FDM 19-21-1 Overview

March 28, 2014

1.1 General QMP Information

The quality management program (QMP) provisions require the contractor to perform quality control testing during material production, material placement, and/or construction. The QMP provisions allow department product acceptance based on the contractor's quality control tests when verified with department testing. Each of the QMP provisions is a standard specification, standard special provision (STSP) or special provision (SPV). Each QMP provision is independent of the others. An individual contract can contain any combination of QMP provisions meeting the following individual QMP use criteria. Additional information on QMPs is available at:

https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/qmp/default.aspx

FDM 19-21-2 Use of Standard Specification and Incentives for QMP's

May 18, 2020

2.1 Standard Specification QMP Provisions

The following QMPs are included in WisDOT's Standard Specifications for Highway and Structure Construction.

2.1.1 Ride Quality

The ride quality specification is in Standard Spec 740. The specification applies to all riding surfaces and specifies where profiling is required and where incentive and disincentive provisions are enforced.

This specification may not be appropriate for some rehabilitation and maintenance projects. The designer should consider the expected life of the rehabilitation, safety, public perception, and potential extra cost of avoiding ride disincentives. Projects designed to be short-term fixes may not warrant the additional costs associated with including and administering this provision. Designers need to write a project special provision to remove the ride specification from projects or parts of projects deemed inappropriate.

There is no pay item for the testing required under this specification. Costs for furnishing and operating the profiler, documenting the profile results, and correcting the final pavement surface as required under this specification are incidental to the work. There is, however, a pay item for the IRI ride incentive payable under this specification (refer to FDM 19-21-2.2.1).

2.1.2 QMP HMA Mixture

This QMP provision is included in Standard Spec 460. This provision covers all HMA paving projects that use an HMA mixture specified in standard spec 460 and is included with local force account (LFA) and State Highway Rehabilitation/Maintenance (SHRM) projects. As stated in standard spec 460, the engineer may waive the QMP specification on projects with quantities of HMA pavement less than 500 tons, or for temporary pavements that will be placed and removed before the completion of the contract.

Bid items covered by standard spec 465 (HMA Surface bid items) do not use the QMP specification.

There is no pay item for the testing required under this provision. Costs for all QMP sampling, testing, and documentation required under this provision are incidental to the work. However, there is a payment item for incentive density HMA pavement (refer to FDM 19-21-2.2.2).

2.1.3 QMP Concrete

The QMPs are included in standard specification part 7 in the following four sections;

1. Standard Spec 701 outlines the general requirements for all QMPs within part 7,
2. Standard Spec 710 outlines the general requirements common to the three concrete related QMPs within part 7,
3. Standard Spec 715 outlines specific QMP requirements for class 1 concrete used in pavements and structures, and
4. Standard Spec 716 outlines specific QMP requirements for class II and III concrete used in ancillary applications.

Individual material sub-sections reference appropriate sections of part 7. If design requires the use of a special

provision the materials should reference appropriate section of part 7.

There is no pay item for the testing required under this provision. Costs for all QMP sampling, testing, and documentation required under standard spec part 7 are incidental to the work. However, there is a payment item for incentive strength concrete (refer to FDM 19-21-2.2.3).

2.1.4 QMP Base Aggregate

Use this QMP provision included in Standard Spec 730. This provision covers any Base Aggregate Open Graded or Base Aggregate Dense bid items. For dense graded, it applies to all grades except reclaimed asphaltic pavement. It applies to all open graded base aggregates. Is does not apply to Aggregate Detours, Salvaged Asphaltic Pavement Base, Breaker Run, Select Crushed, Pit Run, Subbase, or Riprap bid items.

This provision requires contractor testing for small quantities. It is used whenever any one of the Base Aggregate Dense or Base Aggregate Open Graded bid items are in the contract regardless of the quantity.

There is no pay item for the testing required under this provision. Costs for all QMP sampling, testing, and documentation required under this provision are incidental to the work.

2.2 Incentive Items for Standard Specification QMPs

2.2.1 Payment for Incentive IRI Ride, Item 740.0440

Include the Incentive IRI Ride bid item on projects with greater than 1,500 feet of continuous concrete or asphalt pavement.

For the project letting, the designer predetermines the amount for this bid item, thus all bidders will bid the same amount for the bid item. The designer should estimate the quantity by multiplying the lane mile of pavement covered under this provision by 2,000. The unit price will always be $1.00.

2.2.2 Incentive Density HMA Pavement, Item 460.2000

The engineer will use this bid item to pay for density incentive earned by the contractor. Include the item for any quantity of HMA that is not covered under the PWL Spec. See FDM 19-21-5.2.4.

For the project letting, the designer predetermines the amount for this bid item, thus all bidders will bid the same amount for the bid item. The designer should estimate the quantity by multiplying the total tons of HMA pavement mixes by 0.64 and rounding up to the next $10.00. The unit price will always be $1.00.

If the total quantity of HMA Pavement is greater than 10,000 tons, then QMP HMA Pavement Nuclear Density (STSP 460-020) should be included in the Special Provisions. See FDM 19-21.5.2.3.

2.2.3 Incentive Strength Concrete

Include the following items on projects requiring the use of class I concrete in pavements and/or concrete structures to pay for compressive strength incentives earned by the contractor.

1. **Item 715.0415 - Incentive Strength Concrete Pavement**
   For the project letting, the designer predetermines the amount of this bid item, thus all bidders will bid the same amount for the bid item. The designer should estimate the quantity by multiplying 0.30 X the number of square yards of concrete pavement or use a minimum of 500. The unit price will always be $1.00.
2. **Item 715.0502 - Incentive Strength Concrete Structures**
   For the project letting, the designer predetermines the amount of this bid item, thus all bidders will bid the same amount for the bid item. The designer should estimate the quantity by multiplying 6.00 X the cubic yards of concrete masonry or use a minimum of 500. The unit price will always be $1.00.
3. **Item 715.0603 - Incentive Strength Concrete Barrier**
   For the project letting, the designer predetermines the amount of this bid item, thus all bidders will bid the same amount for the bid item. The designer should estimate the quantity by multiplying 0.50 X the estimated total linear feet of concrete barrier. The unit price will always be $1.00.

FDM 19-21-5 Use of Standard Special Provision and Incentive Item QMPs *May 18, 2020*

5.1 Standard Special Provisions

Refer to FDM 19-15 and the standard special provisions (STSP) web site for information on developing standard special provisions.

5.2 Standard Special Provisions QMPs

5.2.1 QMP Base Aggregate Dense 1 1/4-Inch Compaction; Item 371.2000.S, STSP 370-010

Use this STSP only on projects that meet all three of the following criteria:

- Projects constructing HMA paved travel lanes
- Projects with an estimated quantity of 30,000 tons or more, of Base Aggregate Dense 1 1/4-Inch (Item 305.0120)
- Projects that include subgrade improvement or QMP Subgrade, or both.

This standard special provision limits compaction testing to the base aggregate 1 1/4-Inch placed above at least 16 inches of subgrade improvement, 12 inches of subgrade improvement and geogrid or QMP subgrade provisions, between shoulder hinge points and lower than mainline pavement. Department staff will measure and pay for acceptably completed lots as defined by the provision.

For the project letting, the designer will include a pay item and quantity for QMP Base Aggregate Dense 1 1/4-Inch Compaction equal to the total number of lots. Multiple lots may exist for each base aggregate dense layer. Layers are compacted with lifts a minimum of two inches thick to a maximum of 8 inches thick. Each lift will be measured as a separate lot for a given lot length and width. Expected number of compaction layers corresponding to the total base layer thickness are shown in the table below.

Total 1 ¼" base aggregate layer thickness	Expected number of compaction layers	Thickness of each compacted layer
18 inches	3 layers	6 inches
14 inches	3 layers	4.7 inches
10 inches	2 layers	5 inches
6 inches*	1 layer	6 inches

*Total 1 ¼" base aggregate layer thicknesses less than six inches will be compacted in one layer.

For example, a project's total length is 4200 feet, pavement width is 30 feet, and total 1 ¼" base aggregate layer thickness is 12 inches. To determine the number of lots, divide the project into 1500- foot segments. Partial lots greater than or equal to 750 feet are standalone lots. In this example, there are two 1500-foot segments and one 1200-foot segment. Per the provision, each lot width cannot exceed 18 feet and should be divided into equal widths. In this example, two 15-foot widths within each length segment will be one lot. Finally, the number of lots must be multiplied by the total number of compacted layers. A total 1 ¼" base aggregate layer thickness of 12 inches will likely be compacted in two 6-inch layers, which doubles the total number of lots. The total number of estimated lots is therefore 3 length segments x 2 equal pavement widths x 2 base compaction layers equaling 12 total lots for the 4200 project length.

The designer will also include a pay item and quantity of water (Item 624.0100 Water; MGal). Application rates may vary widely but may be estimated at a rate of approximately 10 - 20 gallons/ton of Base Aggregate Dense 1 1/4-Inch.

5.2.2 QMP Mill and Relay Compaction, Item 374.1010.S; QMP Pulverize and Relay Compaction; Item 374.1020.S; STSP 370-020

Use this STSP only on projects with Pulverize and Relay (bid item 325.0100) or Mill and Relay (bid item 330.0100) pavement quantity of 40,000 SY (square yards) or more.

This standard special provision limits compaction testing to the re-laid material placed beneath the mainline travel way and any shoulders immediately adjacent a mainline travel way. Due to measurement difficulties during construction, the special provision pay quantity for compaction testing is the square yard (SY) of all "Mill and Relay" or "Pulverize and Relay" completed on the project, regardless of the operation's location, or number of lifts of construction; i.e. there will not be additional compensation or quantities for having to test multiple lifts.

For the project letting, the designer will include a pay item and quantity for QMP Mill/Pulverize and Relay Compaction equal to the total contract quantity of Pulverize and Relay or Mill and Relay, or both. The designer will also include a pay item and quantity of water (Item 624.0100 Water; MGal). Application rates may vary widely but may be estimated at a rate of approximately 3 - 6 gallons/SY of 6" lift of Mill and Relay or Pulverize and Relay.

5.2.3 QMP HMA Pavement Nuclear Density; STSP 460-020

Use this STSP on project quantities of 10,000 tons or more of total HMA pavements that are not part of the HMA

Percent Within Limits (PWL) quantities. Include the item 460.2000 estimated according to FDM 19-21 2.2.2. The PWL Mixture Use Table in the miscellaneous quantities as shown in Table 10.1 needs to clearly state which density acceptance applies to each location.

Use on quantities less than 10,000 tons should be reviewed with regional material personnel.

There is no pay item for the testing required under this provision. Costs for all QMP sampling, testing, and documentation required under this provision are incidental to the work. There is, however, a pay item for the density incentive payable under Standard Spec 460.

5.2.4 HMA Pavement Percent Within Limits (PWL) Test Strip Volumetrics, Item 460.0105.S; HMA Percent Within Limits (PWL) Test Strip Density, Item 460.0110.S (STSP 460-040) HMA Pavement Percent Wighin Limits (PWL) QMP (STSP 460-050) Appendix A (STSP 460-055)

5.2.4.1 General Information

Use this special provision on all HMA contracts that have at least 12,000 tons of a single mix type. The tonnage includes shoulder material of the same mix type. The 12,000-ton minimum was established so that the contracts include enough material to construct the 750-ton required test strip and at least three full-sized (3750 tons) lots, the minimum number of lots required to provide sufficient data for statistical analyses.

This special provision replaces certain portions of Standard Spec 460. There is no pay item for testing under this special provision. Costs for all QMP sampling, testing, and documentation under this special provision are incidental to the work. However, there are pay items for density incentives and air void incentives. Include the following two bid items on all HMA PWL contracts to pay for density and air void incentives.

ITEM NUMBER	DESCRIPTION	UNIT
460.2005	Incentive Density PWL HMA Pavement	DOL
460.2010	Incentive Air Voids HMA Pavement	DOL

For the project letting, the designer predetermines the amount for these bid items, so all bidders bid the same amount. The designer should estimate the bid amount at $1.00 per ton of HMA pavement eligible for each incentive item and rounding up to the next $10.00. Typically, the quantity for air voids and density incentive will not be the same.

The HMA PWL special provision limits density incentives to mainline tonnage only. STSP 460-020 QMP HMA Pavement Nuclear Density should not be used on PWL projects unless it is clearly stated in the Miscellaneous Quantities that it applies to pay items other than those to which PWL applies.

All PWL contracts require the construction of at least one test strip. Therefore, include STSP 460-040 for HMA Percent Within Limits (PWL) Test Strip Volumetrics and Density on all contracts that include STSP 460-050 HMA Pavement PWL QMP. Also, include the following two bid items to pay for the construction and associated sampling and testing costs for the volumetrics and density test strips.

ITEM NUMBER	DESCRIPTION	UNIT
460.0105.S	HMA Pavement PWL Test Strip Volumetrics	EACH
460.0110.S	HMA Pavement PWL Test Strip Density	EACH

The test strip HMA tonnage is paid for using the same bid items as the mainline, including the density and air void incentives. For the project letting, the designer should estimate the cost of the test strip items using typical estimating tools such as bid express, average unit costs, etc.

5.2.4.2 Incentive Density PWL HMA Pavement, Item 460.2005

Although shoulder tonnage is included in the mixture quantity to determine PWL eligibility, only mainline tonnage is eligible for PWL density incentive. Full-width passing lanes, turn lanes, or auxiliary lanes greater than 1500 lane feet may also be designated for the PWL density incentive as approved by the engineer. Density for shoulders, intersections, patching, widening, etc. is accepted by department testing.

5.2.4.3 Incentive Air Voids HMA Pavement, Item 460.2010

All mixture tonnage (mainline or otherwise) of the same mix type as the PWL mixture meeting the minimum PWL tonnage requirements is eligible for PWL air void incentives. If minor patching is needed prior to mainline paving, it is recommended that the patching be paid for under a different bid item than that of the mainline.

5.2.4.4 HMA Pavement PWL QMP Mixture Acceptance Table

The plans must clearly state how all HMA material on PWL projects will be accepted. It is recommended that a

table, like the example in Table 10.1 (HMA PWL Mixture Acceptance), be included in Miscellaneous Quantities to clearly identify acceptance criteria for all HMA mix/tonnage on the project.

Table 10.1 HMA PWL Mixture Acceptance

PWL Mixture Use Table

The following acceptance criteria are applicable for this project:

Location	Station	Mixture Use:	Underlying Surface	Bid Item	Tons	Thickness	Quality Management Program to be used for:	
							Mixture Acceptance	Density Acceptance
12 foot Driving Lane	1+00 to 20+39	Upper Layer	3 MT 58-34H	4 MT 58-34H	12,000	1 ¾ "	PWL Incentive Air Voids HMA Pavement 460.2010	Incentive Density PWL HMA Pavement 460.2005
12 foot Driving Lane	1+00 to 20+39	Lower Layer	Milled Existing HMA Surface	3 MT 58-34H	15,400	2 ¾"	PWL Incentive Air Voids HMA Pavement 460.2010	Incentive Density PWL HMA Pavement 460.2005
3 foot shoulder	1+00 to 20+39	Upper Layer	3 MT 58-34H	4 MT 58-34H	2,450	1 ¾ "	PWL Incentive Air Voids HMA Pavement 460.2010	Acceptance testing by the department; Not eligible for incentive or disincentive
3 foot shoulder	1+00 to 20+39	Lower Layer	Milled Existing HMA Surface	3 MT 58-34H	3,850	2 ¾"	PWL Incentive Air Voids HMA Pavement 460.2010	Acceptance testing by the department; Not eligible for incentive or disincentive
Various		Culvert patches	Base Aggregate	Asphaltic Surface	550	6" total	QMP as per SS 465.	Acceptance by ordinary compaction
12 foot Driving Lane	20+39 to 23+00	Upper Layer	3 MT 58-34H	4 MT 58-34H	1000	1 ¾ "	QMP as per SS 460.	Incentive Density HMA Pavement 460.2000
12 foot Driving Lane	20+39 to 23+00	Lower Layer	Existing Concrete Pavement	3 MT 58-34H	1,570	2 ¾"	QMP as per SS 460.	Incentive Density HMA Pavement 460.2000
10 foot shoulder	20+39 to 23+00	Upper Layer	3 MT 58-34H	4 MT 58-34H	830	1 ¾ "	QMP as per SS 460.	Incentive Density HMA Pavement 460.2000
10 foot shoulder	20+39 to 23+00	Lower Layer	Existing Concrete Pavement	3 MT 58-34H	1,310	2 ¾"	QMP as per SS 460.	Incentive Density HMA Pavement 460.2000

5.2.4.5 HMA Pavement Percent Within Limits (PWL) Test Strips; STSP 460-040

All contracts with the HMA Pavement Percent Within Limits QMP special provision will require at least one volumetrics test strip (item 460.0105.S) and one density test strip (item 460.0110.S). The actual number of test strips required depends on the contract specifics. Typically, for the lower layer of HMA mainline, the volumetrics and density test strip will be the same and tested simultaneously. However, some circumstances may require the volumetric and density test strips to be separated. For subsequent layers of the same mix type, additional volumetrics test strips aren't necessary; therefore, the number of density test strips will not necessarily equal the number of volumetrics test strips.

5.2.4.5.1 HMA Pavement PWL Test Strip Volumetrics, Item 460.0105.S

The purpose of a test strip for volumetrics is to ensure the mix produced on the first day is within specifications and to ensure that contractor and department laboratory test results correlate before going into full production. A volumetric test strip is required for each mix type meeting the PWL tonnage criteria. For example, a 2-layer pavement with the same mix type for both layers would require only one volumetric test strip on the lower layer.

5.2.4.5.2 HMA Pavement PWL Test Strip Density, Item 460.0105.S

The purpose of a test strip for density is to ensure the contractor can achieve the target density before going into full production. In addition, each density gauge to be used for acceptance testing on the project must be correlated with test strip cores and assigned a specific offset. The offsets will be applied to the density readings for the remainder of the contract. An offset is specific to a particular gauge, mix design, and underlying material; therefore, a density test strip is required when there is a change in HMA material or underlying layer.

The area that influences nuclear density gauge readings is limited to approximately four inches in depth from the surface being tested. Therefore, underlying material more than four inches below the surface does not influence the readings.

5.2.4.6 HMA Pavement PWL Test Strip QMP Examples

Examples are listed below to help clarify when a density test strip is needed.

- Example 1: A two-layer contract with the same mix type in both layers. This requires a minimum of 2 density test strips and 1 volumetric test strip.

- Example 2: A single layer contract over aggregate base for one portion of the project and over milled HMA for another portion of the project. This requires 2 density test strips (one over aggregate base, one over milled HMA) and 1 volumetric test strip.
- Example 3: A contract where the layer thickness changes within a segment of the same mix type. This may require additional density test strip(s). Contact BTS HMA Unit with project specifics for further guidance.