addendum to the mix design for approval within 1 business day.

      The Contractor may challenge upon request. Must use aggregate/RAP from G_{sb} testing. This challenge stands.

   d. The Contractor may correlate NCAT ovens with AASHTO T 308 and CNCF to be used during the test strip.

C. HMA Quality Control Plan. Develop and submit for approval a HMA quality control plan that complies with the requirements of Idaho IR 152, Idaho IR 155, Idaho IR 160, and 106.03.A.2. The Contractor HMA quality control plan must be approved by the Engineer in accordance with 106.03.A.2, Idaho IR 152, Idaho IR 159, Idaho IR 160, and Idaho IR 155 before the material is incorporated into the work/project.

D. Weather Limitations for Permanent Paving. Do not place Superpave HMA on a wet or frozen surface or when weather or surface conditions will otherwise prevent the proper handling or finishing of the Superpave HMA material. Place Superpave HMA as specified in the temperature limitations in Table 405.03-2.

Table 405.03-2 – Air and Surface Temperature Limitations

Compacted Thickness of Individual Courses	Top Course	Leveling and Courses Below the Top Course
Less than 0.10 foot	60 °F	50 °F
0.10 to 0.18 foot	50 °F	40 °F
Greater than 0.18 foot	40 °F	40 °F

Provide a paved surface for travel if the work extends into the winter. Do not start construction on the pavement surface, unless the progress schedule realistically shows the pavement can be replaced or completed within the temperature limitations listed above.

E. Mixing Plants. Use an approved mixing plant that complies with Idaho IR 160 and in accordance with the approved HMA Quality Control Plan. Meet the requirements of Idaho IR 155, with the exception that the Contractor may calibrate the asphalt plant according to current National Asphalt Pavement Association (NAPA) manuals and documented best practices or in accordance to the manufacturer's recommendations. The Contractor will provide the calibration documentation (e.g., manufacturer's recommendation) to the Engineer.

F. Hauling Equipment. Provide hauling equipment in accordance with the approved HMA Quality Control Plan.

G. Paver. Provide a paver that complies with the approved HMA Quality Control Plan.

H. Pre-Paving Meeting. Immediately before paving, the Contractor, the asphalt supplier, the Engineer, and the Department personnel involved in the paving operation will hold a pre-operational paving meeting to discuss how to achieve the highest quality surface. The Engineer will prepare minutes of the pre-operational paving meeting and distribute them to the attendees. Any requests to revise the minutes must be made to the Engineer within 7 business days of receipt. These minutes will constitute the final record of the pre-operational paving meeting.

I. Acceptance Test Strip (Lot 1). Note: If a C-JMF has been accepted, this section does not apply because a test strip has already been accepted; continue to 405.03.O. Construct an acceptance test strip of 200 to 750 tons in accordance with Idaho IR 125 using the approved JMF (including offsite test strips). The Department does not require acceptance test strips on small quantity pavement less than 750 tons, nonstructural pavement, or temporary pavement.

The Engineer will base acceptance on the requirements in Table 405.03-4. Do not continue production paving until properties of the acceptance test strip are accepted and a C-JMF has been established as specified in 405.03.K.

1. Test Strip Location. The first day of production paving will be considered the acceptance test strip. The Contractor may elect to perform an offsite mix verification of the JMF. Do not use Department-owned or controlled sources for offsite testing.
2. Testing Timeframe. The Department will require 7 business days from the time of receipt of Superpave HMA mix samples, core samples, and cold feed samples to perform acceptance testing. Time will begin when all the required samples and associated paperwork needed to perform the specified testing are in the Engineer's possession.
3. Acceptance Testing Lab. The Department's Central Materials Laboratory will perform acceptance testing for the acceptance test strip.
4. Test Strip Tolerance. The Engineer will apply the tolerances to the acceptance test strip test properties as specified in Table 405.03-4 to establish the upper specification limit (USL) and lower specification limit (LSL) for quality level analysis.
5. Test Strip Acceptance Criteria. The Engineer will determine acceptance in accordance to Idaho IR 125.

6. The production paving lot following the accepted test strip will be based on Table 405.03-4 except the gradation requirements.

Table 405.03-4 – Acceptance Test Strip Tolerance

Quality Characteristic	Test Strip Mix Tolerance
VMA, %	703.05 minimum value
Laboratory Air Voids, %	4.0 ± 1.5
Asphalt Binder Content, %	If AAO > 0.3, JMF ± 0.40 If AAO ≤ 0.30, JMF ± 0.40 + AAO
Dust Proportion (DP)	Table 405.02-1 range ± 0.10
VFA, %	Table 405.02-1 range ± 5
No. 4 and larger sieves, %	JMF value ± 6.0 [a]
No. 8 to No. 30 sieves, %	JMF value ± 5.0 [a]
No. 50 to No. 100 sieves, %	JMF value ± 4.0 [a]
No. 200 and smaller sieves, %	JMF value ± 2.0 [a]
G_{mm}	JMF value at P_b ± 0.012 [d]
G_{se}	JMF value ± 0.012 [d]
Mainline Density, % Compaction	92.0 – 100.0
Rut Depth, mm [b]	10.0 mm maximum [d]
Stripping, passes [c]	12,500/15,000 [d]
Cracking Test, IDEAL-CT_{Index}	80 (index value) [d]

[a] The upper and lower specification limits are never allowed to be outside the control points specified in 703.05.

[b] Maximum depth after 12,500/15,000 passes. For information only.

[c] Minimum number of passes with no stripping inflection point.

[d] For information only.

If the acceptance test strip is considered acceptable based on Idaho IR 125, the Contractor may proceed to production paving once a C-JMF is established as specified in 405.03.K.

If the acceptance test strip is not considered acceptable based on 106.03.B. for any quality characteristic, the Contractor will not be allowed to proceed with production paving. The Engineer will reject an unacceptable test section for SP 3 and SP 5 mixtures and require removal. The Department will not pay for the removal or the applicable contract pay item quantities. An unacceptable test section for an SP 2 mixture will be subject to rejection. If the Engineer determines the failed SP 2 test section may remain in place, the Contractor may leave the test section in place with a 50 percent reduction in price or remove the failed material and replace it with acceptable material and receive full payment. Remove the failed SP 2 test section if rejected. The Department will not pay for removal or for the applicable contract pay item quantities.

If the Contractor is unable to meet the requirements after 3 test strips, the Engineer will require a new mix design to meet specifications. Place a new acceptance test strip at no additional cost to the Department.

If the Contractor's testing determines the test strip fails and the Contractor chooses to proceed with another test strip before receiving the Engineer's results, the Engineer will complete testing of the test strip in question and

report the results before accepting material from the next test strip for evaluation.

PWL will be used to evaluate the test strip. The test strip will be paid at a 1.0 pay factor for a PWL greater than 40. If any quality characteristic, except G_{mm} or G_{se}, has a PWL less than 40, the asphalt mix will be rejected (i.e., G_{mm} or G_{se} with a PWL less than 40, will not be rejected but the cause will be evaluated by the Engineer). Plant settings may differ from the JMF or C-JMF in an effort to match actual plant output to the JMF or C-JMF.

J. Production Laboratory Comparison Process. The Contractor or the Engineer may request split sample comparison testing at any time during the project. The split sample comparison will be performed using Idaho IR 153.

1. The Department recommends that at a minimum the comparison be performed during test strip or before production.

K. C-JMF. Once a JMF is confirmed at acceptance test strip, the Contractor will establish an initial C-JMF.

1. Adjusting the C-JMF. C-JMF adjustments are allowed that will result in improved mix quality characteristics. If a lot is currently in progress, the adjustment will go into effect at the beginning of the next lot.

    a. Adjustments within Table 405.03-5. Adjustments listed in Table 405.03-5 can be made to the JMF. Provide a detailed description of how these adjustments will be made and what quality characteristics will be affected. The Engineer will be notified within 24 hours of adjustments and descriptions.

Table 405.03-5 – C-JMF Adjustment Limit Table

Parameter	Adjustment
No. 4 (4.75 mm) and greater	± 3% from JMF
No. 8 (2.36 mm)	± 2% from JMF
No. 100 to No. 30 (0.600 mm)	± 2% from JMF
No. 200 (0.075 mm)	± 0.3% from JMF
Asphalt Content	± 0.2% from JMF
G_{mm}	± 0.010 from C-JMF [(c)]
G_{se}	± 0.010 from C-JMF [(c)]
Individual Cold Feed Percentage for Aggregate	± 10.0% from JMF [(a)] [(d)]
Cold Feed Percentage for RAP	- 10.0% from JMF [(b)] [(d)]

[(a)] The cold feed percentage of any aggregate may be adjusted up to 10 percentage points from the amount listed on the JMF, however no aggregate listed on the JMF will be eliminated.

[(b)] The cold feed percentage for RAP may be reduced up to 10 percentage points from the amount listed on the JMF and must not exceed the percentage of RAP approved in the JMF or for the specific application under any circumstances.

[(c)] Based on the initial C-JMF.

[(d)] Individual cold feed percentages for aggregate and RAP greater than 5.0% for a single stock pile of the same product must have a new correction factor established in accordance with IR 157.

    b. Adjustments outside of Table 405.03-5. Adjustments outside the limits listed in Table 405.03-5 can be requested, but these adjustments are considered significant adjustments and will require the Contractor to document any differences in the asphalt plant settings necessary to achieve the designed asphalt plant output as documented by acceptance test results. Thus, additional supporting documentation and justification must be submitted and how these adjustments will affect on the quality characteristics of the asphalt mix. Adjustments and descriptions must be submitted for the Engineer's prior approval and the Engineer will have 1 business day after the date the request was

submitted.

Use the C-JMF to establish target values and control limits when producing control charts during production paving.

L. Tack Coat. Apply an asphalt tack coat as specified in 402 to the following surfaces:

1. Existing plant mix surfaces and to the surface of each course constructed, except the final course.
2. Surfaces of curbing, gutters, manholes, portland cement pavement, and other structures. Paint or spray a thin, uniform tack coat of asphalt before placing pavement against the surfaces.
3. Contact surfaces of transverse joints and cold longitudinal joints just before additional mixture is placed against previously laid material.

M. Production Paving. Before production milling, obtain approval for Superpave HMA mix design(s). Milling, coring, or sampling for preliminary sample collection will be allowed for mix design development in accordance with the QCP.

The Contractor may request to continue production paving in accordance with the C-JMF after the acceptance test strip (Lot 1) is approved. Superpave HMA paving acceptance during production is based on the requirements in Table 405.03-6. The production paving lot (Lot 2) following the accepted test strip will be based on Table 405.03-4 except the gradation requirements. The Contractor will produce and place mix in accordance with the approved QCP.

If aggregate or asphalt binder sources change from the approved mix design, develop a new mix design as specified in 405.03.B. at no additional cost to the Department. If the G_{sb} changes during production more than 0.030, the Engineer may establish a new G_{sb} and re-evaluate the mix design.

1. Conformance to the C-JMF. The Contractor will produce mix that meets the requirements of Table 405.03-6. The Contractor may elect to remove defective material and replace it with new material on a lot basis, at no additional cost to the Department to ensure conformance to the C-JMF.
    a. Isolated Non-Conformance. If the Contractor is unable to meet the requirements on a single lot, the Engineer will require the Contractor to stop production and/or delivery until a corrective action plan can be developed and implemented to remedy the non-conformance. Submit the corrective action plan to the Engineer before resuming work.
    b. Repeated Non-Conformance. If the Contractor is unable to meet the requirements on 2 consecutive lots, the C-JMF, mix design, and associated JMF will be considered expired as defined in 405.03.B.2. The Engineer will require a new mix design to meet the specifications in 405.03.B. at no additional cost to the Department.

    If aggregate or asphalt binder sources change from the approved mix design, develop a new mix design to meet the specifications in 405.03.B. at no additional cost to the Department.
2. Production Limits**.** The properties listed in Table 405.03-6 will be used for purpose of quality analysis calculations, acceptance, and payment. The Engineer will apply the tolerances to the properties as specified in Table 405.03-6 to establish the upper specification limit (USL) and lower specification limit (LSL) for quality level analysis.
3. Production Acceptance Criteria. The Engineer will perform quality level analysis and determine acceptance as specified in 106.03.B using the quality characteristics specified in Table 405.03-6.

Table 405.03-6 – Production Paving Quality Limits

Mix Quality Characteristic	Limits
SP 2 Mixture	
No. 4 sieve and larger sieves, %	C-JMF value ± 5.0 [a]
No. 8 to No. 30 sieves, %	C-JMF value ± 4.0 [a]
No. 50 to No. 100 sieves, %	C-JMF value ± 3.0 [a]
No. 200 sieve and smaller sieves, %	C-JMF value ± 1.5 [a]
Asphalt Binder Content, %	C-JMF value ± 0.3
SP 3 and SP 5 Mixtures	
Laboratory Air Voids, % N_{design}	SP 3: 2.5 – 5.0% SP 5: 2.8 – 5.0%
VMA, % N_{design}	703.05 minimum value
Dust Proportion	Table 405.02-1Range
G_{se} [f]	C-JMF value ± 0.012 [g]
G_{mm} [e, f]	C-JMFvalue@ P_b± 0.012 [g]
Rut Depth, mm	10.0 maximum [b, c]
Stripping, passes	12,500/15,000 [b, d]
Cracking Test, IDEAL-CT_{Index}	80 (index value)[b]
Roadway Quality Characteristic	**Limits**
Mainline Density, % Compaction	92.0 –100.0

[a] The upper and lower specification limits are never allowed to be outside the control points specified in 703.05.

[b] Hamburg and Ideal-CT are for information only at this time.

[c] Maximum depth after 15,000 passes.

[d] Minimum number of passes with no stripping inflection point.

[e] G_{mm} tests must be performed only after a 2-hour oven cure time in accordance to the mix design requirements to limit test result variability.

[f] G_{mm} and G_{se} values are indicators of consistency of the asphalt mix and are tracked using PWL. G_{mm} and G_{se} will be monitored for information only and, if the PWL is less than 40, the Engineer and the Contractor will review the data and take appropriate action (e.g., review plant settings, review test results). There will be no deduction for a low PWL based on G_{mm} or G_{se}.

[g] Based on the initial C-JMF.

N. Spreading and Finishing. Place the mixture on an approved surface. Use pavers to distribute the mixture over the entire width or over a partial width as practical. Do not extend partial width paving beyond one day's production. Minimum lift thickness will be no less than 3.5 times nominal maximum aggregate size (NMAS) of the mix design.

Use pavement marking tape to temporarily mark roadway centerline on pavements being used by traffic as specified in 626.03.

Unless otherwise specified, equip the paver with a shoe on the outside to provide slopes as follows:

The Engineer will allow an 18-inch-wide shoe for depths 0.2 foot or less on initial pavement placement. The shoe must be 24 inches wide for depths greater than 0.2 foot. The shoe must be 24 inches wide on pavement overlays.

Meet-lines must be within 1 foot of lane lines or within 1 foot of center of lanes. Meet-lines are not allowed within a wheel path. Ensure transverse and longitudinal joints are smooth and match the adjacent surfaces.

O. Compaction. Compact the pavement to a density between 92.0 percent and 100.0 percent of maximum theoretical density for SP 2, SP 3, and SP 5 asphalt mixes. Determine G_{mm} using Idaho IR156.

Following acceptance test strip approval or C-JMF approval, pavement density testing for acceptance will be performed by the Department using a nuclear density gauge with the readings corrected by cores in accordance with AASHTO T 355. The G_{mm} for determining the percent compaction will be determined using a rolling, consecutive 2-lot average (i.e., the most recent 2 completed lots) of the Department's acceptance test results. For the first lot of production paving, the test strip's G_{mm} corresponding to the C-JMF is used for determining the percent compaction. The Contractor is responsible for quality control testing.

Density Gauge Correlation. When nuclear density gauges are used for acceptance, the Engineer will correlate the gauges in accordance with Idaho IR 154. A new gauge correlation will be established for each mix design, each paving lift, each paving lift thickness, and each underlying material (e.g., ¾" base, CRABs, 0.25' underlying lift of HMA).

Repair holes left in the pavement by the coring operation with non-shrink grout at no additional cost to the Department. Do not begin coring until repair methods and materials have been approved.

P. Joints. Do not roll over the unprotected end of freshly laid mixture. Form transverse joints by cutting back on the previous run to expose a vertical edge the full depth of the course.

Slope the cold transverse construction joints open to public traffic at 20H:1V. Remove the sloped surface (ramp) without damage to the base just before paving is resumed. Test the new joint for smoothness as specified in 405.03.S.

Construct end transitions between overlays and the adjoining pavement by milling a wedge out of the adjoining pavement, starting at the surface and continuing into the adjoining pavement on a 200H:1V slope or flatter until a vertical edge equal to 0.15 foot or the depth of overlay is reached. Transitions to ramps and crossroads are transverse joints. The milled wedge is a transverse joint when the adjoining pavement is concrete. Mill the wedge from the pavement to be overlaid, with the vertical edge against the concrete, when the adjoining pavement is concrete. Taper transitions between overlays and approaches to form a smooth transition while maintaining drainage.

Provide a positive bond, density, and a finish surface to the new mixture at longitudinal joints that is equal to the mixture against which it is placed. The Engineer may take density tests at longitudinal joints to ensure the integrity of material in the joint area.

Locate the longitudinal joint in the top course at the centerline of the traveled way if the roadway is two lanes wide or at the lane lines if the roadway is more than 2 lanes wide. On the lower courses, stagger the longitudinal joint and offset it 6 inches to 1 foot from the centerline of the traveled way if the roadway is 2 lanes wide or from the lane lines if the roadway is more than 2 lanes wide. Match the pavement surface across a longitudinal joint with the transverse slope shown on typical sections.

Test joints, except crowns, for smoothness in accordance with Idaho IR 87. Use an approved 10-foot straightedge. Complete the test and necessary corrections before the material temperature drops below 175 °F.

Place longitudinal joints straight and true. Use approved methods to bring back to straight and true unacceptable deviations. Make adjustments as needed to achieve the specified results.

Obtain approval for Superpave HMA mix design(s) before the start of milling operations.

Q. Miscellaneous Pavement. Place miscellaneous Superpave HMA pavement in irregular areas (e.g., raised or depressed medians, gores, tapers, radii (excluding approach radii), tapered paving for guardrail terminal widening). Include areas that taper from 0 to 8 feet maximum width and gore areas from roadway shoulders to termini in this work. Do not include pavement widening for installation of guardrail in this work.

R. Small Quantities. Small quantities will be accepted in accordance with the QA Manual 270.XX. When an acceptance test strip is not required as per 405.03.I, the Department will base acceptance for pavement density on the density of cores taken from the finished pavement. Obtain 5 randomly located core samples in accordance with the FOP for AASHTO R 67 from the compacted Superpave HMA in the Engineer's presence. The Engineer will determine the random core locations. Immediately submit the cores for testing. The Department will determine the density of the cores the FOP for AASHTO T 166 Method A or AASHTO T 331. In addition, obtain 3 randomly located mix samples during HMA placement, in the Engineer's presence, and immediately submit samples for testing. Obtain the samples in accordance with the AASHTO R 97 (see the QASP Table 106.03-1 Note 1.c.). The Engineer will randomly locate the mix samples and the Department will test the mix samples to determine the G_{mm} value in accordance with the FOP for AASHTO T 209 or ASTM D6857. The Department will use the average of the 3 G_{mm} values to compute in-place density of the cores taken for density acceptance. If paving will be performed in different construction seasons (e.g., bridge approaches), obtain 5 additional cores from the compacted Superpave HMA and 3 additional mix samples for density acceptance when paving resumes. The Contractor is responsible for quality control testing.

S. Leveling Course. Construct the leveling course of Superpave HMA, with a compacted thickness greater than 0.2 foot, in multiple courses.

Place the leveling course on the existing surface in quantities as approved. Use pavers and/or motor graders and a sufficient number of pneumatic tire rollers to adequately place and compact the leveling course to the required cross-section and grade. Use a steel-wheel roller for final rolling if the leveling course is to be used as a wearing course or if a seal coat is to be applied.

When blade laid leveling course is specified, place Superpave HMA in wheel ruts and other surface irregularities. Blade Superpave HMA into the low areas using a motor grader. Normally, 2 passes are required to fill depressions. Follow each pass of the motor grader with a pneumatic tired roller to provide compaction. Position the blade of the motor grader so light contact with the existing pavement surface is maintained. The Contractor may dispose of excess coarse aggregate resulting from placing the blade laid leveling course along the edge of the roadway.

When machine laid leveling course is specified, place Superpave HMA on the roadway with a paver to restore crown, super elevation, or rideability. Operate the screed close to the existing pavement surface. The Engineer will accept minor surface tears from this operation. Use pneumatic and vibratory rolling for compaction.

T. Surface Smoothness. Place pavement complying with Schedule II unless otherwise specified.

For Schedule III only, perform pre-paving, quality control, and acceptance surface smoothness testing, analyze the results of this testing, and submit the results. Submit pre-paving results. Before paving, submit a plan showing how Schedule III smoothness will be achieved.

Perform acceptance testing on the final lift and submit the results before corrective action. Complete acceptance testing within 1 week of paving completion.

Perform quality control testing in international roughness index (IRI). Request to use quality control testing for acceptance before the start of paving.

Submit quality control results by the next business day following placement.

If the quality control testing results show surface smoothness is not within the acceptable specification limits, suspend paving operations until it can be shown the steps taken to modify operations will result in acceptable smoothness.

Acceptance surface smoothness testing must be verified by the Engineer. The profile run must be witnessed by the Engineer and a preliminary copy of the report submitted immediately after the end of the run. The Engineer will not accept the testing, unless witnessed. Submit the profile data in a format suitable for evaluation using ProVAL or other industry standard software. In addition, each week or as requested by the Engineer, submit to the Engineer an electronic, editable Microsoft Excel spread sheet containing the data produced from the acceptance smoothness

testing. Do not perform corrective action until approved.

The Engineer may elect to perform additional testing for verification. If the results vary from the Contractor's IRI results by more than 10 percent, the Engineer will use the Department's IRI results for acceptance.

Measure the finished pavement as follows:

1. Test the surface with a 10-foot straightedge at locations determined by the Engineer. Identify the locations that vary more than ¼ inch from the lower edge when the straightedge is laid on finished pavement in a direction parallel with centerline or perpendicular to centerline. Remove the high points that cause the surface to exceed the ¼ inch tolerance by grinding with equipment specified in Corrective Action below.
2. Profile the surface 3 feet from and parallel to each edge of each traffic lane. The Engineer will use the average of the results for each 0.1 mile section to calculate incentive payments and determine sections requiring corrective action.

   Use Class 1 or Class 2 profilers as defined in ASTM E950. Operate profilers in accordance with the manufacturer's instructions and AASHTO R 57. Set the profiler as follows:

   1. High pass or pre-filter: off or at least 200 feet.
   2. Bump detection: on
   3. Dip detection: on
   4. Resolution: 0.01 inch
   5. Low pass filter: off
   6. Other filters: off

   Operate the profiler according to the manufacturer's recommended speed. Calibrate the profiler at the beginning of the work and as needed thereafter.

   The Department requires the pavement to comply with the following surface smoothness schedule requirements:

   a. Where longitudinal grade is 6.5 percent or less, pavement on tangent alignment and pavement on horizontal curves having centerline radius of curve 1,000 feet or more must meet the surface smoothness requirements for the smoothness schedule specified. The Engineer will add consecutive 0.1 mile sections of roadway tested together to obtain the mile section. There will be no overlapping of the 0.1 mile or 1 mile sections to change cumulative test results.
      (1) Smoothness Schedule using IRI:
         (a) Schedule I Projects: Target IRI values range from 60.0 to 70.0 inches per mile per 0.1 mile. Corrective action required above 95.0 inches per mile per 0.1 mile.
         (b) Schedule II Projects: Target IRI values range from 71.0 to 80.0 inches per mile per 0.1 mile. Corrective action required above 95.0 inches per mile per 0.1 mile.
         (c) Schedule III Projects: Target IRI value range defined as one of the following:
            i. For sections with a pre-paving IRI less than 160.0 inches per mile per 0.1 mile the final index must not exceed 80.0 inches per mile per 0.1 mile.
            ii. For sections with a pre-paving IRI of 160.0 inches per mile per 0.1 mile or greater, use the smoother of either:
               1. A 50 percent improvement of the pre-paving index.

2. A maximum final index of 100.0 inches per mile per 0.1 mile. Corrective action is required above the target IRI.

b. The Engineer will exclude acceptance test strips, pavement on horizontal curves having a centerline radius of curve of less than 1,000 feet and pavement within the super elevation transition of such curves, or pavement with a longitudinal grade greater than 6.5 percent from incentive/disincentive payments. Meet the corrective action requirements for the smoothness schedule specified.

c. Profile the pavement to provide continuous, uninterrupted profile data. The Department will not apply profile smoothness tolerances and incentive/disincentive payments to the following:

(1) Pavement within 50 feet of a transverse joint that separates the pavement from a structure deck, an approach slab, or an existing pavement not constructed under the contract.

(2) Pavement for approaches and structure decks.

(3) Roadways with a speed limit less than 40 mph.

(4) Interstate ramps.

Smoothness acceptance for these areas will be as specified with straightedge requirements.

Surface Smoothness Corrective Action:

Use power-driven grinding equipment that is specifically designed to smooth portland cement concrete pavement with diamond blades. Use a machine with an effective wheelbase at least 12 feet and a cutting width of at least 3 feet. Restrict the machine forward speed to 5 feet per minute while milling. Provide grinding equipment of a shape and dimension that does not encroach on traffic movement.

Grind parallel to centerline. Extend adjacent grinder passes, within ground area, to produce a neat rectangular area having a uniform surface appearance. Make smoothly feathered transitions at transverse boundaries between ground and unground areas. Apply a fog coat to the ground pavement surface as specified in 408 after grinding has been completed.

Grind individual high points in excess of 0.3 inch within 25 feet or less, as determined by the California Profilograph simulation, until such high points do not exceed 0.3 inch.

After individual high point grinding has been completed, perform additional grinding in sections requiring corrective action to reduce the IRI to a maximum of 80.0 inches per mile per 0.1 mile section along lines parallel with the pavement edge.

Individual low points are areas in excess of 0.3 inch within 25 feet or less, as determined by the California Profilograph simulation. Low points will be subject to rejection and replacement at no cost to the Department. Under these circumstances, the Engineer's decision whether to accept the completed pavement or to require corrections is final.

Check the pavement for smoothness after grinding as specified in this subsection and make additional corrections necessary to achieve smoothness. Submit a report and graph showing compliance of the final surface to the smoothness requirements. The Department will not pay for the cost of grinding, milling or related work (e.g., fog coat), disposal of milled material, traffic control, flagging, profiling, surface repair of ground or milled areas, or temporary striping.

Surface Smoothness Deductions, Incentives, and Disincentives:

1. Straight-Edge Evaluation.

If correction of the roadway as specified will not produce satisfactory smoothness results or it reduces pavement thicknesses and serviceability, the Engineer may accept the completed pavement and will deduct

from monies due or may become due to the Contractor the sum of $500.00 for each individual high point exceeding ¼ inch tolerance or $3,000.00 for each 0.1 mile section. $500.00 per individual low point exceeding ¼ inch tolerance will be deducted from monies due or may become due to the Contractor. Low points exceeding ½ inch will be subject to rejection and replacement at no cost to the Department. Under these circumstances, the Engineer's decision whether to accept the completed pavement or to require corrections is final.

2. Profilograph Evaluation.

   For each evaluation section, the Contractor is entitled to a payment adjustment excluding acceptance test strips and Schedule III surface smoothness work. An evaluation section is defined as a 0.1 mile per traffic lane or fraction as applicable. The Department will not pay an incentive for pavement on the roadway shoulders, center turn lanes, turn bays, crossovers, tapers, or other miscellaneous pavement. The Department will pay incentive as specified in Table 405.03-7.

   The Department will base incentive payments on initial profiles before corrective work on the top course of paving.

Table 405.05-1 – IRI
Initial Index inches per mile per 0.1 mile section

Payment $ per 0.1 mi	Schedule I	Schedule II
$500.00	40.4 or less	45.4 or less
$300.00	40.5 to 50.4	45.5 to 60.4
$100.00	50.5 to 60.4	60.5 to 70.4
$0.00	60.5 to 70.4	70.5 to 80.4
-$100.00	70.5 to 75.4	80.5 to 85.4
-$300.00	75.5 to 85.4	85.5 to 95.4
-$500.00	85.5 to 95.4	—
-$500.00 and corrective action	95.5 or greater	95.5 or greater
-$500.00 and corrective action	Individual high points [(a)]	Individual high points [(a)]
-$500.00 and corrective action	Individual low points [(a)]	Individual low points [(a)]

[(a)] In addition to the incentive/disincentive payment applied to the 0.1 mile section, the Engineer will deduct from monies due or may become due to the Contractor the sum of $500.00 for each individual high point or low point up to a maximum of $3,000.00 for each 0.1 mile section.

The Department will make only 1 incentive payment per evaluation section. An evaluation section runs consecutively from the point paving begins to the point paving is interrupted (e.g., at bridges, the end of lane paving areas specifically excluded by the specifications). The Department will prorate partial sections based on their percentage of a full section.

The Department will base incentive payments on initial profiles before corrective work on the top course of paving.

405.04 Method of Measurement. The Engineer will measure acceptably completed work as follows:

1. Pavements, leveling courses, and asphalts by the ton. The Engineer will not permit batch weights as a method of measurement. The Superpave HMA quantity will be the weight used in the accepted pavement and will include the weight of the aggregate, asphalt, and additives in the mixture.
2. Anti-stripping additive by the percentage of additive per ton of asphalt.

3. Miscellaneous pavement by the square yard. Final measurement will be based on plan quantities, unless changed by the Engineer. Miscellaneous pavement measurement is in addition to the measurement of asphalt and Superpave HMA material.
4. Approaches per each regardless of width or length. Separate mailbox turnouts will be measured as an approach. Mailbox turnouts adjacent to an approach will be considered as part of the approach and no separate measurement will be made. Approach measurements are in addition to the measurement of asphalt and Superpave HMA material.
5. Wedge milling for the transition section by the square yard.
6. Tack coat will be paid for as specified in 401.

405.05 Basis of Payment.

1. Superpave SP3 and SP5.

   Composite mix pay factor will be computed for each lot using the following equation:

   $CPF_{405Mix} = (0.4 \times PF_{AIRVOIDS}) + (0.4 \times PF_{VMA}) + (0.2 \times PF_{DP})$

   Where:

   CPF_{405Mix} = Composite pay factor for mix quality characteristics.

   $PF_{AIRVOIDS}$ = Pay factor for air voids.

   PF_{VMA} = Pay factor for VMA.

   PF_{DP} = Pay factor for dust proportion.

   Calculation of Composite Incentive/Disincentive. The composite incentive/disincentive dollar amount to be paid or deducted for Superpave plant mix pavement accepted by the Department, excluding plant mix pavement for test strips, small quantity, approaches, and miscellaneous paving not placed with mainline paving, will be computed for each lot using the formula:

   $PA_{405} = (CPF_{405Mix} + PF_{MLD} - 2) \times Q_i \times P$

   Where:

   PA_{405} = Pay adjustment for material and main line density in dollars for the lot.

   CPF_{405Mix} = Composite pay factor for material characteristics for the lot.

   PF_{MLD} = Pay factor for main line density for the lot.

   Q_i = Quantity represented by individual lot.

   P = Contract unit price.

   Note: The incentive may be a negative amount (i.e., a deduction from the total amount bid for the item).

   A pay factor of 1.00 will be used for all acceptable Superpave plant mix pavement incorporated into the onsite acceptance test strip for volumetrics.

   Density pay factor for the Superpave plant mix leveling course will be 1.00.

   Pay factors for approaches and miscellaneous paving not placed with mainline paving will be 1.00.

2. Superpave SP2.

   Composite pay factors will be computed for each lot using the following equations:

$CPF_{405} = (0.3 \times PF_{AC}) + (0.3 \times PF_{AGG}) + (0.4 \times PF_{MLD})$

Where:

CPF_{405} = Composite pay factor for mix quality characteristics.

PF_{AC} = Pay factor for asphalt content.

PF_{AGG} = Pay factor for plant mix aggregate.

PF_{MLD} = Pay factor for main line density.

Calculation of Composite Incentive/Disincentive. The composite incentive/disincentive dollar amount to be paid or deducted for Superpave plant mix pavement accepted by the Department, excluding plant mix pavement for test strips, small quantity, approaches, and miscellaneous paving not placed with mainline paving, will be computed for each lot using the formula:

$PA_{405} = (CPF_{405} - 1) \times Q_i \times P$

Where:

PA_{405} = Pay adjustment for material and main line density in dollars for the lot.

CPF_{405} = Composite pay factor for material characteristics for the lot.

Q_i = Quantity represented by individual lot.

P = Contract unit price.

Note: The incentive may be a negative amount (i.e., a deduction from the total amount bid for the item).

Density pay factor for the Superpave plant mix leveling course will be 1.00.

Pay factors for approaches and miscellaneous paving not placed with mainline paving will be 1.00.

A pay factor of 1.00 will be used for calculating a pay factor for all acceptable Superpave plant mix pavement incorporated into an onsite acceptance test strip for volumetrics.

The Department will pay for accepted quantities as follows:

Pay Item	**Pay Unit**
Superpave HMA Pavement Class SP	Ton
Superpave HMA Pavement, including asphalt and additives Class SP	Ton
Leveling Course Class SP	Ton
Leveling Course, including asphalt and additives, Class SP	Ton
___Asphalt Binder for Superpave HMA Pavement	Ton
___Percent Anti-stripping Additive for Superpave HMA Pavement	TOA
Miscellaneous Pavement	SY
Approaches	Each
Wedge Milling	SY

The cost to produce the required aggregate in each stockpile to accommodate blends is incidental and included in the contract unit price for the Superpave HMA contract pay item.

When Superpave HMA includes RAP, in any proportion, the Department will not include the asphalt binder contributed by the RAP in the quantity for asphalt and additives when asphalt and additives are paid for separately.

3. Payment B, Additional Binder Content determined from Asphalt Analyzer Offset (AAO).

   The offset between 3 extractor samples and the known AC from hand batched blend sheets will be used to quantify an Asphalt Analyzer Offset binder quantity (offset) to be valued at asphalt invoice prices, Payment B.

   Payment B will be calculated for each accepted lot throughout project including the test strip if plant printouts for that lot indicate additional liquid binder was used from design. For any lot that plant printouts do not indicate equal or additional total binder and liquid binder was used compared to the JMF, no Payment B will be made. The Department may verify plant calibrations at any time.

4. Pre-milling, Coring, or Sampling for RAP.

   All work and maintenance associated with the pre-mix design RAP sampling is incidental.

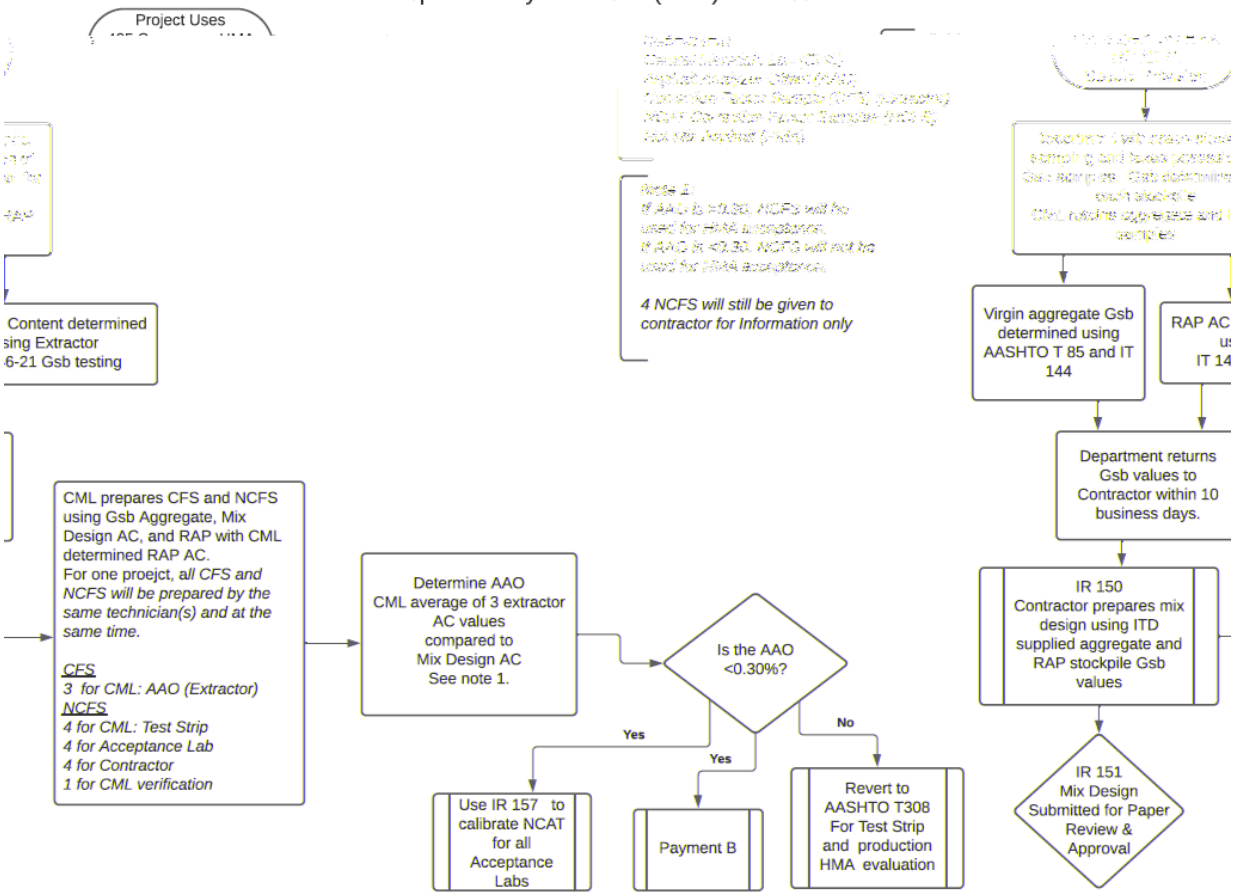
ON SHEET 10 OF 15 QASP (10/21/2019) – 109.09 PAY FACTOR EQUATIONS

Add to the beginning of the second paragraph: “For all pay items, except 405 pay items,”

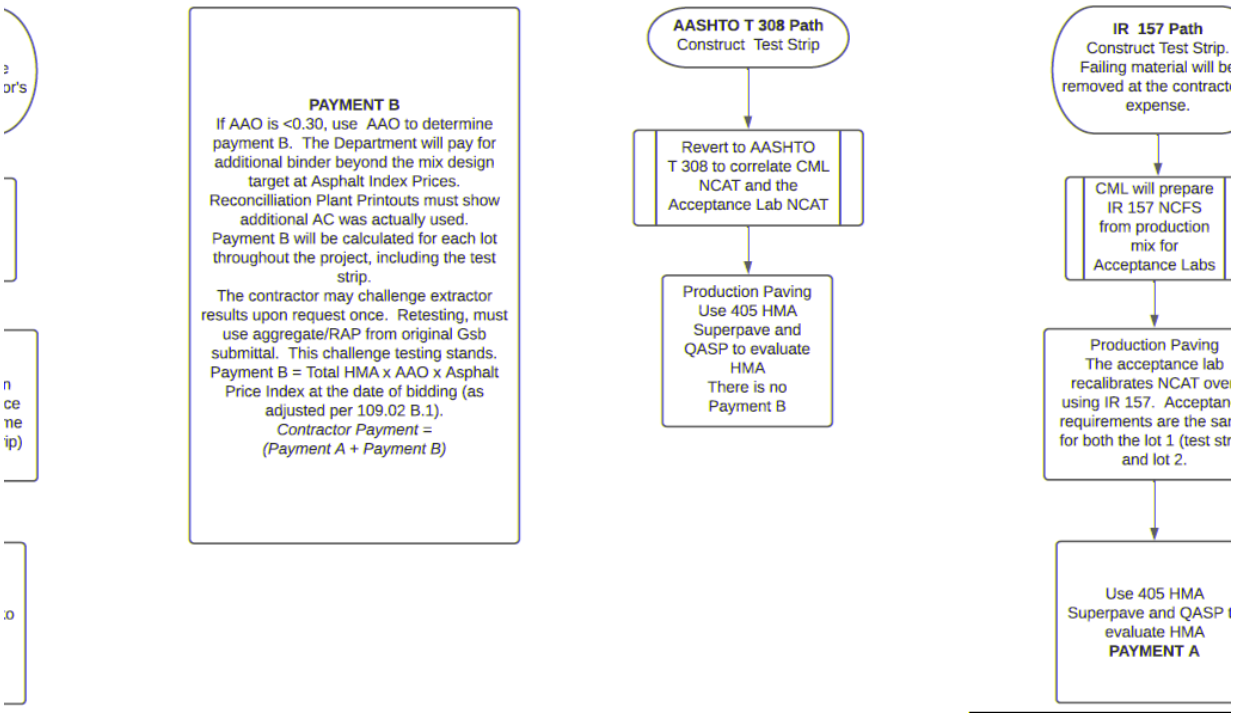
Following the second paragraph add the following:

For 405 items, with the exception of reject quality level material, if any two quality characteristic used in calculating the pay factor for the lot fall below 60 PWL, all quality characteristics will be paid corresponding to the average two lowest, unrounded PWL.

Asphalt Analyzer Offset (AAO) Process



Test Strip Control, Evaluation and Payment



Example Calculation for Payment B

Total 405 HMA for the lot	3,000 Tons
Asphalt Analyzer Offset (AAO)	0.29%
Total Additional Asphalt Binder from AAO for the Lot	8.7 tons
Bid Price of Asphalt Binder (as documented on Invoices)	$500.00 per ton
Total Payment B for the Lot (3,000 tons x 0.29% x $500/ton)	**$4,350.00**

Idaho Standard Practice for

Acceptance Test Strip for Asphalt Mixtures

IDAHO Designation: IR-125-21

1. SCOPE

1.1. This Standard Practice is used to evaluate hot mix asphalt (HMA) and warm mix asphalt (WMA) produced through a hot plant for conformance to the mix design and JMF and for acceptance. This IR includes responsibilities of the Engineer, the Central Materials Laboratory, and the Contractor.

1.2. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the user's responsibility of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations before use.*

2. REFERENCE DOCUMENTS

2.1 *AASHTO Standards*

- FOP for T 27, Particle Size Distribution of Aggregate
- FOP for T 11 Method A or B, Materials Finer than 75um (No. 200) Sieve in Mineral Aggregate by Washing
- FOP for T 30, Mechanical Analysis of Extracted Aggregate
- FOP for T 312, Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
- R 35, Superpave Volumetric Design for Hot Mix Asphalt (HMA)
- FOP for T 335, Method 1, Determining the Percentage of Fracture in Coarse Aggregate
- T 269, Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
- FOP for AASHTO T 209, Bowl Method, Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- FOP for AASHTO R 67, Sampling Asphalt Mixtures after Compaction (Obtaining Cores)
- R 57, Standard Practice for Operating Inertial Profilers and Evaluating Pavement Profiles
- FOP for T 308, Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
- R 97, Sampling Asphalt Mixtures
- FOP for R 47, Reducing Samples of Hot Mix Asphalt to Testing Size
- FOP for T 329, Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
- FOP for T 176, Alternate Method #2 Mechanical Pre-Wet, Plastic Fines in Graded Aggregate and Soils By Use of the Sand Equivalent Test
- T 304, Method A, Uncompacted Void Content of Fine Aggregate

- FOP for R 66, Sampling Asphalt Materials
- M 323, Superpave Volumetric Mix Design
- T 344, Evaluation of the Superpave Gyratory Compactor (SGC) Internal angle of Gyration Using Simulated Loading
- T 331, Bulk Specific Gravity and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing Method
- R 79, Standard Practice for Rapid Drying of Compacted Asphalt Specimens Using Vacuum Drying Apparatus
- T 164, Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
- T 319, Quantitative Extraction and Recovery of Asphalt Binder from Asphalt Mixtures
- FOP for T 166, Method A, Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens
- FOP for T 355, In-Place Density of Asphalt Mixtures by Nuclear Methods
- T 324, Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)

2.2 *ASTM Standards*

- D 1075, Standard Test Method for Effect of Water on Compressive Strength of Compacted Bituminous Mixtures (Immersion-Compression)
- D 4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
- D 6857, Standard Test Method for Maximum Specific Gravity and Density of Bituminous Paving Mixtures Using Automatic Vacuum Sealing Method
- 8159, Standard Test Method for Automated Extraction of Asphalt Binder From Asphalt Mixtures (Asphalt Analyzer™)
- 8225, Standard Method of Test for Determination of Cracking Tolerance Index of Asphalt Mixture Using the Indirect Tensile Cracking Test at Intermediate Temperature

2.3 *Idaho Standards*

- Idaho IR 87, Pavement Straightedge Procedures
- IT 120, Determining Volume of Liquids in Horizontal or Vertical Storage Tanks
- IR 125, Acceptance Test Strip for Hot Mix Asphalt (HMA) Pavement
- IT 144, Specific Gravity and Absorption of Aggregate Using Automatic Vacuum Sealing Method
- IT 146, Determination of Recycled Asphalt Pavement (RAP) Aggregate Dry Bulk Specific Gravity (G_{sb})
- IR 148, Stratified Random Sampling
- IR 150, Superpave Mix Design
- IR 151, Superpave Mix Design Evaluation
- IR 152, HMA Quality Control Plan Development and Implementation
- IR 153, Split Sample Comparison
- IR 154, Nuclear Density Gauge Correlation
- IR 155, Procedures for Checking Asphalt Drum Mix Plant Calibrations

- IR 156, Method for Determining Rolling G_{mm}
- IR 157, Determining Ignition Furnace Correction Factor
- IR 158, Quality Control Plan (QCP) Development and Implementation
- IR 159, Quality Control Plan (QCP) Review Process
- IR 160, Development, Evaluation, and Approval of HMA Plant Quality Control Plans

2.4 Standard Specifications, Subsection 106.03

2.5 Standard Specifications, Section 405

2.6 Quality Assurance Manual, Section 220

3. GENERAL TEST STRIP REQUIREMENTS

3.1. The Contractor will notify the Engineer of the date, time, and location of the acceptance test strip before or during the pre-pave meeting. The Engineer will immediately notify the Central Materials Laboratory.

3.2. The Engineer must witness all sampling of material to be used for acceptance. Any acceptance sample obtained that is not witnessed by the Engineer will be rejected.

3.3. The Contractor is responsible for material sampling. The Contractor will have a qualified technician available for the duration of the test strip. The Contractor will immediately give the samples to the Engineer.

4. IDENTIFYING THE TYPE OF ACCEPTANCE TEST STRIP

4.1. There are 2 types of test strips, an onsite test strip and an off-site test strip (i.e., off-site mix verification). The onsite test strip is performed at the start of production paving operations and encompasses the first lot of production paving. The off-site test strip is performed before beginning production paving.

Note: For the density correlation, reference IR-154. Density correlation is not a test strip.

4.2. Determine if the Contractor will perform an onsite test strip or off-site test strip to verify the JMF.

4.3. For an onsite test strip, the test strip will be the first day of production with the following exception:

4.3.1. If the total estimated quantity of material for the bid item is between 750 and 2,250 tons, the entire quantity of material will be considered the test strip, use the modified sampling schedule found in Annex 1 – On-Site Test Strip Procedure for Smaller Production Runs.

4.4. For an off-site test strip (i.e., offsite mix verification), the test strip sampling will be performed while the Contractor is targeting the JMF.

5. DETERMINING THE TEST STRIP SAMPLING SCHEDULE

5.1. Before the test strip, determine, in conjunction with the Contractor, the anticipated quantity of material that will be produced for the test strip.

Note: *It is recommended to do this via email or other written communication to ensure adequate documentation for the project records.*

5.2. Calculate the testing frequency by dividing the anticipated quantity of material that will be produced for the test strip by the required number of samples needed.

5.3. Using the value calculated in 5.2, perform Idaho IR 148 to determine the sampling schedule to obtain the required number of stratified, random samples.

5.4. Repeat step 5.2 and step 5.3 for each material to be sampled. See Example of Determining the Test Strip Sampling Schedule.

6. MATERIAL SAMPLING REQUIREMENTS

6.1. Before obtaining the first sample, confirm at the hot plant that the approved JMF is being targeted in the hot plant control system and that the most current hot plant calibrations have been verified in accordance with Idaho IR 155.

6.2. The Contractor will sample the required materials as shown in Table 6.1 at the intervals given in the test strip sampling schedule.

6.2.1. Each sample must be clearly labeled and secured in the Engineer's possession immediately after the sample is taken. If a sample consists of multiple containers, label each container in such a way that the samples and the increments are readily distinguishable (i.e., if there are 2 boxes of material for Sample 1: label one box "Box 1 of 2", and the other box "Box 2 of 2").

6.2.2. Each sample must be accompanied by the appropriate sample tracking form with all sampling information included and signed by the WAQTC sampling technician.

6.3. Continue to monitor that the proper mix is being produced throughout the test strip.

6.4. Immediately after completion of the test strip, obtain the hot plant printouts showing production totals for each mix constituent and the most current calibration records (e.g., take a snap shot or provide a written note on the plant printout of where the test strip begins/ends and the next lot begins).

6.5. The testing timeframe begins once the Engineer has received all test strip samples, sample tracking forms, and hot plant printouts and calibration records. The Engineer will submit samples, and original sample tracking forms to the acceptance lab for testing.

Table 6.1-Sampling Requirements

Material	**Sampling Procedure**	**Number of Samples**	**Minimum Sample Size**	**Sample Container**
Mix	AASHTO R 97	6	100 lbs	Cardboard box [(a)]
Aggregate	AASHTO R 90	2	50 lbs	5-gallon bucket [(b)]
RAP	AASHTO R 97	2	50 lbs	5-gallon bucket [(b)]
Binder	FOP for AASHTO R 66	1	Three 1-quart containers	Screw top can [(a)]
Field Compacted Mix	FOP for AASHTO R 67	10 [(d)]	One 6-inch diameter core	Suitable protective container [(c)]

[(a)] See Quality Assurance Manual Table 220.01.1.
[(b)] Clean 5-gallon bucket with a snap-on lid.
[(c)] See FOP for AASHTO R 67 for guidance on packaging and transporting samples.

[(d)] No cores required for offsite test strips.

7. SAMPLING AND TESTING FIELD COMPACTED MIX

7.1. For on-site test strips, field compacted mix acceptance will be based on the results of cores sampled in accordance with AASHTO R 67. Sample locations cannot be closer than 1.0 foot from a cold joint.

7.1.1. When nuclear density gauge results are to be used for acceptance for lots after the completion of the acceptance test strip, correlate the nuclear density gauge(s) in accordance with Idaho IR 154.

7.2. For off-site test strips, there is no field compacted mix acceptance performed during test strip.

7.2.1. When nuclear density gauge results are to be used for acceptance for lots after the completion of the acceptance test strip, correlate the nuclear density gauge(s) in accordance with IR 154.

8. TEST STRIP DOCUMENTATION

8.1. Maintain in ProjectWise the following records, *at a minimum,* for the test strip sampling:

8.1.1. Sampling schedule.

8.1.2. The carbon copy of the appropriate sample tracking form for each sample obtained.

8.1.3. A daily work report (DWR) or daily diary documenting the day's events.

8.1.4. A copy of the hot plant calibration records and a hot plant printout showing recorded data every 15 minutes.

8.2. Ensure the documentation listed under 8.1 is available in ProjectWise within 2 business days after the completion of the test strip.

9. ACCEPTANCE LAB RECEIVING PROCEDURE

9.1. Upon receiving the samples and associated sample tracking forms, ensure that all required documentation is included.

9.2. Document condition of samples, and date and time received.

9.3. Notify the Engineer of receipt and provide a time of estimated completion and review of all testing.

9.4. *With the mix samples:*

9.4.1. Select 1 sample for Idaho IT 157.

9.4.2. Select 3 samples for volumetric testing shown in Table 10.1.

9.4.3. Select 2 samples for performance testing shown in Table 10.2.

9.4.4. Test the mix samples in accordance with Section 10.

9.5. *With the aggregate samples:*

9.5.1. Test the aggregate samples in accordance with Section 11.

9.6. *With the RAP samples:*

9.6.1. Test the RAP samples in accordance with Section 12.

9.7. *With the binder sample:*

9.7.1. Test the binder sample in accordance with Section 13.

9.8. *With the field compacted mix samples:*

9.8.1. Test the field compacted mix samples in accordance with Section 14.

10. ACCEPTANCE LAB MIX TESTING REQUIREMENTS

10.1. With the 1 sample selected in Section 9.4.1, perform Idaho IT 157.

10.2. With each of the 3 samples selected in Section 9.4.2 retain 1 box of each sample for dispute resolution testing. With the remaining box from each sample, reduce in accordance with FOP for AASHTO R 47 and perform the volumetric testing shown in Table 10.1.

10.2.1. Report results on the most current ITD-773 form and include copies of all original source documents.

Table 10.1 – Test Strip Mix Volumetric Testing Requirements.

Test Method	Increments Per Sample
FOP for AASHTO T 308	1
FOP for AASHTO T 30	1
FOP for AASHTO T 312	2
FOP for AASHTO T 166 Method A	2
FOP for AASHTO T 209	2
FOP for AASHTO T 329	1

10.3. With the 2 samples selected in Section 9.4.3 retain 1 sample for dispute resolution testing.

10.3.1. With the remaining sample, blend and reduce in accordance with FOP for AASHTO R 47 to within (plus or minus) 15.0 grams of the desired sample size. Fine tune by hand to the desired sample size and perform the performance testing shown in Table 10.2.

10.3.2. Report results on the most current ITD-773 form and include copies of all original source documents.

Table 10.2 – Test Strip Mix Performance Testing Requirements.

Test Method	Increments [(a)] Per Sample
AASHTO T 324	4
ASTM D 8225	3

[(a)] An increment is considered a single SGC puck.

11. ACCEPTANCE LAB AGGREGATE TESTING REQUIREMENTS

11.1. With one of the 2 samples selected in Section 9.5.1, reduce in accordance with FOP for AASHTO R 76 and perform the testing shown in Table 11.1.

11.1.1. Retain remaining 1 sample for testing, test remaining 1 sample if the first sample fails.

11.1.2. Report results on the most current Department forms, include copies of all original source documents.

Table 11.1 – Test Strip Aggregate Testing Requirements.

Test Method	Increments Per Sample
FOP for AASHTO T 335	1
FOP for AASHTO T 255	1
AASHTO T 304 Method A	1
FOP for ASTM D 4791	2
FOP for AASHTO T 176 (Alternate Method 2, Mechanical)	2
AASHTO T 85[(a)]	3
Idaho IT 144[(a)]	3

[(a)] Department may elect to perform to confirm G_{sb}.

12. ACCEPTANCE LAB RAP TESTING REQUIREMENTS

12.1. With 1 of the samples selected in Section 9.6.1, reduce in accordance with FOP for AASHTO R 76 and perform the testing shown in Table 12.1.

12.1.1. Report results on the most current Department forms include copies of all original source documents.

Table 12.1 – Test Strip RAP Testing Requirements.

Test Method	Increments Per Sample
FOP for AASHTO T 255 (Controlled Heat Source)	1
Idaho IT 146 [(a)]	1
ASTM D8159 [(a)]	1
AASHTO T 30 [(a)]	1
AASHTO T 308 [(a)]	1

[(a)] The Department may confirm the RAP G_{sb}.

13. ACCEPTANCE LAB BINDER TESTING REQUIREMENTS

13.1. With the one sample selected in Section 9.7.1, select 2 quarts for Department acceptance testing and 1 quart for challenge resolution. Perform the testing shown in Table 13.1.

13.1.1. Report results on the most current Department forms, include copies of all original source documents.

Table 13.1 – Test Strip Binder Testing Requirements.

Test Method	Increments Per Sample
Idaho IT 99	1
AASHTO M 320[(a)]	1
ASTM D 8159[(a)]	1

[(a)] See QA Manual Sections 230.10. Meet the requirements of Standard Specifications Sections 702.01 and 702.06.

14. ACCEPTANCE LAB FIELD COMPACTED MIX TESTING REQUIREMENTS

14.1. With the each of the 10 samples selected in Section 9.8.1, separate two or more pavement courses, lifts, or layers per FOP for AASHTO R 67. Perform the testing shown in Table 14.1.

14.1.1. Report results on the most current Department forms, include copies of all original source documents.

Table 14.1 – Field Compacted Mix Testing Requirements.

Test Method	Increments Per Sample
FOP for AASHTO T 166 Method A or AASHTO T 331[(a)]	1

[(a)] Use the average G_{mm} from testing performed in Section 10 to compute the in-place density of the cores.

15. ACCEPTANCE LAB TEST STRIP RESULTS REPORTING PROCEDURE

15.1. Report the results of each test performed on the most current Department forms, include copies of all original source documents and sample tracking forms in the report.

15.1.1. Each original source document will be signed by the testing technician.

15.2. The lab manager or the lab manager's qualified designated agent will fully review the report and all supporting documents for completeness.

15.3. Submit a complete electronic copy of the report to the Engineer for distribution with ample time to allow the Engineer time to review and determination of test strip acceptance.

16. EVALUATING ACCEPTANCE TEST STRIP RESULTS

16.1. The Engineer, upon receipt of the results from 15.3, will determine acceptance of the test strip as follows:

16.1.1. Use the Department approved method (e.g., Department provided spreadsheet or web portal) to perform the quality level analysis and determine acceptance as specified in 106.03.B and 405.03.I.

16.2. *Review of hot plant calibration records:*

16.2.1. Verify that the calibration records meet Idaho IR 155. If they do not match the most recent plant calibration record that was witnessed, perform a calibration verification in accordance with Idaho IR 155.

16.3. *Review of hot plant printout:*

16.3.1. Use the ITD-774 form to verify that the hot plant printout indicates the individual cold feed percentage for aggregate, cold feed percentage for RAP, asphalt content for the RAP, and virgin binder meet the requirements of 405.03.I.

17. ACCEPTANCE OF THE TEST STRIP

17.1. The test strip is considered acceptable when it meets 405.03.I.6.

18. EXAMPLE OF DETERMINING THE TEST STRIP SAMPLING SCHEDULE

Example: During the pre-paving meeting, the Contractor informs the Engineer that they will be performing an onsite test strip on April 19th. They anticipate paving 2,130 tons.

The Engineer will use this information to develop a test strip sampling schedule as follows:

For plant mix:

- The plant mix sampling frequency is calculated by dividing 2,130 by 6.
- Sampling frequency for plant mix is 1 sample per 355 tons.
- Use a 355 ton sample frequency and 6 samples, perform Idaho IR 148 to determine the sampling schedule to obtain 6 stratified random, samples of plant mix.
- Obtain plant mix samples in accordance with AASHTO R 97 per the sampling schedule.

For cold feed aggregate:

- Before sampling asphalt mix, obtain 1 cold feed aggregate sample by Conveyor Belt Method A or Method B of FOP for AASHTO R 90. Conveyor Belt Method B is the preferred method if automatic sampling devices are available.
- After sampling asphalt mix, obtain 1 cold feed aggregate sample by Conveyor Belt Method A or Method B of FOP for AASHTO R 90. Conveyor Belt Method B is the preferred method if automatic sampling devices are available.

For RAP (if used):

- Before sampling asphalt mix, obtain 1 RAP sample by FOP for AASHTO R 90. Conveyor Belt Method B is the preferred method if automatic sampling devices are available.
- After sampling asphalt mix, obtain 1 RAP sample by FOP for AASHTO R 90. Conveyor Belt Method B is the preferred method if automatic sampling devices are available.

For binder:

- Use a 2,130 ton sample frequency and 1 sample, perform Idaho IR 148 to determine the sampling schedule to 1 stratified, random samples of binder.
- Obtain 1 binder sample (consisting of 3, 1-quart cans) in accordance with FOP for AASHTO R 66 per the sampling schedule.

For field compacted mix:

- The field compacted mix sampling frequency is calculated by dividing 2,130 by 10.
- Sampling frequency for plant mix is 1 sample per 213 tons.
- Use a 213 ton sample frequency and 10 samples, perform Idaho IR 148 to determine the sampling schedule to obtain 10 stratified random, samples of field compacted mix.
- Obtain field compacted mix samples in accordance with AASHTO R 67 per the sampling schedule.

Idaho Standard Practice for

Superpave Volumetric Mix Design

IDAHO Designation: IR-150-21

1. SCOPE

1.1. This practice describes the requirements for developing a Superpave mix design.

1.2. *This standard practice may involve hazardous materials, operations, and equipment. This standard practice does not purport to address all of the safety concerns, if any, associated with its use. It is the user's responsibility of this procedure to establish appropriate safety and health practices and determine the applicability of regulatory limitations before use.*

2. BACKGROUND

2.1. Developing a mix design is a function of quality control (QC). A mix design is developed to find a combination of aggregates, recycled materials, asphalt, and additives to produce a roadway that meets the Department's specifications.

2.2. The end result of a successful mix design is a recommended mixture of aggregate and asphalt binder. This recommended mixture, which also includes aggregate gradation and asphalt binder type, is the job mix formula (JMF).

2.3. A JMF is a recipe for the plant to make. The mix design is the development of that recipe. A mistake in the design process can disrupt a project's schedule dramatically and have a big impact to the overall quality of the finished roadway. The development of the JMF is a QC process. It is the Contractor's responsibility to ensure that their mix design and resulting JMF will result in a mix that meets the contract requirements as determined by the Department's testing.

> **Note:** A JMF is only as good as the information that was used to develop it. A good mix design can help limit issues in production.

2.4. The mix design evaluation is for the Department to use to validate that the recipe was properly developed and the resulting JMF appears that the mix produced will meet the contract requirements.

3. REFERENCE DOCUMENTS

3.1. AASHTO Standards

- M 323, Superpave Volumetric Mix Design
- R 30, Mixture Conditioning of Hot-Mix Asphalt (HMA)
- R 35, Superpave Volumetric Design for Asphalt Mixtures
- R 76, Reducing Samples of Aggregate to Testing Size
- R 90, Sampling Aggregate Products
- T 11, Materials Finer Than 75-pm (No. 200) Sieve in Mineral Aggregates by Washing
- T 27, Sieve Analysis of Fine and Coarse Aggregates

- T 84, Specific Gravity and Absorption of Fine Aggregate
- T 85, Specific Gravity and Absorption of Coarse Aggregate
- T 166, Bulk Specific Gravity (G_{mb}) of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens
- T 209, Theoretical Maximum Specific Gravity (G_{mm}) and Density of Hot Mix Asphalt (HMA)
- T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor
- T 324, Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)
- T 331, Bulk Specific Gravity (G_{mb}) and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing Method

3.2. Idaho Standards:

- IT 144, Specific Gravity and Absorption of Fine Aggregate Using Automatic Vacuum Sealing Method
- IT-146, Determination of Recycled Asphalt Pavement (RAP) Aggregate Dry Specific Gravity G_{sb}
- Standard Specifications for Highway Construction

3.3. WAQTC/Idaho FOPs

- R 76, Reducing Samples of Aggregate to Testing Size
- R 90, Sampling Aggregate Products
- T 11, Materials Finer Than 75-pm (No. 200) Sieve in Mineral Aggregates by Washing
- T 27, Sieve Analysis of Fine and Coarse Aggregates
- T 166, Bulk Specific Gravity (G_{mb}) of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens
- T 209, Theoretical Maximum Specific Gravity (G_{mm}) and Density of Hot Mix Asphalt (HMA)
- T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor
- WAQTC TM 13, Volumetric Properties of Hot Mix Asphalt
- WAQTC TM 14, Laboratory Prepared Asphalt Mixture Specimens

3.4. ASTM Standards

- D8159, Automated Extraction of Asphalt Binder From Asphalt Mixtures (Asphalt Analyzer)
- D8255, Determination of cracking Tolerance Index of Asphalt Mixture Using the Indirect Tensile cracking Test at Intermediate Temperature

3.5. *Other Standards*

- Asphalt Institute MS-2, Asphalt Mix Design Methods, 7th Edition

4. SPECIFIC GRAVITY OF AGGREGATE AND RAP

4.1. Use the bulk dry specific gravity of aggregate (G_{sb}) established by the Department for each stockpile when developing the mix design and performing calculations.

5. MIX DESIGN REQUIREMENTS

5.1. Develop a Superpave mix design in accordance with AASHTO R 35 that will result in a plant-produced mixture that meets the contract requirements.

5.2. The mix design must be developed by an individual that is qualified by the Department as a Superpave mix design technician (SPMDT).

5.2.1. The specific tests required during the mix design process must be performed by an individual qualified by the Department for the specific test method.

5.3. The mix design must be reviewed, approved, signed, and sealed by an Idaho-licensed professional engineer responsible for the mix design.

5.4. Use a Department-qualified Superpave mix design laboratory for developing the design.

6. MIX DESIGN REPORT REQUIREMENTS

6.1. Provide a single job mix formula (JMF) reported on an ITD-774 form.

6.2. Attach all supporting documentation and data used in developing the JMF.

6.2.1. Include signature(s) and WAQTC/PE license number(s) for testers and reviewers on each sheet.

Note: The design will be reviewed by the Department in accordance with Idaho IR 151. Ensure that the report has all information required to complete the review. Incomplete or missing information will result in rejection of the mix design.

7. MIX DESIGN SUBMITTAL

7.1. Submit the mix design and all supporting documentation via email to mixdesigns@itd.idaho.gov and the Engineer.

7.2. Each mix design submitted for approval must be accompanied by a Microsoft® Excel® electronic version of the ITD-774 form specific to the mix design.

7.3. Only 1 mix design per email notification will be accepted. Submit the mix design for evaluation a minimum of 5 business days before paving is scheduled to begin.

7.4. Upon submittal, the Department will give the mix design a unique identifier number. This will be the mix design number. Keep this number for your records.

8. AMENDING THE MIX DESIGN

8.1. If the mix design is required to be amended per 405.03.B.1.b.i.1, amend the mix design the following process:

8.1.1. Each page of the mix design that is revised or added is required to include the project key lead number, bid item number, date of revision, and means of identifying the revision. The amendment is required to be signed and dated by the Contractor's representative who is responsible for developing the mix design and subsequently signed and dated when approved by the Engineer.

8.2. Amending the mix design or JMF is not allowed once the mix design has been approved by the Department.

9. APPROVED MIX DESIGNS

9.1. The Department will maintain a list of approved mix designs listed by Department generated mix design number. Mix designs are not approved for use unless they are listed.

Idaho Standard Practice for

Superpave Mix Design Evaluation

IDAHO Designation: IR-151-21

1. SCOPE

1.1. This practice describes the procedures for evaluating a Superpave mix design, mix design requirements, and the time required to perform the evaluation.

1.2. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the user's responsibility of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations before use.*

2. BACKGROUND

2.1. When reviewing a mix design, it is important to keep in mind the following:

2.2. A mix design is solely a function of quality control (QC). A mix design is developed to find a combination of aggregates, recycled materials, asphalt, and additives to use to produce a roadway that meets the Department's specifications.

2.3. The end result of a successful mix design is a recommended mixture of aggregate and asphalt binder. This recommended mixture, which also includes aggregate gradation and asphalt binder type is the job mix formula (JMF).

2.4. A JMF is a recipe for the plant to make. The mix design is the development of that recipe. A mistake in the design process can disrupt a project's schedule dramatically and have a big impact to the overall quality of the finished roadway. However, developing the JMF is a QC process. It is the Contractor's responsibility to ensure that their mix design and resulting JMF will result in mix that meets the contract requirements.

Note: A JMF is only as good as the information that was used to develop it. A good mix design can help limit issues in production.

2.5. The mix design evaluation is for the Department to use to validate that the recipe was properly developed and the resulting JMF appears that the mix produced will meet the contract requirements.

3. REFERENCE DOCUMENTS

3.1. *Idaho Procedures:*

- IT-150, Superpave Volumetric Mix Design
- Standard Specifications for Highway Construction

4. SUBMITTAL OF MIX DESIGN

4.1. The Contractor must submit the asphalt mix design in accordance with Idaho IR 150.

5. RECEIPT OF MIX DESIGN SUBMITTAL

5.1. Upon receipt of the mix design submittal, the mix design will be given a unique identifier number.

6. REVIEW OF MIX DESIGN SUBMITTAL

6.1. The Department will review all Superpave mix designs proposed for use before use. The Department recognizes the risk associated with each paving application varies. Therefore, the extent of each mix design review will be in accordance with these potential risks.

6.2. The mix design will be reviewed by the Engineer, the Central Materials Laboratory, and the State Construction and Materials Engineer.

6.3. The reviewers may contact the mix designer or the professional engineer responsible for the mix design during the review process for further information or clarifications.

6.4. All mix designs will be reviewed for the following:

6.4.1. Accuracy.

6.4.2. Completeness.

6.4.3. Reasonableness. Examples of items that will be check for reasonableness include, but are not limited to, ensuring that calculations were done correctly and that the volumetric data follows the expected trends (i.e., binder absorption not being dependent on asphalt content).

6.4.4. Compliance with specifications.

6.4.5. Compliance with Idaho IR 150.

6.5. When amendments are made to the mix design submittal, the current review will be ended and the amended mix design will be considered a new submittal.

6.5.1. Amendments must meet the requirements of Idaho IR 150.

7. REVIEW OF PREVIOUSLY USED MIX DESIGNS

7.1. A mix design reviewed and accepted for a previous or current project may be submitted in writing for use on a new project. Acceptance of the mix design will be based on meeting the following requirements in addition to the requirements of Section 3:

7.1.1. The proposed mix design is of the type required for the new project.

7.1.2. The mix produced on previous projects utilizing the proposed mix design was of good quality (e.g., the combined average PWL on all the previous project(s) was ≥ 90 PWL for all mix quality characteristics).

7.1.3. The mix design is not classified as expired in accordance with 405.03.B.2 of the Standard Specifications.

8. MIX DESIGN REVIEW TIMEFRAME

8.1. The Department will review the mix design within 5 business days after receiving the full submittal package.

9. APPROVAL OF MIX DESIGN

9.1. The Department will maintain a list of approved mix designs. Upon approval, the mix design will be placed on this list.

10. REJECTION OF MIX DESIGN

10.1. The Department will notify the Contractor upon rejection of a mix design via email.

10.1.1. The Department will provide details as to why the mix design was rejected.

10.2. Notification of the rejection will be sent to the email address given on the ITD-774 form.

Idaho Standard Practice for

ASPHALT MIXTURES QUALITY CONTROL PLAN (QCP) DEVELOPMENT AND IMPLEMENTATION

IDAHO Designation: IR-152-21

1. PURPOSE

1.1. The purpose is to establish minimum requirements for the Contractor's quality control system and quality control plan (QCP) for asphalt mixtures. It is intended that these requirements be used as a procedural guide in detailing the inspection, sampling, and testing deemed necessary to maintain compliance with the Department's specifications. The Department and the Contractor must hold a pre-pave meeting and document the decisions and agreements made. An example of a pre-pave meeting agenda is provided in the Appendix. Conducting a thorough pre-pave meeting increases partnership as well as it can only increase the likelihood of success of each party.

2. SCOPE

2.1. This procedure is applicable to the production and construction of asphalt mixtures.

3. REFERENCE DOCUMENTS

3.1. Idaho Standards

- IR 158, Quality Control Plan Development.
- IR 160, Evaluation and Approval of HMA Plants and Equipment.
- IR 155, Procedures for Checking Asphalt Drum Mix Plants

4. GENERAL REQUREMENTS

4.1. As stated in the Standard Specifications for Highway Construction, a QCP must be developed by the Contractor/producer and submitted in writing to the Engineer at the preconstruction conference. Acceptance of the QCP by the Engineer will be contingent upon its concurrence with the Standard Specifications and this standard method. For this reason, the QCP will clearly describe the methods by which the quality control program will be conducted. For example, the items to be controlled, tests to be performed, testing frequencies, sampling locations, and techniques will be included with each item listed separately. Also include a table stating what actions will occur when test results indicate specification limits are approached or exceeded. See Table 1 at end of this guide for an example. Also, a detailed plan of action regarding disposition of non-specification material will be included. Such a plan will provide for immediate notification of all parties involved in the Quality Assurance process in the event nonconforming situations are detected. Example 1. HMA Quality Control Plan may be used as an example.

4.2. Inspection and testing records must be maintained, kept current, and made available for review by Department personnel throughout the life of the contract. All other documentation (e.g., date of inspections, tests performed, temperature measurements, and accuracy, calibration or re-calibration checks performed on production of testing equipment) will be recorded.

4.3. The Contractor will maintain standard equipment and qualified personnel in accordance with the contract and specification requirements for the item(s) being produced.

5. QUALITY CONTROL PLAN

5.1. Operation quality control plans will be submitted for each contract/project to the Engineer for review and approval. Include a Plant Quality Control Plan that meets the requirements of Idaho IR 160. Distribution of the approved quality control plans will be made by the Engineer.

5.2. Example 1. HMA Quality Control Plan is provided only as an acceptable template that contains the required information is attached.

6. ADDENDA TO THE QUALITY CONTROL PLAN

6.1. Addenda are defined as an addition or deletion to the QCP. Each page of the QCP that is revised is required to include the project key lead number, date of revision, and means of identifying the revision. The addenda are required to be signed and dated by the Contractor's representative who is responsible for insuring that all items of work will comply with Department Specifications and subsequently signed and dated when approved by the Engineer.

Table 1: Example of QC Actions to Implement When Approaching or Exceeding Specification Limits

Test Description	Test Method	QC Action Limits		Situation		Action
		Single Test	4-Point Moving Avg. or Daily Avg.	Single Test	4-Point Moving Avg. or Daily Avg.	
Binder Content, P_b	FOP for AASHTO T 168 and FOP for AASHTO R 47 and FOP for AASHTO T 308 and FOP for AASHTO T 329	± 0.6	± 0.3	Approaching Limit	Approaching Limit	Discuss with hot mix plant, operator, and may suspend construction process
Aggregate Gradation	FOP for AASHTO T 30 (wash method used for all gradation measurements)	NA	C-JMF	4 percent on +#4 2 percent on -#4	Approaching Limit	Increase frequency of tests and prepare for process modification
Air Voids @ N_{design}, P_a	WAQTC TM 13	± 1.0%	NA	2 tests over ± 1%	NA	Initiate C-JMF Modifications
VMA @ N_{design}	WAQTC TM 13	≤ 1% min	≥ min	3 tests over ± 1%	Approaching Limit	Discuss with the Engineer & Process Modification
Dust Proportion, DP	WAQTC TM 13	NA	≥ min ≤ max	Approaching Limit	Approaching Limit	Modify C-JMF
G_{mm}	FOP for AASHTO T 168 and FOP for AASHTO R 47 and FOP for AASHTO T 209 (Bowl Method)	C-JMF	C-JMF	Approaching Limit	Approaching Limit	Modify C-JMF or Redesign
G_{se}	WAQTC TM 13	C-JMF	C-JMF	Approaching Limit	Approaching Limit	Modify C-JMF or Redesign
Rut Depth, mm	AASHTO T 324	≥ min	NA	Approaching Limit	NA	Discuss with the Engineer & initiate investigation, modification, or redesign
Stripping, passes	AASHTO T 324	≥ min	NA	Approaching Limit	NA	Discuss with the Engineer & initiate investigation, modification, or redesign
Cracking, FI	AASHTO TP 124	≥ min	NA	Approaching Limit	NA	Discuss with the Engineer & initiate investigation, modification, or redesign
Mainline Density	Idaho IR 156, and FOP for AASHTO T 355 or FOP for AASHTO T 343	NA	≥ min	Approaching < 92%	≤ 100% Pay	Notify the Engineer

Note: When 2 consecutive test results fail or if any of the 4-point moving average values fail, production will be suspended and the situation discussed with the Engineer. The process will be corrected before production resumes.

EXAMPLE 1

HMA Quality Control Plan – General Overview (Details provided in PrePave Meeting/Project Specific)

NOTE: This is provided only as an acceptable template; other options/formats are acceptable

Date:
To: (RESIDENT ENGINEER)
From: (CONTRACTOR(s) NAME)
Subject: HMA Quality Control Plan

1. Project Information

1.1. We are submitting our HMA Quality Control Plan, developed in accordance with Idaho IR 152, Idaho IR, 158, and Idaho IR 160 for:

Project Number:_____
Lead Key Number:_____
Date Submitted:_____

1.2. (NAME) is responsible for ensuring that all items of work will comply with the contract and Department specifications.

2. Hot Plant

2.1. General Information:

Make:_____

Type:_____

Address of Plant:_____

2.2. The hot plant operation is under the direction of (NAME) who can be contacted at (ADDRESS, EMAIL, AND TELEPHONE).

2.3. Current calibration and verification status of plant and history of plant inspection program attached in Exhibit A.

2.4. The Hot Plant Quality Control Plan, developed in accordance with Idaho IR 160 and approved on (DATE) by (NAME OF PERSON(s)) is attached in Exhibit B.

3. Mix Designs

3.1. Mix designs will be the responsibility of (NAME OF PERSON(s)), WAQTC number (NUMBER(s)).

3.2. The HMA design(s) to be used are attached in Exhibit C.

3.3. Before production, (NAME), (WAQTC NUMBER), will submit our HMA mix design for each type of mix in accordance with the contract and specifications by (DATE). Only allowable and approved materials will be incorporated in the mix.

4. Delivery and Placement

4.1. The field operation is under the direction of (NAME) who can be contacted at (ADDRESS, EMAIL, AND TELEPHONE).

4.2. (LIST OF EQUIPMENT TYPE, MAKE).

4.3. (DETAILED DESCRIPTION OF THE PRODUCTION AND PLACEMENT PROCESS).

5. Quality Control Sampling and Testing,

5.1. The laboratory performing quality control testing is (LAB QUALIFICATION NUMBER), located at (LOCATION).

5.2. The quality control program is under the direction of (NAME OF PERSON), who can be contacted at (ADDRESS, EMAIL, AND TELEPHONE).

5.3. During the placement operations of the HMA pavement we will perform at a minimum quality control tests per attached schedule. Sampling and testing is the responsibility of (NAME(s), WAQTC number (NUMBER(s)).

5.4. Sampling and testing is the responsibility of (NAME OF PERSON(s)), WAQTC number (NUMBER(s)).

5.5. During the production operations of the HMA (NAMES) will perform, at a minimum, quality control tests in accordance with the attached schedule. Also attached are the proposed method to select locations and/or times for sampling. See Exhibit D.

5.6. All testing will be completed by (NAME(s)), (WAQTC NUMBER(s)), within (HOURS) hours of sampling and all original documentation of results will be completed on the attached original documentation forms. See Exhibit E.

5.7. Testing reports and original source documents will be reviewed and checked by (NAME(s)), (WAQTC NUMBER(s)), within (HOURS) hours of testing being completed. All reporting will be completed on the attached forms. See Exhibit F.

EXAMPLE 1 (CONTINUED)
HMA Quality Control Plan

6. Records.

6.1. Testing reports and all backup documentation will be located at (LOCATION) for review by the Department between the hours of (TIME) and (TIME) during the life of the contract/project.

6.2. Testing reports and all backup documentation will be located at (LOCATION) for review by the Department between the hours of (TIME) and (TIME) for (YEARS) after the completion of the project.

7. Notifications.

7.1. Any material found to be noncomplying will be addressed by (NAME) who will notify the Engineer immediately.

7.2. (NAME) will notify appropriate Department personnel at least 48 hours before any work is to begin.

8. Nonconforming Material.

8.1. (STATE THE PROCESS FOR DISPOSITION OF NONCONFORMING MATERIAL)

8.2. See the Exhibit G for what actions will occur when test results indicate specification limits are approached or exceeded.

Attachments:

Exhibit A – Current calibration and verification status of plant and history of plant inspection program

Exhibit B – Hot Plant Quality Control Plan

Exhibit C – HMA Mix Design

Exhibit D – Minimum QC Testing Schedule, Sampling and Testing Methods, and Location(s)

Exhibit E – Original Test Documentation Form Template(s)

Exhibit F – Test Reporting Form Template(s)

Exhibit G – Table of QC actions when approaching or exceeding specification limits

Idaho Standard Practice for

Split Sample Comparison

IDAHO Designation: IR-153-21

1. SCOPE

1.1. This Standard Practice is used to compare 2 or more sets of test results in order to measure the testing variability of different parties (e.g., Department vs. Contractor).

2. BACKGROUND

2.1. There are 4 primary components or sources of inherent variability in individual test results for material samples. These components of inherent variability are:

- Sampling Variability
- Testing Variability
- Material Variability
- Construction Variability

2.1.1. **Sampling variability** is caused by variation that is inherent in the sampling methods or procedures used to obtain a material sample. Even when the person obtaining a sample carefully follows standard sampling methods or procedures, some amount of sampling variability will occur.

2.1.2. **Testing variability** is the result of variation inherent in performing a test method and variation inherent in the test equipment. Even when the person performing a test carefully follows standard testing methods and even when the test equipment is properly calibrated, some amount of testing variability will occur.

2.1.3. **Material variability** is essentially due to the inherent variation that naturally exists in a given material. It is quite unrealistic to expect perfect homogeneity in any raw or processed source of construction materials (e.g., soils, aggregate, HMA, PCC, steel, paint). The inherent variation for most construction materials, on a relative basis, is usually small.

2.1.4. **Construction variability** is the result of variation that is inherent in production methods and construction operations. The largest amount of construction variability is generally attributed to the production and placement process.

2.1.5. Additional construction variability (i.e., beyond the expected or accepted range) can be introduced through inconsistent production methods and construction operations. This is why good, consistent quality control, both at the source/plant and in the field, is essential in minimizing the amount of construction variability as a component of overall inherent variability.

2.1.6. Additional sampling variability and testing variability (i.e., beyond the expected or accepted range) can be introduced through deviations from standard sampling method and test procedures by the person(s) performing the sampling and testing, or as a result of test equipment that is not properly calibrated or properly functioning. Sampling and testing variability, combined, have been stated as comprising up to 50 percent of the total overall variation in test results. Specification

limits were developed to take standard sampling and testing variability into account. However, it is important not to compound or add to the expected range of inherent variability due to sloppy practices. Consistent and careful adherence to proper sampling and testing procedures can minimize these two components of overall inherent variability.

3. REFERENCE DOCUMENTS

2.1 *AASHTO Standards*

- FOP for R 90, Sampling of Aggregates
- R 76, Reducing Samples of Aggregates to Testing Size
- T 255, Total Evaporable Moisture Content of Aggregate by Drying
- FOP for T 27, Particle Size Distribution of Aggregate
- FOP for T 11, With Materials Finer than 75um (No. 200) Sieve in Mineral Aggregate by Washing
- T 335, Determining the Percentage of Fracture in Coarse Aggregate
- T 176, Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
- R 97, Sampling Asphalt Mixtures
- R 47, Reducing Samples of Hot Mix Asphalt (HMA) to Testing Size
- T 329, Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
- T 308, Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
- T30, Mechanical Analysis of Extracted Aggregate
- T 209, Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt Paving Mixtures
- T 167, Standard Method of Test for Compressive Strength of Hot Mix Asphalt
- T 166, Bulk Specific Gravity of Compacted Hot Mix Asphalt using Saturated Surface-Dry Specimens
- R 30, Mixture Conditioning of Hot-Mix Asphalt (HMA)
- FOP for R 66, Sampling Asphalt Materials
- T 164, Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
- T 319, Quantitative Extraction and Recovery of Asphalt Binder from Asphalt Mixtures
- T 303, Lime for Asphalt Mixtures
- T 312, Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor
- T 324, Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)
- T 33, Bulk Specific Gravity and Density of Compacted Asphalt Mixtures Using Automatic Vacuum Sealing Method
- R 79, Standard Practice for Rapid Drying of Compacted Asphalt Specimens Using Vacuum Drying Apparatus
- T 269, Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
- T 283, Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
- TM 13, Volumetric Properties of Hot Mix Asphalt

- R 67, Sampling Asphalt Mixtures after Compaction (Obtaining Cores)
- T 309, Temperature of Freshly Mixed Portland Cement Concrete
- T 119, Slump of Hydraulic Cement Concrete
- T 121, Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
- T 152, Air Content of Freshly Mixed Concrete by the Pressure Method
- T 23, Method of Making and Curing Concrete Test Specimens in the Field
- T 265, Laboratory Determination of Moisture Content of Soils
- T 99, Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and 305-mm (12-in.) Drop
- T 180, Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and 457-mm (18-in.) Drop
- T 85, Specific Gravity and Absorption of Course Aggregate
- T 355, Determining the Percentage of Fracture in Coarse Aggregate
- T 310, In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- T 272, One-Point Method for Determining Maximum Dry Density and Optimum Moisture
- T 304, Uncompacted Void Content of Fine Aggregate
- R 64, Standard Practice for Field Sampling and Fabrication of 50-mm (2-in) Cube Specimens using Grout (Non-Shrink) or Mortar
- T 359, Pavement Thickness by Magnetic Pulse Induction

ASTM Standards

- FOP for D 4791, Flat and Elongated Particles in Coarse Aggregate
- D 1075, Standard Test Method for Effect of Water on Compressive Strength of Compacted Bituminous Mixtures (Immersion-Compression)
- D 6857, Standard Test Method for Maximum Specific Gravity and Density of Bituminous Paving Mixtures Using Automatic Vacuum Sealing Method
- D 8159, Standard Test Method for Automated Extraction of Asphalt Binder From Asphalt Mixtures (Asphalt Analyzer™)
- D 8225, Standard Method of Test for Determination of Cracking Tolerance Index of Asphalt Mixture Using the Indirect Tensile Cracking Test at Intermediate Temperature

Idaho Standards

- IT 13, Measuring Mortar-Making Properties of Fine Aggregate Idaho
- IT 15, Degradation
- IT 72, Evaluating Cleanness of Cover Coat Material
- IT 74, Vibratory Spring-Load Compaction for Coarse Granular Material
- IT 116, Disintegration of Quarry Aggregates (Ethylene Glycol)
- IT 144, Specific Gravity and Absorption of Fine Aggregate Using Automatic Vacuum Sealing (CoreLok) Method
- IT 61, Sampling and Viscosity Testing Emulsified Asphalt Binders in the Field

- IT 146, Determination of Reclaimed Asphalt Pavement (RAP) Aggregate Bulk (Dry) Specific Gravity (G_{sb})
- IR 128, Sampling Concrete for Chloride Analysis
- IT 131, Total Chloride Content of Hardened Concrete by Gran Plot Method
- IT 133, Determination of the Rate of Evaporation of Surface Moisture from Concrete
- IR 143, Field Sampling of Hydraulic Cement and Fly Ash
- IT 147, Measuring Texture Depth of Portland Cement Concrete Using a Tire Tread Depth Gauge
- IR 7, Inspecting/Sampling Paint and Curing Compound
- IT 121, Determining Total Solids-Latex Percent
- IT 8, Resistance R-Value and Expansion Pressure of Compacted Soils and Aggregates
- IR 162, Taking Undisturbed Soil Samples for Laboratory Consolidation, Shear and Permeability Tests
- Idaho Transportation Department Quality Assurance Manual

WAQTC Standards

- TM 13, Volumetric Properties of Hot Mix Asphalt
- TM 2, Sampling Freshly Mixed Concrete
- IR 87, Pavement Straightedge Procedures
- IT 120, Determining Volume of Liquids in Horizontal or Vertical Storage Tanks

4. SUMMARY OF THE PRACTICE

4.1. This practice describes the testing and analysis needed to perform a comparison of split samples tested by different parties against an allowable degree of test result difference attributed to testing variability.

5. TERMINOLOGY

5.1. *Individual Split Sample Acceptable Range*— The allowable tolerance between individual split sample test results when properly sampled and split.

5.2. *Paired t-Test*— Uses the difference between each pair of tests of the split samples and determines whether the difference is much different from zero.

5.3. *Split Increment*— A representative portion of a split sample that is larger than the minimum size needed for a single party to perform the desired testing.

5.4. *Split Sample*— A sample that will be used for split sample comparison testing.

6. MATERIAL SAMPLING AND SPLITTING AND TESTING

6.1. Obtain a sample in accordance with the Department's approved sampling procedure.

6.1.1. Ensure that the sample is large enough for each party to receive a split increment larger than the minimum sample size.

6.2. Split each sample in accordance with the Department's approved splitting procedure.

6.2.1. Ensure that each split increment meets the minimum sample size for the testing to be performed.

6.3. Each party will test in accordance with Department's approved testing procedures.

6.4. Repeat steps 6.1 to 6.3 until the desired number of split samples are obtained to perform the analysis.

Note: It is recommended to compare a minimum of 3 split samples for material that will be subject to statistical based acceptance (e.g., HMA, aggregates)

7. COMPARISON OF RESULTS

7.1. Compare the split increments for each split sample using the D2S limits (Section 9).

7.2. Compare the sets of split increments for all split samples using the paired t-test (Section 8).

Note: The D2S comparison is simple and can be done for each split sample that is obtained. However, this procedure compares only 2 test results (from one split sample), and is not very powerful due to the limited amount of data being evaluated. The paired t-test, compares multiple sets of split samples, and is a better method for comparison since this test uses the differences between multiple pairs of tests and determines whether the average difference is statistically different from zero.

7.3. Use the ITD-1237 form to perform and report the comparison.

7.4. When differences in results have been identified, the parties will collaborate and investigate to determine the source of the inconsistency and make necessary corrections.

7.5. The possible source of the inconsistencies and any corrections made will be documented on the ITD-1237 form.

8. PAIRED T-TEST COMPARISON (RECOMMENDED)

8.1. Determine the individual difference between split sample test results (X_{dif}) for each split sample.

$$x_{dif} = x_A - x_B$$

Where:

X_{dif} = Individual difference between split sample test results.

X_A = Party A's individual test value.

X_B = Party B's individual test value.

Note: This difference is not the absolute difference, it is the algebraic difference. The subtraction (i.e., Party A's test value minus Party B's test value) is performed in the same direction for every set of split samples.

8.2. Determine the mean of the differences between the split sample test results, calculated as follows:

$$\overline{X}_{dif} = \frac{(x_{dif1} + x_{dif2} + \ldots x_{dif\,n})}{n}$$

Where:

$\overline{X}_{dif}$ = Mean of the differences between the split sample test results.

n = Number of split samples.

8.3. Compute the standard deviation of the differences between the split sample test results, calculated as follows:

$$S_{dif} = \sqrt{\frac{\sum(x_{dif} - \overline{X}_{dif})^2}{n - 1.0}}$$

Where:

S_{dif} = Standard deviation of the differences between the split sample test results.

8.4. Compute the paired t-statistic (t_{pair}) using the following equation:

$$t_{pair} = \frac{|\overline{X}_{dif}|}{\left(\frac{S_{dif}}{\sqrt{n}}\right)}$$

8.5. Compute the degrees of freedom (df). The degrees of freedom are the number of sample pairs (n) minus one, used to compute the t-statistic.

$$df = n - 1$$

8.6. Determine the two-tailed probability distribution (P-value) for the 2 data sets using the degrees of freedom (df) for a two-tailed t-test.

8.7. Compare the P-value to (0.05).

8.7.1. If the P-value is greater than , the paired t-test passes. There is reason to believe that the paired test results are similar and it can be concluded they are from the same population. (i.e., no differences in testing has been identified)

8.7.2. If the P-value is less than , the paired t-test fails. The difference between the paired test results of the split samples is greater than is likely to occur from chance and therefore the results are not similar. (i.e., difference in testing has been identified)

9. D2S COMPARISON

9.1. Determine the individual difference between split sample test results (X_{dif}).

$$x_{dif} = x_A - x_B$$

Where:

X_{dif} = Individual difference between split sample test results.

X_A = Party A's individual test value.

X_B = Party B's individual test value.

9.1.1. For aggregates, compare X_{dif} to the QA Manual Table 390.01.1.

9.1.2. For concrete, compare X_{dif} to the QA Manual Table 390.01.2.

9.1.3. For HMA, compare X_{dif} to Table 1 in this method.

9.1.4. For all other materials, compare X_{dif} to the precision statement in the test method performed (if available).

9.2. If X_{dif} is greater than the individual split sample acceptable range, they are considered outside of allowable tolerances. (i.e., a difference in testing has been identified)

Table 1 – Allowable HMA Single Individual Split Sample Variations

Test Method	Quality Characteristic	Acceptable Range of Split Sample Results
AASHTO T 308	Asphalt Content (%)	0.15
AASHTO T 30	95 to 100% passing a sieve	1.6
	40 to 94% passing a sieve	3.5
	25 to 39% passing a sieve	2.4
	10 to 24% passing a sieve	2.3
	5 to 9% passing a sieve	1.6
	2 to 4% passing a sieve	1.2
	0 to 1% passing a sieve	0.9
AASHTO T 209	G_{mm}	0.012
AASHTO T 166	G_{mb}	0.017
WAQTC TM 13	G_{se}	0.012
	P_a	0.30
	VMA	0.30
	DP	0.15

10. EXAMPLES

10.1. A Department lab and a Contractor lab performed a split sample comparison on 5 samples. The table below presents the split sample test results for theoretical maximum specific gravity (G_{mm}) to determine whether a difference exists between the Department's and the Contractor's results.

Example 10.1 – AASHTO T 209 Results			
Split Sample Number	Contractor's Results	Department's Results	Difference (X_{dif})
1	2.396	2.405	-0.009
2	2.368	2.374	-0.006
3	2.377	2.381	-0.004
4	2.395	2.390	0.005
5	2.381	2.379	0.002
		$\bar{X}_{dif}$ =	-0.0024
		S_{dif} =	0.00577
		P-value =	0.405

10.1.1. Conclusion: Since the calculated P-value is greater than 0.05 (Section 8) and the X_{dif} of each test is less than the individual split sample acceptable range (Section 9), the split sample comparison indicates that there is not a significant difference in testing between these labs.

Idaho Standard Practice for

Nuclear Density Gauge Correlation

IDAHO Designation: IR-154-21

1. SCOPE

1.1. This Standard Practice is used to determine the nuclear density gauge correlation for each nuclear gauge used for acceptance testing.

1.2. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the user's responsibility of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations before use.*

2. REFERENCE DOCUMENTS

2.1 *AASHTO Standards*

- FOP for T 355, Method A, In-Place Density of Asphalt Mixtures by Nuclear Methods
- FOP for R 67, Sampling Asphalt Mixtures After Compaction (Obtaining Cores)
- FOP for T 166, Method A, Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens
- T 331, Bulk Specific Gravity and Density of Compacted Asphalt Mixtures using Automatic Vacuum Sealing Method

2.2 *Idaho Standards*

- Idaho IR 148, Stratified Random Sampling

3. SUMMARY OF THE PRACTICE

3.1. The bulk specific gravity (G_{mb}) of the core is a physical measurement of the in-place asphalt mixture and can be compared with the nuclear density gauge readings. Comparing the core value to the corresponding gauge values, a correlation can be established.

3.2. The correlation can then be used to adjust the gauge readings to the in-place density of the cores. The core correlation is gauge-specific and must be determined without traffic allowed on the pavement between nuclear density gauge readings and obtaining the core. When using multiple nuclear density gauges, each gauge will be correlated to the core locations before removal of the core.

3.3. Correlation of the nuclear density gauge with pavement cores must be made on the first lot of paving (within 24 hours) or anytime a change of the testing conditions occurs (see Section 8).

Note: *The Department must correlate all gauges that will be used for acceptance testing for each gauge correlation section.*

4. APPARATUS

4.1. *Density Gauge*— With accessory equipment as specified in FOP for AASHTO T 355.

4.2. *Coring Equipment*— With accessories as specified in FOP for AASHTO R 67 for collecting 6-inch diameter pavement cores.

4.3. *Measuring Device*— Approved measuring device capable of measuring gauge correlation section and sub-section lengths.

5. TERMINOLOGY

5.1. *Gauge Correlation Section*— Pavement placed during production paving that is used to correlate the nuclear density gauge(s) used for acceptance. The gauge correlation section must be constructed to the same placement width and thickness and on the same underlying material as the course it represents.

5.2. *Gauge Correlation Sub-Section*— A portion of the gauge correlation section in equal-length to other sub-sections that is represented by a single test location.

5.3. *Job Mix Formula* (JMF)— End result of a successful mix design that is the Contractor's selected mixture to be produced and includes the aggregate gradation and asphalt binder percentage.

5.4. *Test Location*— The stratified random location within a gauge correlation sub-section where testing will be performed.

5.5. *Test Site Density*— The uncorrected density reading taken on the compacted pavement after finish rolling is complete at a test site for correlation to cores. It is obtained by using the test procedure specified in FOP for AASHTO T 355 without applying a gauge correlation factor. Filler material must be applied as required in the procedure before taking test site density readings.

5.6. *Stratified Random Sampling* —Method used to ensure the specimens for the sample are obtained from throughout the test section, and are not concentrated in one portion of the test section. All sample locations will be determined by the Engineer using a random sampling system in accordance to Idaho IR 148.

6. PROCEDURE

6.1. *Determine the gauge correlation section and testing locations as follows:*

6.1.1. Gauge correlation for each correlation section will be within the first 1,000 tons and consist of a minimum of 1,000 feet of production and anytime there is a change of conditions (Section 8).

6.1.2. Divide the total length of the gauge correlation section into 10 equal-length sub-sections.

6.1.3. Identify a test location for each gauge correlation sub-section in accordance with IR 148.

6.2. *Determine the in-place density using the nuclear density gauge for each test location as follows:*

6.2.1. Determine in-place density using the nuclear density gauge(s) for each test location in accordance with FOP for AASHTO T 355.

Note: *It is recommended that the Contractor's QC personnel also determine in-place density at each test location to develop a correlation factor for QC purposes.*

6.2.2. The ITD-820 form will be used by the Department personnel as the original source document to record the test site densities for each gauge at each test location.

6.3. *Determine the bulk specific gravity (G_{mb}) for each sub-section as follows:*

6.3.1. After the pavement has cooled sufficiently to avoid deformation during coring, the Contractor will obtain 1 core at each test site from each segment in accordance with FOP for AASHTO R 67 in the Engineer's presence. The Engineer will immediately receive the cores. The relative position of the core to the nuclear gauge readings for each test location is illustrated in Figure 1.

Note: The Contractor may core for quality control purposes.

6.3.2. Determine the G_{mb} of each core in accordance with FOP for AASHTO T 166 Method A or AASHTO T 331.

Note: *Determine the G_{mb} of all cores for the gauge correlation section using the same procedure.*

6.3.2.1. Determine the bulk density of the each core by multiplying G_{mb} by 62.245 lb/ft^3 and report the value to the nearest 0.1 lb/ft^3.

6.3.3. The ITD-820 form from Section 6.2.2 will be used by the Department personnel as the chain of custody documentation and the original source document used to record the G_{mb} of each core.

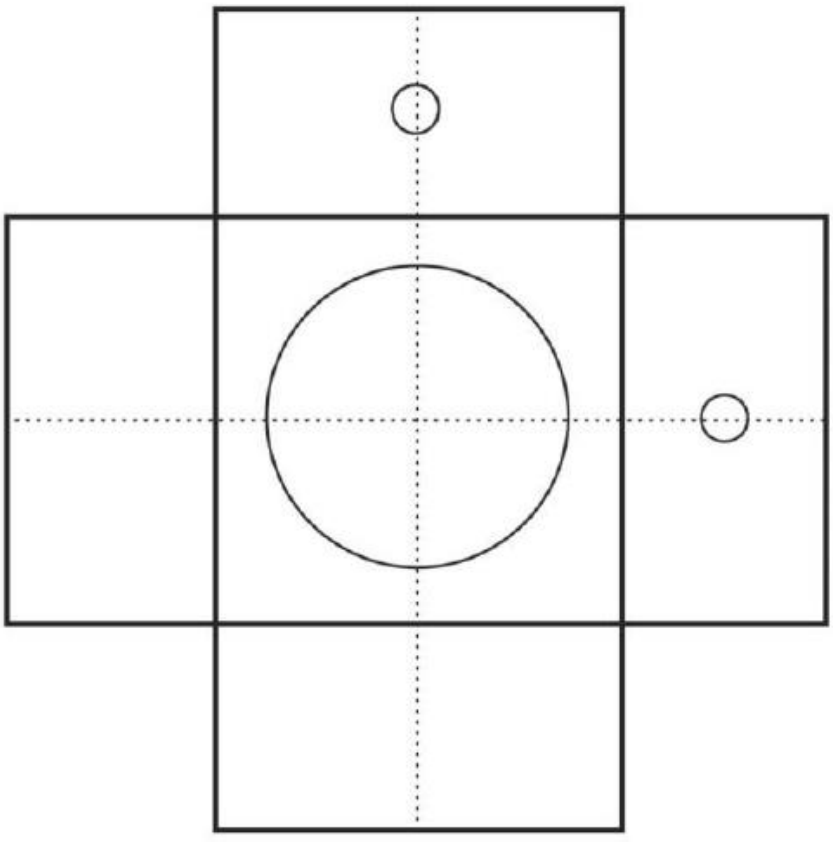


Figure 1. *Footprint of the gauge test site. Core location in the center of the test site.*

7. CALCULATION OF CORRELATION

7.1. *Calculate a correlation factor for the nuclear gauge reading as follows*:

7.1.1. Calculate the difference between the core density and nuclear gauge density at each test site to the nearest 0.1 lb/ft^3. Calculate the average difference and standard deviation of the differences for the entire data set to the nearest 0.1 lb/ft^3.

7.1.2. If the standard deviation of the differences is equal to or less than ±2.5 lb/ft^3, the correlation factor applied to the nuclear density gauge reading will be the average difference calculated in Section 7.1.1.

7.1.3. If the standard deviation of the differences is greater than ±2.5 lb/ft^3, the test location with the greatest variation from the average difference must be eliminated from the data set, and the data set properties and the correlation factor recalculated following Sections 7.1.1 and 7.1.2.

If the standard deviation of the modified data set still exceeds the maximum specified in Section 7.1.2, additional test sites will be eliminated from the data set, and the data set properties and the correlation factor will be recalculated following Sections 7.1.1 and 7.1.2. If the data set consists of less than 5 test locations, additional test sites must be established.

8. CHANGE OF CONDITIONS

8.1. A correlation factor is valid only for:

8.1.1. A specific project.

8.1.2. A specific JMF.

8.1.3. For the specific nuclear density gauges correlated.

8.1.4. Specific gauge thickness setting.

8.1.5. Specific gauge mode setting.

8.1.6. Specific underlying material.

8.1.7. Specific pavement thickness.

8.1.8. A specific pavement lift.

8.1.9. A specific calendar year.

8.2. Re-correlation of the gauge must occur when any of the above conditions change.

9. REPORT

9.1. The Department will report the results of testing on the ITD-820 form.

9.2. Project information.

9.3. Make, model, and serial number of the nuclear density gauge.

9.4. Stratified, random numbers.

9.5. Location of test and thickness of layer tested.

9.6. Underlying material.

9.7. Mixture type.

9.8. JMF identification.

9.9. Date.

9.10. Density standard.

9.11. Gauge readings.

9.12. Name and signature of individual performing AASHTO T 355.

9.13. Name and signature of individual performing AASHTO R 67.

9.14. Name and signature of individual performing AASHTO T 166 or T 331.

9.15. Nuclear gauge correlation to 0.1 lb/ft^3.

Idaho Standard Practice for

Procedures for Checking Asphalt Mix Plant Calibrations

IDAHO Designation: IR-155-21

1. SCOPE

1.1. These procedures are used in conjunction with the Department's Standard Specifications for Highway Construction for checking asphalt drum mix plants to assess plant conformance. This procedure is used for original plant approval, annual plant approval, after plant relocation (if necessary), or trouble shooting. If, at any time the Engineer has reason to believe plant calibration should be checked and provides documentation supporting the reason(s), only the meter(s) or scale(s) in question will be considered verified if the indicated metered or scaled amount, at a production rate within the range stated in the Plant Quality Control Plan, is confirmed when within ±1.0% of the actual scaled or measured amount. Some variations from this procedure may be necessary depending upon the configuration of the plant, including volumetric plants.

1.1.1. Volumetric plants are defined as those plants that meter some or all constituent materials using volumetric metering, such as a volumetric asphalt meter rather than a mass flow meter, or aggregate feeder gate and conveyor speed settings rather than individual belt scales.

1.2. All calibration procedures stated below are required to be completed in the Department's presence for plant verification, unless the Department waives, in writing, witness of calibration. Documentation will be provided to the Department that the tests have been completed and meet specification tolerances. If the Engineer requests how to read and interpret the plant information provided, the Contractor will inform the Engineer.

1.3. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the user's responsibility of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations before use. All individuals must comply with the Contractor's safety program requirements at the plant.*

2. MEASURING DEVICES

2.1. Any weighing device used for payment must meet Section 109.01.A.6.b.

2.2. All measuring devices must meet the current edition of the National Institute of Standards and Technology Handbook 44, except as modified by Table 2.1. The Contractor must provide all personnel and equipment for calibrating measuring devices.

2.3. Balance and zero conditions of scales must be checked daily, and at any other time requested by the Department. The Engineer may, at any time, direct that any measuring device be tested by the producer or an outside agency if there is any doubt about the accuracy of the measuring device. Certificates of inspection must be posted in a prominent place in the plant, and a copy must be promptly submitted to the Engineer.

2.4. Production plant tolerances must meet the following table:

Table 2.1

Material	Measurement Tolerance [a]	Unit of Measure
Aggregate	0.2%	Weight
RAP	0.2%	Weight
Asphalt	0.2%	Weight or Volume
Additives	0.5%	Weight or Volume

[a] Measurement tolerance equals the smallest scale or meter graduation divided the quantity or volume measured (e.g., 20-pound graduations / 10,000 pounds measured = 0.2%)

3. BELT SCALES ON COLD FEEDERS

3.1. Use a certified scale(s) to check each individual belt scale, including RAP, at its high production rate and low production rate, as stated in the Plant Quality Control Plan. The Contractor will determine the amount of material needed to ensure plant calibration is accurate within ±1.0%. A minimum of 2 tests will be run at each range to check for repeatability and eliminate any outliers.

3.2. ***Plant Test Procedure:***

3.2.1. Each bin and its belt scale are tested individually.

3.2.2. Some plants may have to use a zero percent moisture input to ensure accuracy.

3.2.3. Check the belt scale accuracy at both high range and low range by running material over the belt scale and checking the indicated computer weight (accumulator) against the actual net weight of the material in the truck.

3.2.4. The allowable error must not exceed ±1.0% from the certified truck scale weight.

3.2.5. The final belt scale (totalizer) will be checked at its high production rate and low production rate, as stated in the Plant Quality Control Plan. The Contractor will determine the amount of material needed to ensure plant calibration is accurate within ±1.0%

4. BELT SCALE ON VOLUMETRIC PLANTS

4.1. ***Plant Test Procedure:***

4.1.1. The final belt scale will be tested using two high-production rate runs and two low-production rate runs as stated in the Plant Quality Control Plan. The allowable error must not exceed ±1.0%.

5. FEEDER BINS ON VOLUMETRIC PLANTS

5.1. Use a certified scale(s) to check each individual volumetric feeder, including RAP, gate setting and underbelt speed, at its high production rate and low production rate, as stated in the Plant Quality Control Plan. The Contractor will determine the amount of material needed to ensure plant calibration is accurate within ±1.0%. A minimum of 2 tests will be run at each range to check for repeatability and eliminate any outliers.

5.2. Test Procedure:

5.2.1. Each bin and its gate setting(s) and underbelt speed(s) are tested individually.

5.2.2. Record the gate setting and underbelt speed at both high range and low range by running material over the belt scale and recording the indicated computer weight or the actual net weight of the material in the truck divided by the run time and record the tons per hour for those settings.

6. ASPHALT METER ACCURACY

6.1. The asphalt meter is checked at its estimated high production rate and low production rate, as stated in the Plant Quality Control Plan. Run 2 checks at each rate.

6.2. ***Test Procedure:***

6.2.1. Enter the correct specific gravity or lb/gal and temperature for the liquid asphalt being used for the test into the computer system. The Contractor will determine the amount of material needed to ensure plant calibration is accurate within ±0.5%. Follow the manufacturer's recommendation for calibration of the asphalt meter or the asphalt metering system. The calibration tank must be certified or verified with test weights before calibrating the asphalt meter.

6.2.2. Check the asphalt meter accuracy at the high range and low range by running material through the meter and checking the indicated computer weight (accumulator) against the actual net weight of the material in the truck or calibration tank. For volumetric meters, convert the actual net weight to volume using the specific gravity and correcting for temperature.

A minimum of 2 test runs at the high production rate and low production rate will provide repeatability and eliminate any outliers.

7. BAGHOUSE FINES RETURN SYSTEM

7.1. If baghouse fines are returned, the returns will be in accordance with the quality control plan.

8. MINERAL FILLER SYSTEM

8.1. If mineral filler (e.g., lime, other mineral additive) is added separately and does not come into contact with the other aggregates until it is in the drum mixer, it is handled in the same manner as the asphalt meter check.

Note: *This is not the baghouse fines return system. The fines in the baghouse fines return system has contact with the other aggregates before reaching the drum mixer.*

8.2. *Materials and Equipment:*

8.2.1. Calibration vessel, container, or truck with sufficient capacity for calibrating mineral filler.

8.3. *Test Procedure:*

8.3.1. The mineral filler is pumped through its meter into a tared calibration vessel where it is weighed on an approved scale and compared against the quantity as recorded by the plant automation. The Contractor will determine the amount of material needed to ensure mineral filler calibration is accurate within ±5.0%.

9. ANTI-STRIP ADDITIVE CALIBRATION

9.1. Anti-stripping additive calibration check must be performed in a manner satisfactory to the Engineer; at both the high and low production rates and all percentages of additive addition in accordance with the Plant Quality Control Plan. The Contractor will determine the amount of material needed to ensure anti-strip additive calibration is accurate within ±0.5%.

10. NO-FLOW SYSTEM

10.1. Aggregate, RAP, mineral filler system, and asphalt interlocks must issue an audible alarm if a no-flow situation occurs.

10.2. *Test Procedure:*

10.2.1. The no-flow test will be run on each cold feed bin including RAP.

10.2.2. Material will be placed in the bin, and the bin will be allowed to run empty. An audible alarm must immediately occur.

10.2.3. The asphalt and mineral filler systems will be placed in a "No-Flow" condition or otherwise halted and an audible warning must immediately occur.

11. REPORTS

11.1.1. After the plant calibration and/or verification is complete, the Contractor will supply the Engineer with a printout of all calibration numbers which verify the calibration of the system and show that it meets all Department specifications. The Engineer will sign and date a copy for the Contractor to retain.

11.1.2. The Contractor will supply upon request either a display or printout of all calibration numbers that verify the calibration of the system has not changed since the annual calibration and still meets Department specifications.

Idaho Standard Practice for

Determining Rolling G_{mm}

IDAHO Designation: IR-156-21

1. SCOPE

1.1. This Standard Practice is used to determine the maximum theoretical specific gravity (G_{mm}) used for calculating percent compaction of in-place density during production paving.

1.2. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the user's responsibility of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations before use.*

2. REFERENCE DOCUMENTS

2.1 *AASHTO Standards*

- FOP for T 209, Bowl Method, Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- FOP for T 355, In-Place Density of Asphalt Mixtures by Nuclear Method
- FOP for R 97, Sampling Asphalt Mixtures
- FOP for R 47, Reducing Samples of Hot Mix Asphalt to Testing Size

2.2 *Idaho Standards*

- Idaho IR 148, Stratified Random Sampling
- Idaho IR 125, Acceptance Test Strip for Hot Mix Asphalt (HMA)

3. SUMMARY OF THE PRACTICE

3.1. The maximum theoretical specific gravity (G_{mm}) for determining the percent compaction will be determined using a rolling, consecutive 2-lot average (i.e., the most recent 2 completed lots) of the Department's acceptance test results. For the first 2 lots of production paving, the average G_{mm} from the test strip is used for determining percent compaction.

4. PROCEDURE

4.1. *Determine the rolling G_{mm} for each lot as follows:*

4.1.1. For the first 2 lots of production paving, use the average of all Department acceptance G_{mm} results from the test strip.

Note: The Department must provide the G_{mm} preliminary results before production the next day to the Contractor.

4.1.2. For all other lots of production paving, use the average of all Department acceptance G_{mm} results from the previous 2 lots.

Note: For previously used mix designs, use the average of Lot 1 results of the current project for the first 2 lots of production paving.

4.2. The rolling G_{mm} established in this procedure is used for performing the calculations in the FOP for AASHTO T 355 for the current lot.

5. PROCEDURE FOR TEST RESULT CHALLENGE

5.1. When test result challenge resolution is performed in accordance with Subsection 106.07 of the Standard Specifications, the original Department acceptance test results are replaced with the challenge resolution test results and the rolling G_{mm} for the subsequent lots will be re-determined.

5.2. The rolling G_{mm} established in 5.1 will be used for performing the calculations in place of the G_{mm} determined in Section 4.

6. EXAMPLE

6.1. The table below presents the G_{mm} results from the samples for the first 4 completed lots of production paving. Lot 1 was the test strip. The rolling G_{mm} for the first 5 lots are calculated as follows:

6.1.1. Lot 1 rolling G_{mm} = 2.402 (average of lot 1 combined G_{mm})

6.1.2. Lot 2 rolling G_{mm} = 2.402 (average of lot 1 combined G_{mm})

6.1.3. Lot 3 rolling G_{mm} = 2.399 (average of lot 1 and lot 2 combined G_{mm})

6.1.4. Lot 4 rolling G_{mm} = 2.398 (average of lot 2 and lot 3 combined G_{mm})

6.1.5. Lot 5 rolling G_{mm} = 2.392 (average of lot 3 and lot 4 combined G_{mm})

Lot Number	Sample Number	Combined G_{mm}
1	1	2.396
1	2	2.410
1	3	2.401
2	4	2.395
2	5	2.419
2	6	2.389
2	7	2.391
2	8	2.392
3	9	2.381
3	10	2.422
3	11	2.398
4	12	2.379
4	13	2.388
4	14	2.391
4	15	2.385

Idaho Standard Practice for

Determining Ignition Furnace Correction Factor

IDAHO Designation: IR-157-21

1. SCOPE

1.1. This Standard Practice is used to determine the ignition furnace correction factor for ignition furnaces used on production paving projects to determine asphalt content.

1.2. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the user's responsibility of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations before use*.

2. REFERENCE DOCUMENTS

2.1 *AASHTO Standards*

- FOP for T 308, Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
- FOP for T 30, Mechanical Analysis of Extracted Aggregate
- T 30, Mechanical Analysis of Extracted Aggregate
- FOP for R 97, Sampling Asphalt Mixtures
- FOP for R 47, Reducing Samples of Hot Mix Asphalt to Testing Size

2.2 *ASTM Standards*

2.3 D 8159, Standard Test Method for Automated Extraction of Asphalt Binder From Asphalt Mixtures (Asphalt Analyzer™)

2.4 *Idaho Standards*

- Idaho IR 148, Stratified Random Sampling
- Idaho IR 125, Acceptance Test Strip for Hot Mix Asphalt (HMA)

3. SUMMARY

3.1. Asphalt binder content results may be affected by the type of aggregate in the mixture and by the ignition furnace. Asphalt binder and aggregate correction factors must, therefore, be established by testing a set of correction specimens for each job mix formula (JMF). Each ignition furnace will have its own unique correction factor determined in the location where testing will be performed.

3.2. This procedure must be performed before any acceptance testing is completed, and repeated each time there is a change in the mix ingredients or design. Any changes greater than 5.0 percent for a stock pile of the same product will require a new correction factor. The existing correction factor will continue to be utilized until the new correction factor is available and will be used at the

beginning of the next lot. All correction samples used for acceptance will be prepared by the Department's Central Materials Laboratory.

3.3. Mix design laboratories and quality control laboratories can use this procedure, or FOP for AASHTO T 308 Annex – Correction Factors, or another Department-approved method as described the approved quality control plan for determining correction factors for QC labs.

3.4. **Asphalt binder correction factor:** A correction factor must be established by testing a set of correction specimens for each job mix formula (JMF). Certain aggregate types may result in unusually high correction factors (i.e., > 1.00 percent). Such mixes must be corrected and tested at a lower temperature as described below.

3.5. **Aggregate correction factor:** Due to potential aggregate breakdown during the ignition process, a correction factor will need to be determined.

3.6. This correction factor will be used to adjust the acceptance gradation test results obtained according to the FOP for AASHTO T 30.

4. PRODUCING CORRECTION FACTOR SAMPLES

4.1. Obtain sample of HMA in accordance with the FOP for AASHTO R 97 and Idaho IR 125.

4.2. Reduce the sample of HMA in accordance with the FOP for AASHTO R 47 for the following:

4.2.1. Provide 3 correction factor samples for each ignition furnace to be used for acceptance.

4.2.1.1. Correction factor sample size is determined by AASHTO T 308 Sampling Step 4.

4.2.2. Provide 3 correction factor samples for the Central Materials Laboratory's Asphalt Analyzer™. Sample sizes will be in accordance to the manufacturer's recommendation.

4.2.3. Six (6) additional correction factor samples for use as needed.

5. DETERMINING THE ACTUAL ASPHALT CONTENT AND GRADATION

5.1. Test 3 correction factor samples in accordance with ASTM D8159 and AASHTO T 30 and average the results. Each sample must be dried to constant mass according to the FOP for AASHTO 329 prior to performing ASTM D8159.

5.2. The average of the results are considered to be the actual asphalt content and actual gradation.

5.2.1. The asphalt content will be calculated and reported to 0.01 percent.

5.2.2. The gradation results will be calculated and reported to 0.1 percent.

6. PROCEDURE

6.1. For each ignition furnace that will be used to determine acceptance, perform Steps 7.1 through 7.4 and Steps 8.1 through 8.4.

6.2. The correction factors are unique to each furnace and each JMF.

7. DETERMINING THE IGNITION FURNACE CORRECTION FACTOR

7.1. Test 3 correction factor samples in accordance with FOP for AASHTO T 308. Each sample must be dried to constant mass according to the FOP for AASHTO T 329 prior to performing FOP for AASHTO T 308.

7.2. Once all 3 of the correction specimens have been burned, determine the measured asphalt binder content for each specimen from the printed oven tickets.

7.3. Determine the average measured binder content of the 3 correction specimens.

7.4. The asphalt binder correction factor, C_f, is the difference between the average actual and average measured asphalt binder contents for each specimen to 0.01 percent.

7.5. If the asphalt binder correction factor exceeds 1.00 percent, the test temperature must be lowered to 482 ± 5°C (900 ± 9°F) and new samples must be burned. The temperature for determining the asphalt binder content of HMA samples by this procedure must be the same temperature determined for the correction samples.

7.5.1. If history shows that the aggregate source produces a correction factor that exceeds 1.00 percent, the test temperature may be lowered to 482 ± 5°C (900 ± 9°F) initially.

8. DETERMINING THE AGGREGATE CORRECTION FACTOR

8.1. For each of the 3 correction specimens from Section 7, perform a gradation analysis on the residual aggregate in accordance with FOP for AASHTO T 30.

8.2. Determine the average measured gradation for each of the 3 correction specimens. The results will be utilized in developing an aggregate correction factor and will be calculated and reported to 0.1 percent.

8.3. Determine the difference between the average actual and average measured gradation results.

8.4. If the difference for any single sieve exceeds the allowable difference of that sieve as listed in Table 8.1, then aggregate gradation correction factors (equal to the resultant average differences) for all sieves must be applied to all acceptance gradation test results determined by the FOP for AASHTO T 30. If the 75 µm (No. 200) is the only sieve outside the limits in Table 2, apply the aggregate correction factor to only the 75 µm (No. 200) sieve.

Table 8.1 – Permitted Sieving Difference

Sieve	Allowable Difference
Sizes larger than or equal to 2.36 mm (No. 8)	±5.0%
Sizes larger than 75 µm (No. 200) and smaller than 2.36 mm (No. 8)	±3.0%
Sizes 75 µm (No. 200) and smaller	±0.5%

Idaho Standard Practice for

QUALITY CONTROL PLAN (QCP) DEVELOPMENT AND IMPLEMENTATION

IDAHO Designation: IR-158-21

1. SCOPE

1.1. The purpose of this guide is to establish minimum requirements for the Contractor's quality control system and quality control plan (QCP). It is intended that these requirements be used as a procedural guide in detailing the inspection, sampling, and testing deemed necessary to maintain compliance with the Department's specifications.

2. GENERAL REQUIREMENTS

2.1. As stated in the Standard Specifications for Highway Construction, a QCP must be developed by the Contractor/producer and submitted in writing to the Engineer at the preconstruction conference. Acceptance of the QCP by the Engineer will be contingent upon its concurrence with the Standard Specifications and this standard method. For this reason, the QCP will clearly describe the methods by which the quality control program will be conducted. For example, the items to be controlled, tests to be performed, testing frequencies, sampling locations, and techniques will be included with each item listed separately. Also include a table stating what actions will occur when test results indicate specification limits are approached or exceeded. See Table 1 at end of this guide for an example. Also, a detailed plan of action regarding disposition of non-specification material will be included. Such a plan will provide for immediate notification of all parties involved in the Quality Assurance process in the event nonconforming situations are detected. Example 1. Quality Control Plan may be used as an example.

2.2. Inspection and testing records must be maintained, kept current, and made available for periodic review by Department personnel throughout the life of the contract. All other documentation (e.g., date of inspections, tests performed, temperature measurements, and accuracy, calibration or re-calibration checks performed on production of testing equipment) will be recorded.

2.3. The Contractor will maintain standard equipment and qualified personnel in accordance with the contract and specification requirements for the item(s) being produced.

3. QUALITY CONTROL PLAN

3.1. Operation quality control plans will be submitted for each contract/project to the Engineer for approval. Distribution of the approved quality control plans will be made by the Engineer.

3.2. Follow Example 1. Quality Control Plan as a general guideline but at a minimum include the following:

3.2.1. Contract bid item covered by the quality control plan.

3.2.2. Sampling location and techniques.

3.2.3. Sampling plan.

3.2.4. Tests and test methods.

3.2.5. Testing frequencies.

3.2.6. Testing forms to be used.

3.2.7. Inspection frequencies and areas of inspection.

3.2.8. Detailed description of production and placement equipment and methods.

3.2.9. Detailed calibration processes and procedures (if applicable)

3.2.10. Documentation procedures, including:

3.2.10.1. Inspection and test record requirements and document management.

3.2.10.2. Temperature measurements.

3.2.10.3. Accuracy, calibration, or recalibration checks performed on production or testing equipment.

3.2.11. QC personnel, including the company official ultimately responsible for the quality of work.

4. ADDENDA TO THE QUALITY CONTROL PLAN

4.1. Addenda are defined as an addition or deletion to the QCP. Each page of the QCP that is revised is required to include the project key lead number, bid item number, date of revision, and means of identifying the revision. The addenda are required to be signed and dated by the Contractor's representative who is responsible for insuring that all items of work will comply with Department Specifications and subsequently signed and dated when approved by the Engineer.

EXAMPLE 1

¾” Aggregate Type B Base Quality Control Plan

Date:
To: (RESIDENT ENGINEER)
From: (CONTRACTOR(s) NAME)
Subject: 3/4” Aggregate Type B for Base Quality Control Plan

1. Project Information

1.1. We are submitting our Quality Control Plan, developed in accordance with Idaho IR 158 for:

Project Number:_____
Lead Key Number:_____
Bid Item Number:_____
Date Submitted:_____

1.2. (NAME) will be responsible for insuring that all items of work will comply with the contract and Department specifications.

2. Material Source

2.1. General Information:

Source Number:_____

Address of Source:_____

2.2. The aggregate source operation is under the direction of (NAME) who can be contacted at (ADDRESS, EMAIL, AND TELEPHONE).

2.3. (DETAILED DESCRIPTION OF THE PRODUCTION PROCESS)

3. Delivery and Placement

3.1. The field operation is under the direction of (NAME) who can be contacted at (ADDRESS, EMAIL, AND TELEPHONE).

3.2. (LIST OF EQUIPMENT TYPE, YEAR, MAKE, MODEL)

3.3. (DETAILED DESCRIPTION OF THE PLACEMENT PROCESS)

4. Quality Control Sampling and Testing,

4.1. The laboratory performing quality control testing is (LAB QUALIFICATION NUMBER), located at (LOCATION).

4.2. The quality control program is under the direction of (NAME OF PERSON), who can be contacted at (ADDRESS, EMAIL, AND TELEPHONE).

4.3. During the production operations of the aggregate we will perform at a minimum quality control tests per attached schedule. Sampling and testing will be the responsibility of (NAME(s), WAQTC number (NUMBER(s)).

4.4. During the placement operations of the aggregate (NAMES) will perform, at a minimum, quality control tests in accordance with the attached schedule. Also attached are the proposed method to select locations and/or times for sampling.

4.5. All testing will be completed by (NAME(s)), (WAQTC NUMBER(s)), within (HOURS) hours of sampling and all original documentation of results will be completed on the attached original documentation forms.

4.6. Testing reports and original source documents will be reviewed and checked by (NAME(s)), (WAQTC NUMBER(s)), within (HOURS) hours of testing being completed. All reporting will be completed on the attached forms.

5. Records.

5.1. Testing reports and all backup documentation will be located at (LOCATION) for review by the Department between the hours of (TIME) and (TIME) during the life of the contract/project.

5.2. Testing reports and all backup documentation will be located at (LOCATION) for review by the Department between the hours of (TIME) and (TIME) for (YEARS) after the completion of the project.

6. Notifications.

6.1. Any material found to be noncomplying will be addressed by (NAME) who will notify the Engineer immediately.

6.2. (NAME) will notify all appropriate Department personnel at least 48 hours before any work is to begin.

7. Nonconforming Material.

7.1. (STATE THE PROCESS FOR DISPOSITION OF NONCONFORMING MATERIAL)

Table 1: Example of QC Actions to Implement When Approaching or Exceeding Specification Limits

Test Description	Test Method	QC Action Limits		Situation		Action
		Single Test	4-Point Moving Avg. or Daily Avg.	Single Test	4-Point Moving Avg. or Daily Avg.	
Aggregate Gradation	FOP for AASHTO T 27 and AAHTO T 11	NA	Approaching Limit	5 percent on +#4 3 percent on -#4	Approaching Limit	Increase frequency of tests and prepare for process modification
Sand Equivalent	FOP for AAHTO T 76	NA	Approaching Limit	NA	Approaching Limit	Increase frequency of tests and prepare for process modification

Note: When 2 consecutive test results fail or if any of the 4-point moving average values fail, production will be suspended and corrective action will be taken. The process will be corrected before production resumes.

Idaho Standard Practice for

QUALITY CONTROL PLAN (QCP) REVIEW PROCESS

IDAHO Designation: IR-159-19

1. SCOPE

1.1. The purpose of this process is to establish a standard for reviewing the Contractor's quality control plan (QCP).

2. REFERENCE DOCUMENTS

2.1. Idaho Standards:

- IR 152, Asphalt Mixtures Quality Control Plan (QCP) Development and Implementation
- IR 155, Procedures for Checking Asphalt Drum Mix Plant Calibrations
- IR 158, Quality Control Plan Development and Implementation

2.2. Standard Specifications for Highway Construction

2.3. Quality Assurance Manual

2.4. Laboratory Operations Manual

3. GENERAL REQUIREMENTS

3.1. As stated in the Department's Standard Specifications for Highway Construction, a QCP must be developed in accordance with Idaho IR 158 and in concurrence with the Standard Specifications applicable to the bid item by the Contractor/producer and submitted in writing to the Engineer at the preconstruction conference. Acceptance of the QCP by the Engineer will be contingent upon its concurrence with the Standard Specifications and this standard method.

4. MINIMUM REQUIREMENTS OF A QUALITY CONTROL PLAN

4.1. Requirements shown in Idaho IR 158.

4.2. Subsection 106.03.A.2 of the Standard Specifications

4.3. Requirements of the contract bid item covered by the quality control plan (e.g., subsection 405.03.C of the Standard Specifications).

4.4. Sampling location and techniques.

4.5. Sampling plan.

4.6. Tests and test methods.

4.7. Testing frequencies.

4.8. Testing forms to be used, including examples.

4.9. Inspection frequencies and areas of inspection.

4.10. Detailed description of production and placement equipment and methods.

4.11. Detailed calibration processes and procedures (if applicable).

4.12. Documentation procedures, including:

4.12.1. Inspection and test record requirements and document management.

4.12.2. Temperature measurements.

4.12.3. Accuracy, calibration, or recalibration checks performed on production or testing equipment.

4.13. QC personnel, including the company point of contact responsible for the quality of work.

4.14. Processes for addressing non-conforming material.

5. REVIEW OF THE QUALITY CONTROL PLAN

5.1. Review the quality control plan to ensure it meets the minimum requirements in Section 4 and that adequate quality control measures are in place for the specific project.

6. REVIEW OF ADDENDA TO THE QUALITY CONTROL PLAN

6.1. Addenda are defined as an addition or deletion to the QCP. Each page of the QCP that is revised is required to include the project key lead number, bid item number, date of revision, and means of identifying the revision. The addenda are required to be signed and dated by the Contractor's representative who is responsible for insuring that all items of work will comply with the Department's specifications.

6.2. Review addenda to the quality control plan to ensure the revised QCP meets the minimum requirements and that adequate quality control measures are in place for the specific project.

7. APPROVAL OF THE QUALITY CONTROL PLAN

7.1. The QCP and each addenda will be approved only once the minimum requirements have been met.

7.2. The QCP, and addenda if applicable, as approved by the Department, is binding upon the Contractor as a contract requirement.

Idaho Standard Practice for

DEVELOPMENT, EVALUATION, AND APPROVAL OF HMA PLANT QUALITY CONTROL PLANS

IDAHO Designation: IR-160-21

1. SCOPE

1.1. This procedure covers requirements for plants producing hot mix asphalt (HMA) or warm mix asphalt (WMA) paving mixtures. The requirements in this procedure are the minimum requirements for a plant to meet 405.03.E of the Department's Standard Specifications for Highway Construction ("Standard Specifications").

1.2. *This procedure may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. It is the user's responsibility to establish the appropriate safety and health practices and determe the applicability of regulatory limitations before use. All individuals must comply with the Contractor's safety program requirements at the plant.*

2. REFERENCE DOCUMENTS

2.1. AASHTO Standards:

- M 156, Standard Specifications for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
- R 66, Sampling Asphalt Materials
- T 19M/T 19, Bulk Density ("Unit Weight") and Voids in Aggregate
- T 27, Sieve Analysis of Fine and Coarse Aggregates
- T 30, Mechanical Analysis of Extracted Aggregate
- T 84, Specific Gravity and Absorption of Fine Aggregate
- T 166, Bulk Specific Gravity (G_{mb}) of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens
- R 97, Sampling Asphalt Mixtures
- T 209, Theoretical Maximum Specific Gravity (G_{mm}) and Density of Hot Mix Asphalt (HMA)
- T 283, Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
- T 308, Determining the Asphalt Binder Content of Asphalt Mixtures by the Ignition Method
- T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor

3. TERMINOLOGY

3.1. Check—A specific type of inspection or measurement performed on equipment or materials to indicate compliance with the stated criteria (e.g., lime check, calibration check of the cold feed system).

3.2. Continuous Mix Plant—A manufacturing facility for producing asphalt paving mixtures that continuously proportions the aggregate, asphalt binder, RAP, and other chosen additives into the mix by a continuous volumetric or mass proportioning system without definite batch intervals.

3.3. Drum Mix Plant—A manufacturing facility for producing asphalt paving mixtures that continuously proportions the aggregate, heats and dries it in a rotating drum, adds any chosen additives, and simultaneously mixes the material with a controlled amount of asphalt binder.

3.4. Batch Plant - A manufacturing facility for producing asphalt paving mixtures that proportions and mixes the aggregate, asphalt binder, RAP, and other chosen additives into the mix by in discrete batches.

3.5. Hot Mix Plant (or Plant)—Any manufacturing facility used to produce asphalt paving mixtures.

3.6. Interlock—A system whereby plant production will be interrupted when any one of the interlocked raw material constituents fails to meet the targeted requirements established within the specifications or plant requirements.

3.7. Baghouse fines (dust) - That portion of the aggregate removed during drying and heating by the hot gas stream that accumulates in the particulate emission control baghouse. For purposes of this definition, aggregate removed from the hot gas stream by intermediate collectors such as knockout boxes is not considered baghouse fines.

3.8. Mineral Filler—A finely divided mineral product with a maximum of 3 percent retained on the 0.800 mm (No. 30) sieve and at least 70 percent of which will pass a 0.075 mm (No. 200) sieve. The most common mineral fillers include pulverized limestone, other stone dust, hydrated lime, portland cement, fly ash, and certain natural deposits of finely divided mineral matter. Baghouse fines are not considered mineral filler.

4. PLANT REQUIREMENTS

4.1. Prerequisite for Plant Approval:

4.1.1. Inspection of Equipment—The plant owner or manager will schedule an inspection of the plant facilities to determine compliance with this standard. The equipment will be maintained in a satisfactory operating condition and be capable of its intended function at all times during production.

4.1.2. Quality Control Program—Each plant will have a quality control program and have a designated person to administer the program. This program will include the testing and control of the individual component materials and the final product produced at the plant. Plant operations will be conducted in a manner to ensure a uniform product is produced which will meet specified requirements.

4.1.3. Truck Scales—Scales must meet the requirements of 109.01.A.6.b of the Standard Specifications.

4.1.4. Uniformity—The plant must be capable of producing homogenous asphalt mixtures even though the individual components include such diverse materials as various sizes of aggregate from

stockpiles, reclaimed asphalt pavement (RAP), asphalt binder, and other admixtures, as required by the mix design.

5. WEIGHT MEASURING SYSTEMS

5.1. Furnish (at the Contractor's expense) certified scales to weigh bulk asphalt plant mixtures, regardless of the type of weight measuring system used for payment.

5.2. Ensure that the documentation for certified scales complies with state and/or federal requirements. Platform scales must be certified at a minimum annually. Certified scales must be certified/re-certified if they are moved, re-calibrated, or relocated.

5.3. Each platform scale system must be capable of taring truck weights with each load.

5.4. When not using platform scales, provide calibrated weighing devices that record the mixture's net weight delivered to the truck. Weighing devices will be calibrated at a minimum before the start of the paving season and each time a plant is moved to a new location. A net weigh system will include, but is not limited to, the following:

5.4.1. Hopper weigh system that delivers asphalt mixture directly to the truck.

5.5. The weighing system used to determine the net weight will have a printing system used in conjunction with automatic mixing systems. All printing systems must be approved by the engineer.

5.6. Verify adequate installation of the net weight scale mechanism or device by the manufacturer to ensure acceptable performance and operation.

5.7. Provide information on the project tickets per Section 109.01 of the Standard Specifications.

5.8. Certify the accuracy of the weighing system by an approved registered scale service person at least once annually or whenever the plant is moved or relocated.

6. EQUIPMENT FOR PREPARATION OF ASPHALT BINDER

6.1. Tanks for storage of asphalt binder must provide adequate capacity and means to ensure proper continuous circulation between the individual storage tank and proportioning units during the entire operating period.

6.2. The delivery and metering system for the asphalt binder must have adequate capacity to provide proper continuous flow between the storage tank, proportioning unit, and mixing equipment during the entire operating period.

6.3. Storage tank capacity and operation must allow for continuous operation of the plant and uniform temperature of the asphalt binder when it is introduced into the aggregate. Metering devices must be calibrated in accordance with Idaho IR 155. Any additives based on liquid volume or mass flow must be interlocked with an audible alarm system.

6.4. A sampling valve must be provided in the asphalt binder injection lines connecting the storage tanks to the asphalt binder control unit. The valve will be located in such a manner as to allow for adequate safety for the person obtaining the sample and to allow the Department to safely witness sampling.

6.5. Any tank used for storing polymer-modified asphalt binders must be equipped with an agitation system or circulation system to ensure the liquid asphalt is maintained in a homogenous state without separation.

6.6. The mechanisms used to introduce WMA additives to asphalt mixtures at the hot mix plant must be capable of uniformly feeding and metering the additive. WMA additives typically consist of additives added at the binder production facility, dry material added through cold feeds, or water injection. Depending on the type of WMA process, the plant must be equipped with automatic controls to monitor the feed system and interrupt plant production if there is an interruption in the feed process. Equipment used to produce WMA must be approved by the Engineer before mixture production.

7. COLD AGGREGATE FEEDERS

7.1. A mechanism that must be capable of uniformly feeding the aggregates into the dryer to ensure uniform production and temperature. The mechanism must be capable of accurately combining aggregates from different storage bins.

7.2. Cold bins for storing aggregates before proportioning will be monitored to ensure that bins do not become empty or restricted. The bins will be interlocked so that a production interruption will occur or an audible warning will sound if an interruption in supply of material from any cold feed bin occurs.

7.3. Adequate and convenient facilities must be provided for obtaining samples of the full flow of aggregate from the total of the bins.

7.4. Control will be based on frequent samples from each component aggregate as well as samples taken from the combined cold aggregate feeders.

7.5. All plants are to be equipped with a means of diverting aggregate on the conveyor belt away from the dryer and into an empty haul truck for cold bin calibration purposes.

8. RECLAIMED ASPHALT PAVEMENT (RAP)

8.1. The recycled mixture will be a homogenous mixture of RAP, virgin aggregate, hydrated lime (if required), asphalt binder, and any additives. If recycling capability is required, the plant will be equipped with mechanical means for feeding the desired weight of RAP into the mix.

8.2. RAP bins for storing material before proportioning will be monitored to ensure that the bins do not become empty or restricted. The bins will be interlocked so that a production interruption will occur or an audible warning will sound if any interruption in supply of material from any cold feed bin occurs.

8.3. Adequate and convenient facilities will be provided for obtaining samples of the full flow of RAP material from the total of the bins.

8.4. Use a hot mix plant for the recycling process with necessary modifications to process the recycled material. The ratio of the RAP to virgin aggregate will be controlled by weight.

8.5. For drum and continuous mix plants, use electronic belt weighing devices to monitor the flow of RAP and the flow of virgin aggregate.

8.6. Equip plants with an interlocking system of feeders and conveyors that synchronize the RAP flow with the virgin aggregate flow. Ensure that the electronic controls monitor the flow rates indicated by the belt weighing devices and automatically maintain the desired ratio at varying production

rates. Design the RAP feeder bins, conveyor system, and auxiliary bins (if used) to prevent the material from segregating and sticking. RAP will be screened before crossing the weigh bridge with a 2-inch to 3-inchscreen.

9. EMISSIONS CONTROLS FOR DUST COLLECTOR FINES

9.1. A dust collection system must be provided. The system will be made to waste the material collected, or to return all or any part of the collected material uniformly to the mixture.

9.2. Other emissions, with the exception of water vapor, , will be controlled to be in compliance with applicable environmental limits.

9.3. *Control the dust collection as follows:*

9.3.1. When collecting airborne aggregate particles and returning them to the mixture, ensure the return system delivers the desired portion of the collected dust uniformly into the aggregate mixture and wastes the excess.

10. SURGE AND STORAGE SYSTEMS

10.1. *Provide surge and storage bins as follows:*

10.1.1. Ensure that bins for asphalt mixture storage are insulated and have a working seal, top, and bottom to prevent outside air infiltration and to maintain an inert atmosphere during storage to ensure the asphalt mixture maintains temperature at the working temperature. Bins not intended for storage may be used as surge bins to hold asphalt mixtures for part of the working day; however, empty these surge bins completely at the end of each working day.

10.1.2. Ensure that surge and storage bins can retain a predetermined minimum level of mixture in the bin when trucks are loaded. The determination of the minimum mixture level will be based on minimizing mixture segregation and any other pertinent operational constraints.

10.1.3. Ensure that surge and storage systems do not contribute to mix segregation, loss of homogeneity, lumpiness, temperature loss, draindown, or stiffness.

10.2. A plant may be permitted to store asphalt mixtures in a silo after prior evaluation and approval by the Engineer. Use will conform with all limitations on retention time, type of mixture, heater operation, silo atmosphere, mix level, mix draindown time, or other characteristics set forth in the applicable specifications.

10.3. Approval of silos may be removed or restrictions may be applied if it is determined the silo contributes to segregation, does not maintain temperature, or fails in any other way to provide a homogeneous mix.

11. MINERAL FILLER

11.1. *When mineral filler is required as a mixture ingredient:*

11.2. Use a separate feed system to proportion the required quantity into the mixture with uniform distribution.

11.3. *Control the feeder system with a proportioning device that meets the following:*

11.3.1. Is accurate to within ±5 percent of the filler required by weight.

11.3.2. Has a convenient and accurate means of calibration.

11.3.3. Interlocks or audible/visual alarms with the aggregate feed or weigh system to maintain the correct proportions for all rates of production.

11.4. Provide flow indicators or sensing devices for the mineral filler system and interlock them with the plant controls to interrupt mixture production if the mineral filler introduction fails to meet the required target value after no longer than 60 seconds.

11.5. *Add mineral filler to the mixture as follows, according to the plant type:*

11.5.1. Continuous Plants Using Dryer Drum Mixtures—Add the mineral filler so that the dry mixing is accomplished no less than 18 inches before the addition of the asphalt binder and ensure that the filler does not become entrained into the air stream of the dryer.

12. HYDRATED LIME TREATMENT SYSTEM

12.1. *When hydrated lime is required as a mixture ingredient:*

12.2. Use a separate bin and feed system to store and proportion the required quantity into the mixture.

12.3. Ensure that the aggregate is uniformly coated with hydrated lime at least 18 inches before the addition of the asphalt binder to the mixture. Ensure the hydrated lime does not become entrained in the exhaust system of the dryer or plant.

12.4. *Control the feeder system with a proportioning device that meets the following:*

12.4.1. Is accurate to within ±10 percent of the hydrated lime required by weight.

12.4.2. Has a convenient and accurate means of calibration.

12.4.3. Interlocks or audible/visual alarms with the aggregate feed or weigh system to maintain the correct proportions for all rates of production to ensure mixture produced is properly treated with lime.

12.5. Provide flow indicators or sensing devices for the hydrated lime system and interlock or audible/visual alarms them with the plant controls to interrupt mixture production if hydrated lime introduction fails to meet the required target value after 60 seconds.

13. FIBER SUPPLY SYSTEM

13.1. *When stabilizing fiber is required as a mixture ingredient:*

13.2. Use a separate bin and/or feed system to store and uniformly proportion by weight the required quantity of fiber into the mixture.

13.3. Control the feeder system with a proportioning device that meets the following:

13.3.1. Is accurate to within ±10 percent of the fiber required by weight. Automatically adjust the feed rate to maintain the material within this tolerance at all times.

13.3.2. Has a convenient and accurate means of calibration.

13.3.3. Provides in-process monitoring, consisting of a digital display of output of feed rate, in pounds (kilograms) per min, to verify feed rate.

13.3.4. Interlocks or audible visual alarms with the aggregate feed or weigh system to maintain the correct proportions for all rates of production.

13.4. Provides flow indicators or sensing devices for the fiber system and interlocks them with the plant controls to interrupt mixture production if the fiber introduction fails to meet the required target value.

13.5. *Introduce the fiber as follows, according to the plant type:*

13.5.1. When a continuous or dryer-drum-type plant is used, add the fiber uniformly to the aggregate and disperse it before the injection of the asphalt binder. Ensure the fibers will not become entrained in the exhaust system of the dryer.

14. CALIBRATION OF PLANT EQUIPMENT

14.1. Calibration of the plant must meet Idaho IR 155.

14.2. *Calibration will occur, at a minimum:*

14.2.1. If the material changes, or if a plant component supply system effecting the ingredient proportions has been repaired, replaced, or adjusted, recalibrate the proportions.

14.3. *Calibrate the mixing plant as follows:*

14.3.1. Before producing mixture for the project, calibrate by scale weight the electronic sensors or settings for proportioning the mixture ingredients.

14.3.2. Calibrate the ingredient proportioning for the anticipated range of production rates as shown in the Plant QCP. Do not operate outside the calibration range without first calibrating the proportioning systems for the new range of production rates.

15. THERMOMETRIC EQUIPMENT

15.1. Provide appropriate recording thermometers, of suitable temperature ranges, to accurately assess the temperature of the asphalt mixture at or near the discharge point. Harden the thermometer mechanism as necessary to ensure durability of the device and continuous operation. Thermometers must be calibrated by the manufacturer for the full range of mixture production temperatures. The thermometers must be verified periodically during production to ensure their accuracy.

15.2. Measure the temperature at the discharge chute of the dryer and record the temperature data automatically.

16. DEVELOPING AND MAINTAINING A PLANT QUALITY CONTROL PLAN

16.1. Develop and maintain a Plant Quality Control Plan (Plant QCP). The plant must have an approved Plant QCP prior to the plant being used on Department projects. This plan must address each section of this procedure and describe how these requirements will or will not be met.

16.1.1. If any of the minimum requirements cannot be met; describe in detail why, and how, the plant will mitigate any adverse effects from deviation of this procedure's minimum requirements.

16.2. See Section 19 (Plant QCP template) for a template of the plant quality control plan.

17. PLANT QCP REVIEW

17.1. The Department will review the Plant QCP at a minimum of once per calendar year.

17.2. Review the Plant QCP to ensure all requirements in the previous sections are met or that adequate processes and procedures are in place to mitigate any adverse effects (See Section 16.1.1)

18. PLANT QCP APPROVAL

18.1. If the Plant QCP review finds that the plant's quality control plan is sufficient to ensure a quality product will be produced, the Plant QCP will be approved.

18.2. If the Plant QCP is approved, return a signed copy of the Plant QCP to the plant. The approval is valid for one calendar year.

Company Name:
Year:

Plant Quality Control Plan

Quality Control Plan Administrator

Name

Contact Information

Reviewed By:
Reviewed Date:

Approved By:
Approval Date:

Quality Control Plans for Plants

Template

1. Plant Description
    a. Plant Type (Drum/Batch)
    b. Plant Address
    c. Detailed narrative meeting the requirements of Subsection 17.1 and 17.1.1

2. Plant Laboratory Personnel
    a. Qualified Personnel/Contact Information/WAQTC#/ Exp. Date (Scanned Copy)

3. Laboratory Qualification
    a. Idaho Lab Qualification Number
        i. Date last completed
        ii. Certification Posted in Laboratory
    b. AMRL accreditation (if applicable)
        i. Date last completed

4. Plant Inspection
    a. Performed Yearly
        i. Certification is posted at plant
    b. Plant complies with Idaho IR 160

5. Truck Scales
    a. Calibration Frequency
    b. Testing agency – copies on file

6. Plant Weighing/Measuring Devices
    a. Calibration frequency
    b. Testing agency – copies on file

7. Aggregate Stockpiles
    a. Construction Method
        i. Separation/Labeling
        ii. Segregation Control
        iii. Moisture Control (if applicable)
    b. Testing (method/frequency)

8. RAP stockpile
    a. Construction methods of stockpiles
        i. Separation/Labeling
        ii. Segregation Control
        iii. Moisture Control (if applicable)

b. Testing (method/frequency)

9. Plant Mix Temperatures
    a. Plant Monitor/Control
    b. Temperature checks

10. Binder
    a. Storage
    b. Hauling
    c. Sampling (include location)
    d. Source Change – Notification/Start-up testing
    e. List how corrective action will be taken

11. Asphalt Mix Design
    a. Responsibility

12. Asphalt Mix Sampling
    a. Location for QC
    b. Plant check processes and procedures
    c. Sampling frequency
        i. Low tonnage (< 200 tons)
        ii. > 200 tons

13. Mix Gradation
    a. Test method

14. Asphalt Content
    a. Test method

15. Volumetric Properties
    a. Test methods

16. Mix Diagnostic and Corrective Action Plan
    a. Items to address: #13-15, and on-site density

17. Project Records – Idaho Standard Specs. 106.03.A.2.
    a. Maintain and make avalable to the Engineer upon request complete records (including hand written worksheets) of sampling, testing, actions taken to correct problems, and quality control inspection results. Provide copies of the Reports when requested.
    b. Control Charts

18. Truck Loading
    a. Loading method
    b. Segregation control

19. Warm Mix Capabilities (if applicable)
    a. Plant used for WMA?

b. Type: Foamed, Additive, etc.
c. Operation (e.g. rate(s), temperatures, etc.)

20. Anti-Strip
    a. Type/Brand
    b. Method of dosing

It is hereby certified that the information contained in this Plant Quality Control Plan meets the requirements of Idaho IR 160.

Company Name:

Signature:

First & Last Name:

Quality Control Plan Administrator