

State of Wisconsin



HMA PWL Production Spreadsheet Instruction Manual

2026 Edition

Worksheet Version 4.0

1. Disclaimer

This document is to be used as an instructive guide for the HMA PWL Production Spreadsheet and to answer frequently asked questions of Regional Technical Services Section (TSS) and those acting as Department Representatives. It is not a substitute for reading and understanding HMA Pavement Percent Within Limits (PWL) specifications.

If there is a question about dispute resolution or data entry that is not covered in this document, please contact the Regional PWL Representative. If consulting BTS is recommended by this document or the HMA PWL Production Spreadsheet, that contact should be made by TSS Staff.

The HMA PWL Production Spreadsheet is designed to simplify the recording and analysis of contractor Quality Control (QC) and department Quality Verification (QV) data related to pavement density and air voids used for HMA production pay adjustment.

The Plans, Standard Specifications, and Special Provisions ALWAYS supersede this document, even in cases where this document may contradict those provisions.

2. Table of Contents

1. Disclaimer..... i

2. Table of Contentsii

3. General..... 1

4. Project Info & Instructions 2

5. Core Density Analysis 6

6. LJ Core Density Analysis 8

7. LJ Core Density Pay Adjustment 10

8. Nuc Density F&t 11

9. Nuc Density Pay Factors 16

10. LJ Nuc Density F&t 17

11. LJ Nuc Density Pay Adjustment 21

12. Gmm F&t..... 22

13. Gmb F&t..... 28

14. AC %..... 29

15. VMA, Gsb, & Gse..... 33

16. Volumetric Pay Factors 35

17. Total Pay Adjustment Summary 36

18. Volumetric Charts..... 38

19. Daily Average Gmm for Density..... 40

20. Appendix..... 41

 20.1 F&t Testing 41

 20.2 Volumetric Dispute Resolution Flowchart 44

 20.3 Enabling Macros (Red Banner)..... 45

 20.4 Rounding and Precision..... 46

20.5 User Modes.....47

3. General

- A copy of this instruction manual is available within the PWL Production Spreadsheet on the *Project Info & Instructions* worksheet. Simply double click the button “PWL Production Spreadsheet Instructions” to access them from within the spreadsheet.
- The PWL Production Spreadsheet should be filled out and completed by the Department Representative.
- The *Project Info & Instructions* worksheet must be filled out first prior to entering test results. Worksheets will not appear until the required project information has been entered.
- Worksheets tab colors indicate the following:
 - Green – Worksheets that require test results to be entered.
 - Red – Worksheets that only present results; no data entry is required in these sheets.
- Cells that are canary/yellow colored are data entry fields.
 - It is essential that no blank spaces are entered in or after any of the information entered into the fields.
 - All data should be entered in chronological order as mixture is produced.
 - In general, there should be no gaps in the data entry.
 - When copy/pasting, only use “Paste Values”. If you use the hotkey combination, CTRL+V, values will be pasted automatically.
 - If at the end of the project there is a lot with only two (2) sublots with test results, the pay adjustment will not calculate for that lot. In this scenario, the final two sublots should be combined with the previous lot using the  button to the right of the data entry of the respective lot.

4. Project Info & Instructions

This is the main entry point for the PWL Production Spreadsheet (Figure 1). It contains fields for information about the project as well as paving information such as the mix design, pavement layer and dimensions, and density technician information.

The *Project Info and Instructions* worksheet should be filled out completely by the Department Representative prior to beginning construction. Most of the fields in the *Project Info & Instructions* worksheet (i.e.: Contract Unit Price, Lane Width, Nominal Thickness, JMFs, etc.) are required for the worksheet to function correctly. Complete the project information and mixture information sections. Once these are filled out, you may select a *Production Acceptance* where you can select: Density-Only, Volumetrics-Only, or Volumetrics and Density. Selections will produce the following actions:

- Density-Only
 - Reveals the *Density Information* section on *Project Info & Instructions*.
 - This section must be filled out completely to reveal the appropriate density worksheets for either nuclear and/or core acceptance.
 - Reveals the *Total Pay Adjustment Summary*.
- Volumetrics-Only
 - Reveals *Gmm F&t, Gmb F&t, AC %, VMA, Gsb, & Gse, Volumetrics Pay Factors, Total Pay Adjustment Summary, Volumetrics Charts, and Daily Average Gmm for Density*.
 - Note: This option is typically used when the PWL volumetrics are combined with another layer – usually the lower layer.
- Volumetrics and Density
 - Reveals the *Density Information* section on *Project Info & Instructions*.
 - Reveals *Gmm F&t, Gmb F&t, AC %, VMA, Gsb, & Gse, Volumetrics Pay Factors, Total Pay Adjustment Summary, Volumetrics Charts, and Daily Average Gmm for Density*.

If performing either a Density-Only or Volumetrics and Density acceptance, a Density Acceptance Method (Nuclear, Core, or Nuclear and Core) must be selected to reveal the correct density worksheets for data entry. Additionally, the Longitudinal Joint Construction must also be specified to reveal the longitudinal joint density worksheets. Project information at the top of all other worksheets within the spreadsheet is referenced from the *Project Info & Instructions* worksheet and can only be changed from this worksheet.



Wisconsin Department of Transportation

HMA PWL Production Spreadsheet (Version: 4.0)

PWL Project Information		Instructions
Contract ID: <input style="width: 90%;" type="text"/> Project ID: <input style="width: 90%;" type="text"/> County: <input style="width: 90%;" type="text"/> Route/Road: <input style="width: 90%;" type="text"/> Contractor: <input style="width: 90%;" type="text"/> Project Leader: <input style="width: 90%;" type="text"/> Start Date: <input style="width: 90%;" type="text"/>	Pavement Layer: <input style="width: 90%;" type="text"/> Underlying Layer: <input style="width: 90%;" type="text"/> Paving Width (ft): <input style="width: 90%;" type="text"/> Lane Width (ft): <input style="width: 90%;" type="text"/> Nominal Thickness (in): <input style="width: 90%;" type="text"/> Start Station: <input style="width: 90%;" type="text"/> End Station: <input style="width: 90%;" type="text"/> Estimated Length (ft): <input style="width: 90%;" type="text"/> <small>Enter Start / End Stations</small>	
Comments: <div style="border: 1px solid black; height: 40px; width: 100%;"></div>		Controls <input style="width: 100%; margin-bottom: 5px;" type="button" value="Save As with Suggested File Name (Use this to save)"/> <input style="width: 100%; margin-bottom: 5px;" type="button" value="Import Mix Design Information (DT2490 Form)"/> <input style="width: 100%;" type="button" value="Import Test Strip Information (V2.2.1 and newer)"/>
Mixture Information		
WisDOT Mix Design ID: <input style="width: 90%;" type="text"/> Mix Type: <input style="width: 90%;" type="text"/> Mix Gradation: <input style="width: 90%;" type="text"/> Mix PG: <input style="width: 90%;" type="text"/> Binder Designation: <input style="width: 90%;" type="text"/> Mix Classification: <input style="width: 90%;" type="text"/> ---	JMF % AC: <input style="width: 90%;" type="text"/> JMF AC Specific Gravity: <input style="width: 90%;" type="text"/> JMF Gmm: <input style="width: 90%;" type="text"/> JMF Gse: <input style="width: 90%;" type="text"/> JMF Gsb: <input style="width: 90%;" type="text"/> Contract Unit Price: <input style="width: 90%;" type="text"/>	
Production Acceptance		
Type: <input style="width: 95%;" type="text"/>		

Figure 1: Project Info & Instructions User Interface.



Wisconsin Department of Transportation
HMA PWL Production Spreadsheet (Version: 4.0)

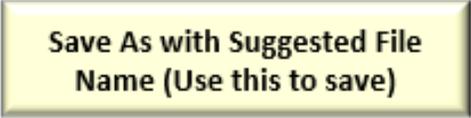
PWL Project Information	
Contract ID: _____	Pavement Layer: _____
Project ID: _____	Underlying Layer: _____
County: _____	Paving Width (ft): _____
Route/Road: _____	Lane Width (ft): _____
Contractor: _____	Nominal Thickness (in): _____
Project Leader: _____	Start Station: _____
Start Date: _____	End Station: _____
	Estimated Length (ft): <input type="text"/> Enter Start / End Stations
Comments: _____ _____ _____	
Mixture Information	
WisDOT Mix Design ID: _____	JMF % AC: _____
Mix Type: _____	JMF AC Specific Gravity: _____
Mix Gradation: _____	JMF Gmm: _____
Mix PG: _____	JMF Gse: _____
Binder Designation: _____	JMF Gsb: _____
Mix Classification: _____	Contract Unit Price: _____
Production Acceptance	
Type: _____	Volumetrics and Density
Density Information	
Density Acceptance Method: <input type="radio"/> Nuclear & Core	Longitudinal Joint Construction: <input type="text"/> Notched Wedge (left in place)
<input type="checkbox"/> Distressed Pavement SPW Applies?	LJD Remedial Action (\$/LF): <input type="text"/> \$4.00
	LJD Alternative Remedial Action: _____
Density Lower Spec Limit (%): <input type="text"/> More Information Needed	LJD Unconfined Lower Spec Limit (%): <input type="text"/> More Information Needed
	LJD Confined Lower Spec Limit (%): <input type="text"/> More Information Needed
Nuclear Density Technician Information	
QC	QV
Technician Name / HTCP #: _____	Technician Name / HTCP #: _____
Primary Gauge Serial #: _____	Primary Gauge Serial #: _____
Primary Gauge Offset: _____	Primary Gauge Offset: _____
Secondary Gauge Serial #: _____	Secondary Gauge Serial #: _____
Secondary Gauge Offset: _____	Secondary Gauge Offset: _____

Instructions

Controls
<input type="button" value="Save As with Suggested File Name (Use this to save)"/>
<input type="button" value="Import Mix Design Information (DT2490 Form)"/>
<input type="button" value="Import Test Strip Information (V2.2.1 and newer)"/>

Figure 2: Project Info & Instructions User Interface Expanded for Density Information.

There are several buttons for worksheet functions found on the righthand side of the interface. The buttons perform the following functions:

	<ul style="list-style-type: none"> • Saves the spreadsheet as a new Excel file (without overwriting old versions) with the suggested file name, including the date and time that the spreadsheet was saved. • This is the preferred method of saving the spreadsheet.
	<ul style="list-style-type: none"> • Imports all JMF Mixture Information except the contract unit price from a completed DT2490 Mix Design Report.
	<ul style="list-style-type: none"> • Imports the QC and QV Nuclear Gauge correlation information from a Test Strip File. The Test Strip must be at least version 2.2.1 or newer to work. This does not import the technician names.

5. Core Density Analysis

This worksheet only appears when the Production Acceptance is either Density-Only or Volumetrics and Density AND either “Core” or “Nuclear and Core” is selected as the Density Acceptance Method on the *Project Info & Instruction* worksheet. This worksheet is used to enter the mainline density test results obtained by cores.

The Department Representative will enter the following information from the core testing (Figure 3):

- Sublot length (ft.)
- Sublot width (ft.)
- Sublot thickness (in.)
- Date (date tested)
- Lot ID
- Sublot ID
- Core Density (%)

Lot Length	Lot Tonnage	Sublot Length	Sublot Width	Sublot Thickness	Date	Lot	Sublot	Core Density

Figure 3: Core Density Analysis data entry fields.

Notes:

- F&t testing is not performed since there are only QV cores and there is no data to compare against.

In the event there are density test results that are more than 3.0% below the lower specification limit (LSL), the unacceptable test result’s cell will turn red (Figure 4) and the corresponding subplot’s Unacceptable Pavement Length Per Sublot and Cores 1 and 2 at the Extent of Unacceptable Material cells will turn canary colored (Figure 5). Results from determining the extents of unacceptable material should then be entered into those corresponding cells in columns AJ through AL (Figure 5). If the material is removed and replaced, the test results from the removed and replaced material should be entered into the corresponding cell in column AM (Figure 5).

	Lot Length	Lot Tonnage	Sublot Length	Sublot Width	Sublot Thickness	Date	Lot	Sublot	Core Density	Data used for pay	Unacceptable Material Left In-Place (Ton)
5											
6											
7			1,500.0	12.0	1.75	9/2/2025	13	1	89.8	89.8	196.00
8											

Figure 4: Failing core density result.

Any comments for a particular test result can be entered in column AN (Figure 5).

AI	AJ	AK	AL	AM	AN
	For individual tests more than 3.0% below the LSL, proceed determining the length of unacceptable material according to CMM 815.11. Record the length of unacceptable material in columns AJ. Record the first acceptable forward and backward 50-foot incremental tests in columns AK and AL.			If unacceptable material is removed and replaced, enter the pavement density values after replacement below.	
Lot-Sublot	Unacceptable Pavement Length Per Sublot	Core 1 at Extent of Unacceptable Material	Core 2 at Extent of Unacceptable Material	Replaced Pavement Cores	Comments
1-A	Enter Unacceptable Length	Enter Core 1	Enter Core 2		

Figure 5: Location to enter results from determining the extents of unacceptable material, removed and replaced material test results, and comments.

Each lot will automatically calculate the standard deviation, mean, PWL value, Pay Factor (PF), and Pay Adjustment once there are at least three (3) test results in that lot (Figure 6).

Lot Length	Lot Tonnage	Sublot Length	Sublot Width	Sublot Thickness	Date	Lot	Sublot	Core Density	Data used for pay	Unacceptable Material Left In-Place (Ton)	Unacceptable Material Pay Adjustment	Standard Deviation	Mean	PWL _D	PF _D	Lot Length (ft)	Lot Size for PWL (Ton)	Density PWL Pay Adjustment	Total Pay Adjustment
7,500.0	980.00	1,500.0	12.0	1.75	9/5/2025	11	2	95.5	95.5										
		1,500.0	12.0	1.75	9/5/2025	11	3	95.9	95.9										
		1,500.0	12.0	1.75	9/5/2025	11	4	94.9	94.9										
		1,500.0	12.0	1.75	9/5/2025	11	5	93.6	93.6										
		1,500.0	12.0	1.75	9/5/2025	11	5	93.6	93.6										
		1,500.0	12.0	1.75	9/5/2025	16	1	93.4	93.4										
												1.12	94.7	95.87	102.35	7,500.0	980.00	\$ 747.40	\$ 747.40

Figure 6: Example Core Density Lot with Pay Adjustment.

6. LJ Core Density Analysis

This worksheet only appears when either “Core” or “Nuclear and Core” is selected as the Density Acceptance Method AND a Longitudinal Joint Construction type is selected on the *Project Info & Instruction* worksheet. This worksheet is used to enter the mainline density test results obtained by cores.

The Department Representative will enter the following information from the applicable Median/Centerline and/or Outside longitudinal joint core testing (Figure 7):

- Joint Type (Confined – C, Unconfined – U)
- Joint Length (ft.)
- Core Density (%)

Notes:

- F&t testing is not performed since there are only QV cores and there is no data to compare against.
- Date Tested, Lot, and Sublot information correspond with the mainline test. This worksheet will automatically input this information from the Core Density Analysis worksheet.
- Unlike the *Core Density Analysis* worksheet, the joint pay adjustments are determined in another worksheet, *LJ Core Density Pay Adjustment*.

	A	B	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	WisDOT Mix No.:			Layer:			Unconfined LSL (%):		More Information Needed							
2	Mix Type:			Confined LSL (%):		More Information Needed										
3																
4																
5						Median-CL Joint				Outside Joint						
	Lot Length	Mainline Traffic Lane Lot Density in Disincentive?	Date	Lot	Sublot	Jt. Type	Joint Length	Core Density	Density LSL	Jt. Type	Joint Length	Core Density	Density LSL	Median-CL /Outside	Core Variance	Core Mean
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20														M-CL		
														O		

Figure 7: LJ Core Density Analysis data entry fields.

In the event there are density test results that are more than 3.0% below the lower specification limit (LSL), the unacceptable test result’s cell will turn red (Figure 8) and the corresponding subplot’s Unacceptable Joint Length Within (Median-CL and/or Outside) Joint Sublot and First Acceptable (Median-CL and/or Outside) Forward/Backward 50-foot Incremental Test cells will turn canary colored (Figure 9). Results from determining the extents of unacceptable material should then be entered in those corresponding cells in columns AD through AK (Figure 9). If the

material is removed and replaced, the test results from the removed and replaced material should be entered into the corresponding cells in columns AL through AM (Figure 9).

Date	Lot	Sublot	Median-CL Joint				Outside Joint			
			Jt. Type	Joint Length	Core Density	Density LSL	Jt. Type	Joint Length	Core Density	Density LSL
9/02/2025	13	1	U	1,500.0	86.9	90.0				

Figure 8: Failing LJ Core Density Result.

AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
<p>For individual tests more than 3.0% below the LSL, proceed determining the length of unacceptable material according to STSP 460-075 460.3.3.2(7). Record the length of unacceptable material in columns AE and/or AI. Record the first acceptable forward and backward 50-foot incremental tests in columns AF and AG and/or AJ and AK.</p>										<p>If unacceptable material is removed and replaced, enter the pavement density values after replacement below.</p>
Lot-Sublot	Jt. Type	Median-CL Joint			Jt. Type	Outside Joint			Replaced Median-CL Joint Core Tests	Replaced Outside Joint Core Tests
		Unacceptable Joint Length Within Median-CL Joint Sublot	First Acceptable Median-CL Forward 50-foot Incremental Test	First Acceptable Median-CL Backward 50-foot Incremental Test		Unacceptable Joint Length Within Outside Joint Sublot	First Acceptable Outside Forward 50-foot Incremental Test	First Acceptable Outside Backward 50-foot Incremental Test		
13-1	U	Enter Joint Length	Enter Density Result	Enter Density Result						
13-2	U									
13-3	U									
13-4	U									
13-5	U									

Figure 9: Location to enter results from determining the extents of unacceptable material for longitudinal joints and removed and replaced material test results.

Comments for individual test results can be entered in column AN.

7. LJ Core Density Pay Adjustment

This worksheet only appears when either “Core” or “Nuclear and Core” is selected as the Density Acceptance Method AND a Longitudinal Joint Construction type is selected on the *Project Info & Instructions* worksheet. This worksheet is used to review the sublots’ density results and the associated pay adjustments (Figure 10).

No information is to be entered into this worksheet.

Median-Centerline (CL) and Outside Joint tests are separated for each subplot and shown in columns F through J and K through O, respectively.

The subplot’s mean, mean – LSL, Pay Adjustment per Lineal Foot, and applicable Joint Length are shown in columns Q through T for confined joints, and columns U through X for unconfined joints.

The subplot’s Pay Adjustment, Length of Unacceptable Longitudinal Joint in Need of Remedial Action, and the Pay Adjustment for Remedial Action are shown in columns Y through AA.

Net Pay Adjustments are accumulated in the upper right-hand corner of the worksheet.

WicDOT Mix No.:		Contract Unit Price:		Total Remedial Action Length (LF):		460.2007 Total Incentive:		\$ 3,300.00													
Mix Type: 4MF-55-28-S		Remedial Action Price (\$/LF): \$4.00		Total Pay Adjustment from Remedial Action:		804.2012 Total Disincentive:		NET: \$ 796.00													
Layer: Upper		Alternative Remedial Action:		Total Joint Length (LF):																	
Lot Length	Date	Lot	Sublot	Median-CL Joint Density After Remedial Action Adjustment			Outside Joint Density After Remedial Action Adjustment			Mean	Confined			Unconfined			Sublot LJJD Pay Adjustment	Length of Unacceptable Longitudinal Joint in Need of Remedial Action	Pay Adjustment for Remedial Action (if Alternative Remedial Action is not used)		
				Joint Length	Core Tests	Density LSL	Unacceptable Joint Length	Joint Length	Core Tests		Density LSL	Unacceptable Joint Length	Mean - LSL	Pay Adjust / LF	Joint Length	Mean				Mean - LSL	Pay Adjust / LF
7,500.0	9/4/2025	9	2	C	1,500.0	95.5	91.5														
	9/4/2025	9	3	C	1,500.0	94.9	91.5														
	9/4/2025	9	4	C	1,500.0	93.6	91.5														
	9/4/2025	9	5	C	1,500.0	93.9	91.5														
	9/4/2025	10	1	C	1,500.0	94.7	91.5														

Figure 10: Longitudinal Joint Core Density Pay Adjustment Example.

Additionally, the Department Representative will enter the results of the daily footprint testing in columns Z and AA (Figure 12).

Notes:

- If the difference between the QC and QV gauges exceeds 1.0 pcf (0.7 percent) for an average of 10 locations, investigate the cause, check gauge moisture and density standards, and perform additional footprint testing. If the cause of the differences between gauge readings cannot be identified, the Department Representative will consult the State’s Radiation Safety Officer (RSO) and BTS HMA Unit to determine necessary actions.

Z	AA	AB
Foot Print Tests (For QC/QV gauge comparison only)		
QC	QV	Difference (%)
97.3	96.6	0.7
96.7	95.6	1.1
95.3	96.6	-1.3
95.8	94.8	1.0
96.8	94.6	2.2
95.0	95.3	-0.3
95.0	94.5	0.5
94.3	95.7	-1.4
95.2	95.7	-0.5
94.7	95.7	-1.0
94.5	94.3	0.2
94.3	95.0	-0.7
95.0	94.6	0.4
94.9	94.7	0.2
93.4	94.6	-1.2

Figure 12: Example Nuclear Gauge Footprint Testing Fields.

After the initial two (2) lots of data entries have been completed, the worksheet will begin to display preliminary F&t results to give an early indication as to how well the datasets are comparing (Figure 13). This information can be useful to determine if re-correlation may be needed, or if a particular nuclear gauge should be removed from the job.

QC Variance	QC Mean	QV Variance	QV Mean	Do the Variances Compare?	Do the Means Compare?
Informational Purposes Only. NOT yet used for pay.					
0.892	95.5	0.283	95.1	Yes	Yes

Figure 13: Preliminary F&t Results shown after two (2) lots of data have been entered.

After the first three (3) lots of data entries have been completed, the worksheet will determine if the means and variances compare for those first three (3) lots via F&t testing, shown in columns S and V (Figure 14). This will determine which testing party’s data, QC or QV, will be used for acceptance and pay adjustment. If the means AND variances compare, QC data will be used, otherwise QV data will be used. Additional information regarding the data, if applicable, will be shown after the first three (3) lots, and each subsequent lot thereafter in the lot’s notification area (row 57 in Figure 14).

Lot Length	Sublot Length	Sublot Width	Date	Lot	Sublot	QC Tests (Avg: 94.9)	QV Tests (Avg: 94.4)	Dispute Resolution Cores	Dataset Used for Pay	QC Variance	QC Mean	QV Variance	QV Mean	Do the Variances Compare?	Do the Means Compare?
WisDOT Mix No.: _____ Lane Width (ft): 11.0															
Mix Type: 3-MT-58-28-S Nominal Thickness (in): 2.50															
Layer: Lower Density LSL (%): 93.0															
Sublot Widths will fill in automatically when Sublot Length is entered															
58	1,500.0	11.0	8/1/2025	8	2B	93.8	92.6		QC						
59			8/1/2025	8	2A	94.2									
60			8/1/2025	8	1C	92.4									
61	1,500.0	11.0	8/1/2025	8	1B	93.9			QC						
62			8/1/2025	8	1A	93.6	94.3								
63			8/1/2025	7	5C	92.6									
64	1,500.0	11.0	8/1/2025	7	5B	94.3	93.8		QC						
65			8/2/2025	7	5A	95.5									
66			8/2/2025	7	4C	95.2									
67	1,500.0	11.0	8/2/2025	7	4B	96.6	95.7		QC						
68			8/2/2025	7	4A	96.6									
69			8/2/2025	7	3C	94.9									
70	1,500.0	11.0	8/2/2025	7	3B	97.7			QC						
71			8/2/2025	7	3A	96.0									
72			9/29/2025	13	1A	93.7	91.7								
The lot average for QC is different from the lot average for QV by more than 0.5%. Lot 4 qualifies for dispute resolution. Lot 4 is in disincentive. Lot 4 qualifies for dispute resolution.										2.32	94.4	1.60	93.9	Yes	Yes

Figure 14: Means and Variances Comparison (F&t) Testing Results.

Notes:

- F&t testing uses a rolling window of 3 lots. See section 20.1 F&t Testing for more details.

Density results may be disputed by the contractor on a lot-by-lot basis if one of the following criteria is met:

1. The lot average for either QC or QV is below the lower specification limit.
2. The lot average for QC is different from the lot average for QV by more than 0.5%.
3. The lot is in disincentive.

The worksheet will determine if a lot is eligible for contractor dispute resolution and present a notification in the notification area below the lot that is eligible for dispute. Dispute core density results can then be entered for the lot in column J, Dispute Resolution Cores, next to the corresponding QV nuclear density tests. If a lot has more than five (5) QV tests in it, the lot can

be expanded using the  button to accommodate up to 7 QV core locations.

Notes:

- Do not continue nuclear density test result entry in the overflow sublots that were added to accommodate dispute cores using the “Add two sublots” button. The exception to this rule is entering the final sublots of the project that would have otherwise had been combined with the previous lot for analysis reasons as described in the General section.
- Dispute Resolution Cores are always used for acceptance and pay adjustment of the lot, when available, regardless of the status of the F&t testing.

In the event there are density test results that are more than 3.0% below the lower specification limit (LSL), the unacceptable test result’s cell will turn red (Figure 15) and the corresponding test’s Unacceptable Pavement Length Per Sublot cell will turn canary colored (Figure 16). Results from determining the extents of unacceptable material should then be entered in the corresponding cell in column AE (Figure 16). If the material is removed and replaced, the test results from the removed and replaced material should be entered into the corresponding cells in columns AG through AI (Figure 16).

Any comments for a particular test result can be entered in column AJ (Figure 16).

Lot Length	sublot Length	Sublot Width	Date	Lot	sublot	QC Tests (Avg: 94.9)	QV Tests (Avg: 94.4)	Dispute Resolution Cores	Dataset Used for Pay	QC Variance	QC Mean	QV Variance	QV Mean	Do the Variances Compare?	Do the Means Compare?
58	1,500.0	11.0	8/1/2025	8	2B	89.6	92.6		QC						
59			8/1/2025	8	2A	94.2									
60			8/1/2025	8	1C	92.4									
61	1,500.0	11.0	8/1/2025	8	1B	93.9									
62			8/1/2025	8	1A	93.6	94.3								
63			8/1/2025	7	5C	92.6									
64	1,500.0	11.0	8/1/2025	7	5B	94.3	93.8								
65			8/2/2025	7	5A	95.5									
66			8/2/2025	7	4C	95.2									
67	1,500.0	11.0	8/2/2025	7	4B	96.6	95.7								
68			8/2/2025	7	4A	96.6									
69			8/2/2025	7	3C	94.9									
70	1,500.0	11.0	8/2/2025	7	3B	97.7									
71			8/2/2025	7	3A	96.0									
72			9/29/2025	13	1A	93.7	91.7								
The lot average for QC is different from the lot average for QV by more than 0.5%. Lot 4 qualifies for dispute resolution. Lot 4 is in disincentive. Lot 4 qualifies for dispute resolution.										2.82	94.3	1.60	93.9	Yes	Yes

Figure 15: Failing nuclear density result.

Lot-Sublot	Unacceptable Pavement Length Per Sublot	Unacceptable Material Left In-Place (Ton)	Replaced Pavement QC Tests	Replaced Pavement QV Tests	Replaced Pavement Dispute Cores	Comments
3-5C	Enter Unacceptable Length	Unacceptable Length Needed				Unacceptable material that has not been removed and replaced will be paid at 50%
3-5B						
3-5A						
3-4C						
3-4B						
3-4A						
11-3A						
11-3B						
11-3C						
11-4A						
11-4B						
11-4C						
11-5A						
11-5B						
11-5C						

Figure 16: Location to enter results from determining the extents of unacceptable material, removed and replaced material test results, and comments.

9. Nuc Density Pay Factors

This worksheet only appears when either “Nuclear” or “Nuclear and Core” is selected as the Density Method on the *Project Info & Instructions* worksheet. This worksheet is used to review the lots’ density results and the associated pay adjustments (Figure 17).

No information is to be entered into this worksheet.

Depending on the results of the F&t testing performed and any Remove and Replacement on the *Nuc Density F&t* worksheet (F&t also shown in columns AH and AI of this sheet), the QC or QV test results will be displayed in column J. The dataset used for pay is shown in column AJ.

If taken, Dispute Resolution Cores will be shown in column K. In the event dispute cores result in a Pay Factor that is less than or equal to the nuclear gauge pay factor, a fee will be assessed for the lot and shown in column AD.

Net Lot Pay Adjustments are shown in column AK and accumulated in the upper right-hand corner of the worksheet.

Lot Length (ft)	Date	Lot	QC Results (C)	QV Results (D)	QC or QV Results (E)	Dispute Resolution Cores (F)	Unacceptable Material Left in Place (Ton)	Unacceptable Material Pay Adjustment	Standard Deviation	Mean	PVI ₁₀	PF ₁₀	Dispute Resolution Std. Dev.	Dispute Resolution Mean	Dispute Resolution PVI ₁₀	Dispute Resolution PF ₁₀	Dispute Resolution Penalty?	Lot Length (ft)	Lot Size for PVI (Ton)	Density PVI Pay Adjustment	Did Variance Compare?	Did Means Compare?	Dataset used for Pay	Total Pay Adjustment
7,500.0	5/27/2009	3	94.6		94.6																			
7,500.0	5/27/2009	3	95.1		95.1																			
7,500.0	5/27/2009	3	95.3		95.3																			
7,500.0	5/27/2009	3	97.3		97.3																			
7,500.0	5/27/2009	3	94.7		94.7																			
7,500.0	5/27/2009	3	96.3		96.3																			
7,500.0	5/29/2009	11	96.9		96.9																			
7,500.0	5/29/2009	11	95.5		95.5																			
7,500.0	5/29/2009	11	97.3		97.3																			
7,500.0	5/29/2009	11	95.4		95.4																			
7,500.0	5/29/2009	11	97.5		97.5																			
7,500.0	5/29/2009	11	95.6		95.6																			
7,500.0	5/29/2009	11	94.4		94.4																			
7,500.0	5/29/2009	11	95.3		95.3																			
7,500.0	5/29/2009	11	94.4		94.4																			
7,500.0	5/29/2009	11	96.5		96.5				1.22	96.0	99.69	93.88						7,500.0	1,283.33	\$ 1,671.04	Yes	Yes	QC	\$ 1,671.04
7,500.0	5/29/2009	12	94.7		94.7																			
7,500.0	5/29/2009	12	92.9		92.9		98.6																	
7,500.0	5/29/2009	12	97.1		97.1																			
7,500.0	5/30/2009	12	91.5		91.5																			
7,500.0	5/30/2009	12	96.4		96.4		96.6																	
7,500.0	5/30/2009	12	95.1		95.1																			
7,500.0	5/30/2009	12	94.1		94.1																			
7,500.0	5/30/2009	12	95.3		95.3																			
7,500.0	5/30/2009	12	94.9		94.9																			
7,500.0	7/29/2009	15	93.0		93.0																			
7,500.0	7/29/2009	15	95.9		95.9		95.3																	
7,500.0	7/29/2009	15	95.1		95.1																			
7,500.0	7/29/2009	15	94.7		94.7																			
7,500.0	7/29/2009	15	96.0		96.0		92.1																	
7,500.0	7/29/2009	15	94.6		94.6				1.46	94.6	89.09	93.54	2.38	95.5	85.34	97.67	Yes	7,500.0	1,283.33	\$ (975.57)	Yes	Yes	DISPUTE CORES	\$ (975.57)
7,500.0	7/29/2009	15	94.2		94.2																			
7,500.0	7/29/2009	15	92.6		92.6																			
7,500.0	7/29/2009	15	95.9		95.9																			
7,500.0	7/29/2009	15	93.2		93.2																			
7,500.0	7/29/2009	15	93.9		93.9																			
7,500.0	7/29/2009	15	94.4		94.4																			
7,500.0	8/4/2009	16	93.2		93.2																			
7,500.0	8/4/2009	16	95.7		95.7																			
7,500.0	8/4/2009	16	93.5		93.5																			

Figure 17: Nuc Density Pay Adjustment Example.

In the event there is a lot with unacceptable material where the extents of unacceptable material were not entered in column AE in the *Nuc Density F&t* worksheet, this worksheet will display, “Enter length of Unacceptable Material on Density F&t Tab” at the top of the sheet (Figure 18).

WisDOT Mix No.:	Layer:	Total Density Tonnage:	Enter length of Unacceptable Material on Density F&t Tab
Mix Type: 3-MT-58-28-S	Lane Width (ft): 11.0	11,293.33	
Contract Unit Price: \$61.00	Nominal Thickness (in): 2.50	Total Length (LF): 66,000.0	
PWL Default Price: \$65.00	Density LSL (%): 93.0		

Figure 18: Missing Extents of Unacceptable Material Example.

10. LJ Nuc Density F&t

This worksheet only appears when either “Nuclear” or “Nuclear and Core” is selected as the Density Acceptance Method AND a Longitudinal Joint Construction type is selected on the *Project Info & Instruction* worksheet. This worksheet is used to enter the longitudinal joint density test results obtained by nuclear density gauge.

The Department Representative will enter the following information from the applicable Median/Centerline and/or Outside longitudinal joint nuclear density testing (Figure 19):

- Joint Type (Confined – C, Unconfined – U)
- Joint Length (ft.)
- QC Test Results (%)
- QV Test Results (%)

		WisDOT Mix No.:		Layer:		Unconfined LSL (%):		More Information Needed																
		Mix Type:				Confined LSL (%):		More Information Needed																
		Median-CL Joint						Outside Joint																
Lot Length	Mainline Traffic Lane Lot Density in Disincentive?	Date	Lot	Sublot	Jt. Type	Joint Length	QC Tests	QV Tests	Density LSL	QC/QV Data Used	Jt. Type	Joint Length	QC Tests	QV Tests	Density LSL	QC/QV Data Used	Median-CL /Outside	QC Variance	QC Mean	QV Variance	QV Mean	Do the Variances Compare?	Do the Means Compare?	
35																								
36																								
37																								
38																								
39																								
40																								
41																								
42																								
43																								
44																								
45																								
46																								
47																								
48																								
49																								
50																								
51																								
52																								
53																								
54																								
55																								
56																								
57																								
58																								

Figure 19: LJ Nuc Density F&t Data Entry Fields.

Notes:

- HMA Field Density Worksheets (V2.2+) contain an automated worksheet, *Formatted for PWL*, that converts daily nuclear density longitudinal joint test results into a format that can be easily copied and pasted into the HMA PWL Production spreadsheet.

Additionally, the Department Representative will enter the results of the daily footprint testing in columns AG and AH (Figure 20).

Notes:

- If the difference between the QC and QV gauges exceeds 1.0 pcf (0.7 percent) for an average of 10 locations, investigate the cause, check gauge moisture and density standards, and perform additional footprint testing. If the cause of the differences between gauge readings cannot be identified, the Department Representative will consult the State’s Radiation Safety Officer (RSO) and BTS HMA Unit to determine necessary actions.

for acceptance and pay adjustment. If the means AND variances compare, QC data will be used, otherwise QV data will be used.

WisDOT Mix No.: 3-MT-58-28-S		Layer: Lower		Unconfined LSL (%): 90.0		Confined LSL (%): 91.5														
Lot Length	Mainline Traffic Lane Lot Density in Disincentive?	Date	Lot	Sublot	Median-CL Joint				Outside Joint				Median-CL /Outside	QC Variance	QC Mean	QV Variance	QV Mean	Do the Variances Compare?	Do the Means Compare?	
					Jt. Type	Joint Length	QC Tests	QV Tests	Density LSL	QC/QV Data Used	Jt. Type	Joint Length								QC Tests
7,500.0	Traffic Lane in Disincentive - LJD Ineligible for Incentive	7/29/2025	15	5B	C	500.0	94.4		91.5											
		7/29/2025	15	5C	C	500.0	90.8	89.9	91.5											
		7/29/2025	16	1A	C	500.0	92.1		91.5											
		7/29/2025	16	1B	C	500.0	93.3		91.5											
		7/29/2025	16	1C	C	500.0	93.9	92.1	91.5											
		7/29/2025	16	2A	C	500.0	92.4	93.9	91.5											
		8/01/2025	16	2B	C	500.0	93.2		91.5											
		8/01/2025	16	2C	C	500.0	91.5		91.5											
		8/01/2025	16	3A	C	500.0	91.7	92.1	91.5											
		8/01/2025	16	3B	C	500.0	91.9		91.5											
		8/01/2025	16	3C	C	500.0	92.4		91.5											
		8/01/2025	8	3C	C	500.0	90.1	92.1	91.5											
		8/01/2025	8	3B	C	500.0	90.1		91.5											
		8/01/2025	8	3A	C	500.0	89.7		91.5											
		8/01/2025	8	2C	C	500.0	93.0	93.0	91.5											
												M-CL	2.01	92.1	1.29	92.2	Yes	Yes		
												O	1.31	93.0	1.07	92.6	Yes	Yes		

Figure 22: Means and Variances Comparison (F&t) Testing Results.

In the event there are density test results that are more than 3.0% below the lower specification limit (LSL), the unacceptable test result's cell will turn red (Figure 23) and the corresponding subplot's Unacceptable Joint Length Within (Median-CL and/or Outside) Joint Sublot and First Acceptable (Median-CL and/or Outside) Forward/Backward 50-foot Incremental Test cells will turn canary colored (Figure 24). Results from determining the extents of unacceptable material should then be entered into those corresponding cells in columns AV through BB (Figure 24). If the material is removed and replaced, the test results from the removed and replaced material should be entered into the corresponding cells in columns BC through BF (Figure 24).

Any comments for a particular test result can be entered in column BG.

Lot Length	Mainline Traffic Lane Lot Density in Disincentive?	Date	Lot	Sublot	Jt. Type	Median-CL Joint				QC/QV Data Used
						Joint Length	QC Tests	QV Tests	Density LSL	
7,500.0	Traffic Lane in Disincentive - LJD Ineligible for Incentive	8/01/2025	8	2B	C	500.0	88.2		91.5	QC
		8/01/2025	8	2A	C	500.0	91.4	94.4	91.5	
		8/01/2025	8	1C	C	500.0	92.1		91.5	
		8/01/2025	8	1B	C	500.0	91.4		91.5	
		8/01/2025	8	1A	C	500.0	91.2		91.5	
		8/01/2025	7	5C	C	500.0	92.3		91.5	
		8/01/2025	7	5B	C	500.0	92.4		91.5	
		8/02/2025	7	5A	C	500.0	93.2	94.5	91.5	
		8/02/2025	7	4C	C	500.0	94.4		91.5	
		8/02/2025	7	4B	C	500.0	94.0		91.5	
		8/02/2025	7	4A	C	500.0	93.2	93.3	91.5	
		8/02/2025	7	3C	C	500.0	94.1		91.5	
		8/02/2025	7	3B	C	500.0	95.7		91.5	
		8/02/2025	7	3A	C	500.0	93.3		91.5	
		9/29/2025	13	1A	C	500.0	88.7	88.5	91.5	

Figure 23: Failing longitudinal joint nuclear density result.

AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF
<p>For an individual test more than 3.0% below the LSL, proceed according to STSP 460-075 460.3.3.2(7) in determining the length of unacceptable material. Record the length of unacceptable material in columns AV and/or AZ. Record the first acceptable forward and backward 50-foot incremental tests in columns AW and AX and/or BA and BB.</p>									<p>If unacceptable material is removed and replaced, enter the pavement density values after replacement below.</p>			
Lot-Sublot	Jt. Type	Unacceptable Joint Length Within Median-CL Joint Sublot	First Acceptable Median-CL Forward 50-foot Incremental Test	First Acceptable Median-CL Backward 50-foot Incremental Test	Jt. Type	Unacceptable Joint Length Within Outside Joint Sublot	First Acceptable Outside Forward 50-foot Incremental Test	First Acceptable Outside Backward 50-foot Incremental Test	Replaced Median-CL Joint QC Tests	Replaced Median-CL Joint QV Tests	Replaced Outside Joint QC Tests	Replaced Outside Joint QV Tests
8-2B	C	Enter Joint Length	Enter Density Result	Enter Density Result								
8-2A	C											
8-1C	C											
8-1B	C											
8-1A	C											
7-5C	C											
7-5B	C											
7-5A	C											
7-4C	C											
7-4B	C											
7-4A	C											
7-3C	C											
7-3B	C											
7-3A	C											
13-1A	C											

Figure 24: Location to enter results from determining the extents of unacceptable material and removed and replaced material test results.

12. Gmm F&t

This worksheet is used to enter the Gmm (Specific Gravity – Mixture Theoretical Maximum) test results used in part along with the Gmb (Specific Gravity – Mixture Bulk) test results to calculate the mixture’s air voids.

The Department Representative will enter the following information from the Gmm testing (Figure 26):

- Sublot Size (Tons)¹
- Date Sampled
- QC Test Results
- QV Test Results

	A	B	C	D	E	F	I	J	K	L	P	S
1	Job No./Project ID: _____						Layer: _____				Gmm	
2	WisDOT Mix No.: _____						Traffic Vol: _____					
3	Mix Type: _____						JMF Gmm: _____					
4	Sublot	Lot Size (tons)	Sublot Size (tons)	Sampled Date	QC Tests	QV Tests	QC Variance	QC Mean	QV Variance	QV Mean	Do the Variances Compare?	Do the Means Compare?
5	1A											
6	1B											
7	1C											
8	1D											
9	1E											
10	2A											
11	2B											
12	2C											
13	2D											
14	2E											
15	3A											
16	3B											
17	3C											
18	3D											
19	3E											
22												

When copying and pasting data into this spreadsheet, either click ctrl+c to copy and ctrl+v to paste, or right click to copy and **PASTE VALUES ONLY.**

Figure 26: Gmm F&t Data Entry Fields.

Notes:

- Lot Size (tons, column B) will not accumulate subplot tonnage until a corresponding QC test is entered in *Gmm F&t*, *Gmb F&t*, AND *AC %* worksheets. This is to allow for tracking missed tests while not giving the tonnage credit in the pay adjustment for the rest of the lot.

After the first three (3) lots of data entries have been completed, the worksheet will determine if the means and variances compare for those first three (3) lots via F&t testing, shown in columns P and S (Figure 27). This will determine whether the lots’ results are disputed. If the means AND

¹ The Sublot Size will always be less than or equal to 750 tons. Add a random sample for any fraction of 750 tons at the end of production for a specific mixture design. Entering a value larger than 750 tons will result in an error message.

variances compare, QC data is verified and will be used for acceptance and pay adjustment, otherwise dispute resolution will begin. Additional information regarding the data, if applicable, will be shown after the first three (3) lots, and each subsequent lot thereafter in the lot's notification area (row 22 in Figure 27).

	A	B	C	D	E	F	I	J	K	L	P	S	
1	Job No./Project ID: _____						Layer: Upper		Gmm				
2	WisDOT Mix No.: 0-250-0126-2024						Traffic Vol: LT						
3	Mix Type: 4-LT-58-28-S						JMF Gmm: 2.512						
4	Sublot	Lot Size (tons)	Sublot Size (tons)	Sampled Date	QC Tests (Avg: 2.498)	QV Tests (Avg: 2.514)	QC Variance	QC Mean	QV Variance	QV Mean	Do the Variances Compare?	Do the Means Compare?	
5	1A	3750.00	750.00	5/30/2024	2.494		When copying and pasting data into this spreadsheet, either click ctrl+c to copy and ctrl+v to paste, or right click to copy and <u>PASTE VALUES ONLY.</u>						
6	1B		750.00	5/30/2024	2.494	2.530							
7	1C		750.00	5/31/2024	2.492								
8	1D		750.00	5/31/2024	2.500								
9	1E		750.00	6/04/2024	2.500								
10	2A	3750.00	750.00	6/04/2024	2.500								
11	2B		750.00	6/06/2024	2.491								
12	2C		750.00	6/06/2024	2.496								
13	2D		750.00	6/07/2024	2.496								
14	2E		750.00	6/07/2024	2.494	2.529							
15	3A	3750.00	750.00	6/10/2024	2.500								
16	3B		750.00	6/10/2024	2.497								
17	3C		750.00	6/12/2024	2.492								
18	3D		750.00	6/12/2024	2.501	2.522							
19	3E		750.00	6/12/2024	2.498								
22	Means do not compare, but the Pay Factor is greater than 102%. No dispute resolution testing required.							0.00001	2.496	0.00002	2.527	Yes	No

Figure 27: Means and Variances Comparison (F&t) Testing Results.

Notes:

- If the lot does not compare via the F&t testing but the Pay Factor for the lot is greater than 102% (as determined in the hidden *Va Pay Factor Comparison* worksheet), then dispute resolution testing is not required. The lot's notification area will notify you if this situation occurs.
- A non-comparison for either Gmm or Gmb will result in the lot requiring dispute resolution for both tests as well as asphalt content². The lot's notification area will notify you if this situation occurs.

In the event there is unacceptable material (individual air voids results not meeting the acceptance limits) dispute resolution is automatically initiated for that lot. Failing results will be flagged with a red cell background as well produce a notification (Figure 28).

² BTS will test the retained sample for Gmm, Gmb, and AC as part of this dispute resolution testing in case the results for Gmm and Gmb are also needed so that additional reheats of the retained material are not required. If asphalt content is the only cause for dispute resolution testing, only enter the referee asphalt content test results.

	A	B	C	D	E	F	I	J	K	L	P	S								
1	Job No./Project ID: _____						Layer: Upper		Gmm											
2	WisDOT Mix No.: 0-250-0126-2024						Traffic Vol: LT													
3	Mix Type: 4-LT-58-28-S						JMF Gmm: 2.512													
4	Sublot	Lot Size (tons)	Sublot Size (tons)	Sampled Date	QC Tests (Avg: 2.498)	QV Tests (Avg: 2.507)	QC Variance	QC Mean	QV Variance	QV Mean	Do the Variances Compare?	Do the Means Compare?								
5	1A	3750.00	750.00	5/30/2024	2.494		When copying and pasting data into this spreadsheet, either click ctrl+c to copy and ctrl+v to paste, or right click to copy and <u>PASTE VALUES ONLY.</u>	0.00001	2.496	0.00139	2.508	No	Yes							
6	1B		750.00	5/30/2024	2.494	2.530														
7	1C		750.00	5/31/2024	2.492															
8	1D		750.00	5/31/2024	2.500															
9	1E		750.00	6/04/2024	2.500															
10	2A	3750.00	750.00	6/04/2024	2.500															
11	2B		750.00	6/06/2024	2.491															
12	2C		750.00	6/06/2024	2.496															
13	2D		750.00	6/07/2024	2.496															
14	2E		750.00	6/07/2024	2.494	2.529														
15	3A	3750.00	750.00	6/10/2024	2.500															
16	3B		750.00	6/10/2024	2.497															
17	3C		750.00	6/12/2024	2.492															
18	3D		750.00	6/12/2024	2.501	2.465														
19	3E		750.00	6/12/2024	2.498															
22	Unacceptable individual tests must be referee tested by BTS according to STSP 460.050 460.2.8.3.1.7(5). Enter BTS results in column AA.																			

Figure 28: Failing air voids result flagged in the Gmm F&t worksheet as well as its corresponding failure notification.

Dispute resolution is initiated if any of the following scenarios occur:

- Either the means or variances do not compare AND the air voids pay factors for both the QC and QV datasets are not greater than 102% as determined in the hidden *Va Pay Factor_Comparison* worksheet.
- There is an individual unacceptable QC or QV air voids test result.

When dispute resolution occurs, the reason for the dispute will appear in the lot’s notification area in red text. The Department Representative will select the retained sample/s to be referee tested either from the lot that caused the dispute, or from within the rolling five (5) lot analytical window of the dispute lot. The results of the referee testing will be entered into column AA, BTS Tests, for the applicable tested subplot in the *Gmm F&t*, and *Gmb F&t* worksheets (Figure 29), and column I in the *AC %* worksheet (Figure 36).

Regardless of the reason dispute resolution is initiated from the list above, once the referee test results are entered, F&t analysis will be reperformed between the QC dataset and the QV dataset with the referee results replacing the original QV results in the comparison. The results of the second round of F&t testing are shown in columns AI and AL in Figure 29. If the datasets compare, dispute resolution ends and QC test results will be used for acceptance and pay adjustment. If the datasets do not compare, then the Department’s Regional Lab will test the retained samples for the remaining four (4) sublots in the disputed lot and enter those test results in column AQ (Figure 30). The Department’s Regional Lab results will be used for acceptance and pay adjustment, unless disputed by the contractor.

Notes:

- A Dispute Resolution Flowchart is available in the appendix in section 20.2 Volumetric Dispute Resolution Flowchart.
- BTS’s test results from the second round of F&t testing, column AA, will auto-populate in column AQ.

W	X	Y	Z	AA	AI	AL
BTS Dispute Resolution						
Sublot	Date	QC Tests	QV Tests	BTS Tests	Do the Variances Compare?	Do the Means Compare?
1A	5/30/2024	2.494				
1B	5/30/2024		2.530			
1C	5/31/2024	2.492				
1D	5/31/2024	2.500				
1E	6/04/2024	2.500				
2A	6/04/2024	2.500				
2B	6/06/2024	2.491				
2C	6/06/2024	2.496				
2D	6/07/2024	2.496				
2E	6/07/2024		2.529			
3A	6/10/2024	2.500				
3B	6/10/2024	2.497				
3C	6/12/2024	2.492				
3D	6/12/2024		2.466	2.466		
3E	6/12/2024	2.498				
Variances do not compare. The region will test the remaining 4 sublots according to STSP 460-050 460.2.8.3.1.7(2) Step [2]ii. Enter results of region testing in column AQ.					No	Yes

Figure 29: Dispute Resolution Data Entry Location for Gmm and Gmb.

AN	AO	AP	AQ	AR
Region Lab Dispute Resolution				
Sublot	Date	QC Tests	QV Tests	BTS Data
1A	5/30/2024	2.494		
1B	5/30/2024	2.494		
1C	5/31/2024	2.492		
1D	5/31/2024	2.500		
1E	6/04/2024	2.500		
2A	6/04/2024	2.500		
2B	6/06/2024	2.491		
2C	6/06/2024	2.496		
2D	6/07/2024	2.496		
2E	6/07/2024	2.494		
3A	6/10/2024	2.500	2.501	
3B	6/10/2024	2.497	2.498	
3C	6/12/2024	2.492	2.494	
3D	6/12/2024	2.501	2.466	2.466
3E	6/12/2024	2.498	2.500	

Figure 30: Remaining Four (4) Sublots Department Regional Lab Testing Data Entry Location for Gmm and Gmb.

Resultant datasets used for acceptance, pay adjustment, and dispute resolution are shown in columns BC and BF (Figure 33).

BC	BD	BE	BF
Dataset for PAY			Dispute Resolution Dataset
2.494			
2.494			
2.492			
2.500			
2.500			
2.500			
2.491			
2.496			
2.496			
2.494			
2.502			2.501
2.495			2.498
2.493			2.494
2.466			2.466
2.501			2.500

Figure 33: Resultant Datasets for Acceptance and Pay Adjustment.

13. Gmb F&t

This worksheet is used to enter the Gmb (Specific Gravity – Mixture Bulk) test results used in part along with the Gmm (Specific Gravity – Mixture Theoretical Maximum) test results to calculate the mixture’s air voids.

The Department Representative will enter the following information from the Gmb testing (Figure 34):

- QC Test Results
- QV Test Results

	A	B	C	D	E	F	I	J	K	L	P	S	
1	Job No./Project ID:						Layer:			Gmb			
2	WisDOT Mix No.:						Traffic Vol:						
3	Mix Type:												
4	Sublot	Lot Size (tons)	Sublot Size (tons)	Sampled Date	QC Tests	QV Tests	QC Variance	QC Mean	QV Variance	QV Mean	Do the Variances Compare?	Do the Means Compare?	
5	1A						<p style="color: red; text-align: center;">When copying and pasting data into this spreadsheet, either click ctrl+c to copy and ctrl+v to paste, or right click to copy and <u>PASTE VALUES ONLY.</u></p>						
6	1B												
7	1C												
8	1D												
9	1E												
10	2A												
11	2B												
12	2C												
13	2D												
14	2E												
15	3A												
16	3B												
17	3C												
18	3D												
19	3E												
22													

Figure 34: Gmb F&t Data Entry Fields.

Notes:

- Sublot Size (tons) and Sampled Date auto-populate from the *Gmm F&t* worksheet, and cannot be entered/changed in this worksheet.
 - Lot Size (tons, column B) will not accumulate sublot tonnage until a corresponding QC test is entered in *Gmm F&t*, *Gmb F&t*, AND *AC %* worksheets. This is to allow for tracking missed tests while not giving the tonnage credit in the pay adjustment for the rest of the lot.
- Features of this worksheet, including notifications, F&t analysis, and dispute resolution, are the same as they are for Gmm. Refer to section Gmm F&t for details about these processes and procedures, they will not be repeated here.

Any comments for a particular test result can be entered in column CS.

14. AC %

This worksheet is used to enter the results of QC and QV mixture asphalt content testing.

The Department Representative will enter the following information from the mixture asphalt content testing (Figure 35):

- QC Test Results (%)
- QV Test Results (%)
- BTS Referee Test Results (if needed, %)

	A	B	C	D	E	F	G	K	L	M	N
1	WisDOT Mix No.:				JMF AC %:						
2	Mix Type:				AC Sp. Gr.:						
3	Layer:										
4	Sublot	Sublot Size (tons)	Lot Size (tons)	Sampled Date	QC Asphalt Content (%)	QV Asphalt Content (%)	BTS Asphalt Content (%)	QC Variance	QC Mean	QV Variance	QV Mean
5	1A										
6	1B										
7	1C										
8	1D										
9	1E										
10	2A										
11	2B										
12	2C										
13	2D										
14	2E										
15	3A										
16	3B										
17	3C										
18	3D										
19	3E										
22	<p style="color: red; font-weight: bold;">When copying and pasting data into this spreadsheet, either click ctrl+c to copy and ctrl+v to paste, or right click to copy and <u>PASTE VALUES ONLY.</u></p>										

Figure 35: Mixture Asphalt Content and Gsb Data Entry Fields.

Notes:

- F&t testing is performed with this data; however, it is both hidden and unused for acceptance or pay determination.
- QC results are used for acceptance unless dispute resolution occurs.

Asphalt contents that exceed the action or acceptance limits will be flagged with red text or a red cell background, respectively (Figure 36 and Figure 37), and produce a corresponding notification in the notification areas below the lots. In both situations, dispute resolution³ is initiated and retained samples should be sent to BTS for referee testing. The Department Representative will enter the results of the BTS testing in column G.

³ BTS will test the retained sample for Gmm, Gmb, and AC as part of this dispute resolution testing in case the results for Gmm and Gmb are also needed so that additional reheats of the retained material are not required. If asphalt content is the only cause for dispute resolution testing, only enter the referee asphalt content test results.

	A	B	C	D	E	F	G	K	L	M	N					
1	WisDOT Mix No.:				JMF AC %:	5.3										
2	Mix Type:			3-MT-58-28-S	AC Sp. Gr.:	1.024										
3	Layer:			Lower												
4	Sublot	Sublot Size (tons)	Lot Size (tons)	Sampled Date	QC Asphalt Content (Avg: 5.3%)	QV Asphalt Content (Avg: 5.4%)	BTS Asphalt Content (Avg: 5.5%)	QC Variance	QC Mean	QV Variance	QV Mean					
5	1A	750.00	3,750.00	5/27/2025	5.3			When copying and pasting data into this spreadsheet, either click ctrl+c to copy and ctrl+v to paste, or right click to copy and <u>PASTE VALUES ONLY.</u>	0.05	5.3	0.01	5.5				
6	1B	750.00		5/27/2025	5.6	5.5										
7	1C	750.00		5/29/2025	5.6											
8	1D	750.00		5/29/2025	5.7											
9	1E	750.00		5/30/2025	5.0											
10	2A	750.00	3,750.00	7/29/2025	5.6	5.4										
11	2B	750.00		7/29/2025	5.4											
12	2C	750.00		7/29/2025	5.2											
13	2D	750.00		8/01/2025	5.4											
14	2E	750.00		8/01/2025	4.9											
15	3A	750.00	3,750.00	8/01/2025	5.3											
16	3B	750.00		8/02/2025	5.5											
17	3C	750.00		8/04/2025	5.2											
18	3D	750.00		9/29/2025	5.2											
19	3E	750.00		9/29/2025	5.5	5.6										
22	Notify Engineer: QC Non-Conforming, take a non-random QV sample and follow STSP 460-050 460.2.8.2.1.7(4).															

Figure 36: Asphalt Content Exceeding Action Limits.

	A	B	C	D	E	F	G	K	L	M	N					
1	WisDOT Mix No.:				JMF AC %:	5.3										
2	Mix Type:			3-MT-58-28-S	AC Sp. Gr.:	1.024										
3	Layer:			Lower												
4	Sublot	Sublot Size (tons)	Lot Size (tons)	Sampled Date	QC Asphalt Content (Avg: 5.3%)	QV Asphalt Content (Avg: 5.4%)	BTS Asphalt Content (Avg: 5.5%)	QC Variance	QC Mean	QV Variance	QV Mean					
5	1A	750.00	3,750.00	5/27/2025	5.3			When copying and pasting data into this spreadsheet, either click ctrl+c to copy and ctrl+v to paste, or right click to copy and <u>PASTE VALUES ONLY.</u>	0.10	5.3	0.01	5.5				
6	1B	750.00		5/27/2025	5.6	5.5										
7	1C	750.00		5/29/2025	5.6											
8	1D	750.00		5/29/2025	5.7											
9	1E	750.00		5/30/2025	5.0											
10	2A	750.00	3,750.00	7/29/2025	5.6	5.4										
11	2B	750.00		7/29/2025	5.4											
12	2C	750.00		7/29/2025	5.2											
13	2D	750.00		8/01/2025	5.4											
14	2E	750.00		8/01/2025	4.5											
15	3A	750.00	3,750.00	8/01/2025	5.3											
16	3B	750.00		8/02/2025	5.5											
17	3C	750.00		8/04/2025	5.2											
18	3D	750.00		9/29/2025	5.2											
19	3E	750.00		9/29/2025	5.5	5.6										
22	Notify Engineer: QC Unacceptable, take a non-random QV sample and follow STSP 460-050 460.2.8.2.1.7(4).															

Figure 37: Asphalt Content Exceeding Acceptance Limits.

If two or more consecutive test results fall outside of the action limits, the notification area will turn red and produce a notification to STOP PRODUCTION (Figure 38). Refer to the specifications to determine how to resume production.

BL	BM	BN	BO
Calculated AC			
Sublot	QC Calculated AC%	QV Calculated AC%	BTS Calculated AC%
1A	5.0		
1B	5.3	4.9	
1C	4.6		
1D	5.5		
1E	4.9		
2A	5.2	4.7	
2B	5.0		
2C	4.7		
2D	5.1		
2E	5.4		
3A	5.4		
3B	5.1		
3C	5.2		
3D	5.4		
3E	6.1	5.7	

Figure 40: Additional Calculated Parameters.

Any comments for a particular test result can be entered in column BQ.

15. VMA, Gsb, & Gse

This worksheet is used to enter the reported QC Gsb (Specific Gravity – Stone Bulk). The Gsb, Gmm, Gmb, asphalt specific gravity, and the mixture’s asphalt content (AC %) are used to calculate and track the VMA (Voids in Mineral Aggregate, %) and Gse (Specific Gravity – Stone Effective).

The Department Representative will enter the following information obtained from the contractor only when the value changes from the JMF (otherwise the worksheet will automatically enter the Gsb – JMF or last entered – as AC % values are entered into the worksheet):

- QC Gsb (Reported)

Sublot	Sublot Size (tons)	Lot Size (tons)	Sampled Date	Gsb (Reported)	QC Gse	QV Gse	BTS Gse	QC VMA	QV VMA	BTS VMA	QC VMA Variance	QC VMA Mean	QV VMA Variance	QV VMA Mean
1A														
1B														
1C														
1D														
1E														
2A														
2B														
2C														
2D														
2E														
3A														
3B														
3C														
3D														
3E														

When copying and pasting data into this spreadsheet, either click ctrl+c to copy and ctrl+v to paste, or right click to copy and **PASTE VALUES ONLY.**

Figure 41: Gsb Data Entry Fields as well as calculated Gse and VMA for each party.

Notes:

- The QV and BTS Gse and VMA will change based on the results of dispute resolution testing.
- F&t testing is performed with VMA data; however, it is both hidden and unused for acceptance or pay determination.
- QV/BTS VMA values are used for pay adjustment.

VMA results that exceed the action or acceptance limits will be flagged with red text or a red cell background, respectively (Figure 42 and Figure 43), and produce a corresponding notification in the notification areas below the lots. In cases where the QC or QV VMA is unacceptable, the department will perform referee testing, and those results will be used for pay adjustment. Referee testing for VMA requires the asphalt contents and Gmb be evaluated. In this scenario, the department representative will enter the BTS AC%, Gmm, and Gmb in their respective worksheets’ dispute resolution areas. Once entered, the VMA calculation will appear for BTS in column T.

Sublot	Sublot Size (tons)	Lot Size (tons)	Sampled Date	Gsb (Reported)	QC Gse	QV Gse	BTS Gse	QC VMA	QV VMA	BTS VMA	QC VMA Variance	QC VMA Mean	QV VMA Variance	QV VMA Mean	
1A	750.00	3,750.00	5/27/2025	2.668	2.732			14.1							
1B	750.00		5/27/2025	2.668	2.731	2.748		14.9	14.2						
1C	750.00		5/29/2025	2.668	2.767			14.1							
1D	750.00		5/29/2025	2.668	2.728			14.9							
1E	750.00		5/30/2025	2.668	2.725			13.7							
2A	750.00		7/29/2025	2.659	2.739	2.752		13.0	12.3						
2B	750.00		7/29/2025	2.659	2.735			13.6							
2C	750.00		7/29/2025	2.659	2.740			13.7							
2D	750.00		8/01/2025	2.659	2.733			13.8							
2E	750.00		8/01/2025	2.659	2.694			13.7							
3A	750.00		8/01/2025	2.659	2.713			14.0							
3B	750.00		8/02/2025	2.659	2.735			14.9							
3C	750.00		8/04/2025	2.659	2.715			13.4							
3D	750.00		9/29/2025	2.659	2.708			15.1							
3E	750.00		9/29/2025	2.659	2.690	2.711		14.6	14.2						
QV VMA below Action Limit.											0.33	14.1	1.20	13.6	

When copying and pasting data into this spreadsheet, either click ctrl+c to copy and ctrl+v to paste, or right click to copy and **PASTE VALUES ONLY.**

Figure 42: VMA exceeding the Action Limits.

Sublot	Sublot Size (tons)	Lot Size (tons)	Sampled Date	Gsb (Reported)	QC Gse	QV Gse	BTS Gse	QC VMA	QV VMA	BTS VMA	QC VMA Variance	QC VMA Mean	QV VMA Variance	QV VMA Mean	
1A	750.00	3,750.00	5/27/2025	2.668	2.732			14.1							
1B	750.00		5/27/2025	2.668	2.731	2.748		14.9	14.2						
1C	750.00		5/29/2025	2.668	2.767			14.1							
1D	750.00		5/29/2025	2.668	2.728			14.9							
1E	750.00		5/30/2025	2.668	2.725			13.7							
2A	750.00		7/29/2025	2.640	2.739	2.752		12.4	11.7						
2B	750.00		7/29/2025	2.640	2.735			13.0							
2C	750.00		7/29/2025	2.640	2.740			13.1							
2D	750.00		8/01/2025	2.640	2.733			13.1							
2E	750.00		8/01/2025	2.640	2.694			13.1							
3A	750.00		8/01/2025	2.640	2.713			13.4							
3B	750.00		8/02/2025	2.640	2.735			14.3							
3C	750.00		8/04/2025	2.640	2.715			12.8							
3D	750.00		9/29/2025	2.640	2.708			14.5							
3E	750.00		9/29/2025	2.640	2.690	2.711		13.9	13.6						
QC VMA below Action Limit. QV VMA below Acceptance Limit. Referee testing required for Gmm, Gmb, and AC according to STSP 460-050 460.2.8.3.1.7(5).											0.47	13.7	1.70	13.2	

When copying and pasting data into this spreadsheet, either click ctrl+c to copy and ctrl+v to paste, or right click to copy and **PASTE VALUES ONLY.**

Figure 43: VMA exceeding the Acceptance Limits.

If two or more consecutive test results fall outside of the action limits, the notification area will turn red and produce a notification to STOP PRODUCTION. Refer to the specifications to determine how to resume production.

16. Volumetric Pay Factors

This worksheet is used to review the lots' volumetric test results and their associated pay adjustments.

No information is to be entered into this worksheet.

Depending on the results of the F&t testing and any dispute resolution performed on the *Gmm F&t*, *Gmb F&t*, and *AC %* worksheets, the QC or QV/BTS test results for air voids will be displayed in column G, and any unacceptable air void results will be shown in column H. The Gmm and Gmb values used to calculate air voids are shown in columns E and F, respectively. Only QV/BTS Asphalt contents are shown in column Z, since pay adjustment for asphalt contents is only based on the QV or BTS results.

Metrics for each lots' air voids are shown in columns K through W. Gross pay adjustments are shown for Unacceptable Air Voids in column J, PWL Air Voids in column Y, Asphalt Content in column AB, and VMA in column AE. Additionally, if a fee is assessed in a lot for Regional Lab Testing or BTS Referee Testing, it will be shown in columns AF and AG, respectively, with a "Yes" or "No" indicating whether or not the fee applies to the lot. The total pay adjustment for each lot is shown in column AH and accumulated in the upper part of the worksheet in columns V through AH.

Sublot	Lot Size (Sq Yd)	Sublot Size (Sq Yd)	Blaze	Gmm	Gmb	Air Voids (1.5 Va & S)	Unacceptable Air Voids (Va < 1.5 or Va > S)	Va Unacceptable Material (Ton)	Unacceptable Air Voids Pay Adjustment	Standard Deviation	Mean	PMA ₁₀₀	PF ₁₀₀	Lot Size (Sq Yd)	PWL Air Voids Pay Adjustment	QWBTS AC%	AC% Unacceptable Material (Ton)	AC% Pay Adjustment	QWBTS VMA	VMA Unacceptable Material (Ton)	VMA Pay Adjustment	Regional Lab Testing Fee?	BTS Referee Testing Fee?	TOTAL Pay Adjustment
1A	3,750.00	3,750.00	52702025	2,530	2,420	3.5									5.5				14.2					
1B	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1C	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1D	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1E	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1F	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1G	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1H	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1I	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1J	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1K	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1L	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1M	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1N	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1O	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1P	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1Q	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1R	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1S	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1T	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1U	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1V	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1W	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1X	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1Y	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
1Z	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2A	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2B	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2C	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2D	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2E	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2F	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2G	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2H	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2I	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2J	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2K	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2L	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2M	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2N	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2O	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2P	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2Q	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2R	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2S	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2T	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2U	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2V	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2W	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2X	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2Y	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
2Z	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
3A	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
3B	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
3C	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
3D	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
3E	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
3F	3,750.00	3,750.00	52702025	2,498	2,405	3.9									5.4				12.3			No	No	\$ 4,826.00
3G	3,750.00																							

17. Total Pay Adjustment Summary

This worksheet is used to summarize the incentives, disincentives, and net pay adjustments for density and volumetric testing (Figure 45).

No information is to be entered into this worksheet.

Density testing is further broken down into nuclear density, core density, and longitudinal joint density pay adjustments, while air voids, asphalt content, and VMA pay adjustments are shown under the Volumetrics header. Near the bottom of the worksheet, Regional Lab Testing fees and Referee Testing Fees are shown. At the bottom of the worksheet, the Total Incentive, Total Disincentive, and Combined NET Pay Adjustment are shown for the project.

Depending on the acceptance methods used (nuclear/core, volumetrics-only, etc), the unused sections will be hidden in the summary.

	A	B	C	D	E	F	G	H	I	J	K
1		Contract ID:		Project Limits:			Paving Width (ft):				
2		Project ID:		Route/Road:			Lane Width (ft):				
3		WisDOT Mix Design ID:		Pavement Layer:			Nominal Thickness (in):				
4		Mix Classification:		Underlying Layer:			Contract Unit Price:				
5											
6											
7											
8		Nuclear Gauge Density									
9							Total Nuc Density Tonnage:		0.00		
10							Total Unacceptable Tonnage:		0.00		
11							Total Nuc Density Length:		0.0		
12							Average Pay Factor (PF _D):		0.00		
13							460.2005 Incentive Density PWL HMA Pavement:	\$	-		
14							804.2010 Disincentive Density PWL HMA Pavement:	\$	-		
15							Density NET Pay Adjustment:	\$	-		
16											
17		Core Density									
18							Total Core Density Tonnage:		0.00		
19							Total Unacceptable Tonnage:		0.00		
20							Total Core Density Length:		0.0		
21							Average Pay Factor (PF _D):		0.00		
22							460.2005 Incentive Density PWL HMA Pavement:	\$	-		
23							804.2010 Disincentive Density PWL HMA Pavement:	\$	-		
24							Density NET Pay Adjustment:	\$	-		
25											
26		Longitudinal Joint Density									
27							Total Joint Length (LF):		0.0		
28							Total Remedial Action (LF):		0.0		
29							460.2007 Incentive Density HMA Pavement Longitudinal Joints:	\$	-		
30							804.2012 Disincentive Density HMA Pavement Longitudinal Joints:	\$	-		
31							Remedial Action Pay Adjust:	\$	-		
32							LJ Density NET Pay Adjustment:	\$	-		
33											
34		Volumetrics									
35							Total Volumetrics Tonnage:		0.00		
36							Total Unacceptable Tonnage:		0.00		
37							Average Pay Factor (PF _{VA}):		0.00		
38							460.2010 Incentive Air Voids HMA Pavement:	\$	-		
39							804.2015 Disincentive Air Voids HMA Pavement:	\$	-		
40							804.5105 Disincentive HMA Binder Content:	\$	-		
41							804.4308 Nonconforming QMP HMA Mixture (VMA):	\$	-		
42							Volumetric NET Pay Adjustment:	\$	-		
43											
44		Administrative Items for Additional Testing									
45							804.5015 HMA Regional Lab Testing:	\$	-		
46							800.0010 Referee Testing:	\$	-		
47											
48		Combined PWL Pay Adjustment									
49							TOTAL Combined Incentive:	\$	-		
50							TOTAL Combined Disincentive:	\$	-		
51							Combined NET Pay Adjustment:	\$	-		
52											

Figure 45: Total Pay Adjustment Summary Example.

Notes:

- If the Total Nuc Density Length or Total Core Density Length are divisible by 1,500, the length of a typical full-length subplot, with no remainder, then there is a chance that one or more sublots may be the incorrect length due to only using a typical subplot size for the subplot size. Double check the subplot lengths such that they are actual length. The worksheet will identify when this may have happened in red text next to the suspect length. However, it is possible that the project ended with a whole increment of 1,500 feet.
- If the Total Joint Length is divisible by 500, or one-third ($1/3$) the length of a typical subplot, with no remainder, then there is a chance that one or more sublots may be the incorrect length due to only using a typical subplot size for the subplot size. Double check the subplot lengths such that they are actual length. The worksheet will identify when this may have happened in red text next to the suspect length. However, it is possible that the project ended with a whole increment of 500 feet.
- If the Total Volumetric Tonnage is divisible by 750, the typical size of a subplot, with no remainder, then the final subplot likely used a full subplot size rather than the actual produced tonnage. The worksheet will identify when this may have happened in red text next to the Total Volumetric Tonnage fields. However, it is possible that the project ended with a whole increment of 750 tons.

18. Volumetric Charts

This worksheet displays volumetric test results for Air Voids, Gmm, Gmb, Asphalt Content, VMA, and calculated Gse on charts (Figure 46). Charts are labeled with QC, QV, BTS, Regional Test results, and BTS Referee Tests for Contractor Disputes as applicable, along with applicable action, specification, and acceptance limits. This worksheet is useful for visualizing the data's variability and results in relation to their limits as well as between testing parties.

No information is to be entered into this worksheet.

Results shown on the charts follow the following style guidelines:

- QC results are shown with solid yellow lines and markers.
- QV results are shown with solid dark blue lines and markers.
- BTS Referee results are shown with solid maroon markers.
- Regional Lab results (remaining four (4) sublots) are shown with hollow green markers and dashed green lines.
- BTS Referee for Contractor Dispute results are shown with solid light blue markers and lines.
- JMFs are shown with dashed black lines.
- Specification Limits are shown with dashed orange lines.
- Action Limits are shown with solid green lines.
- Acceptance Limits are shown with solid red lines.
- Calculated QC, QV, and BTS calculated values use their respective colors described above, except they use hollow markers and dashed lines.

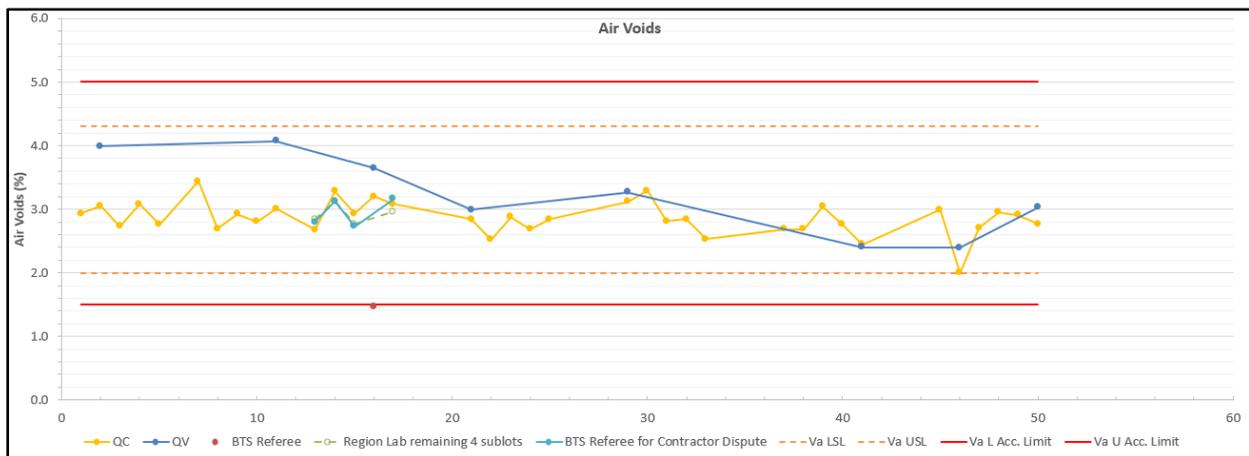


Figure 46: Example of an Air Voids Volumetric Chart.

Notes:

- Occasionally, due to the way Excel determines the upper and lower bounds of the y-axis, the Asphalt Content and VMA charts may not properly scale the y-axis making it difficult to see the data. If this happens, click the button labeled "Fix Y-Axes", located next to the Asphalt Content and VMA charts to force rescale the charts (Figure 47).

- This forces a manual determination of the upper and lower bounds for every chart on this sheet, not just VMA and Asphalt Contents charts. If new data is added after the “Fix Y-Axes” button is clicked that is outside of the manually set ranges the new data will not show on the chart. In this case you may again click “Fix Y-Axes” and new bounds will be determined based on the dataset.
- Clicking “Reset Y-Axes” will return all charts back to automatic calculation of the y-axes.

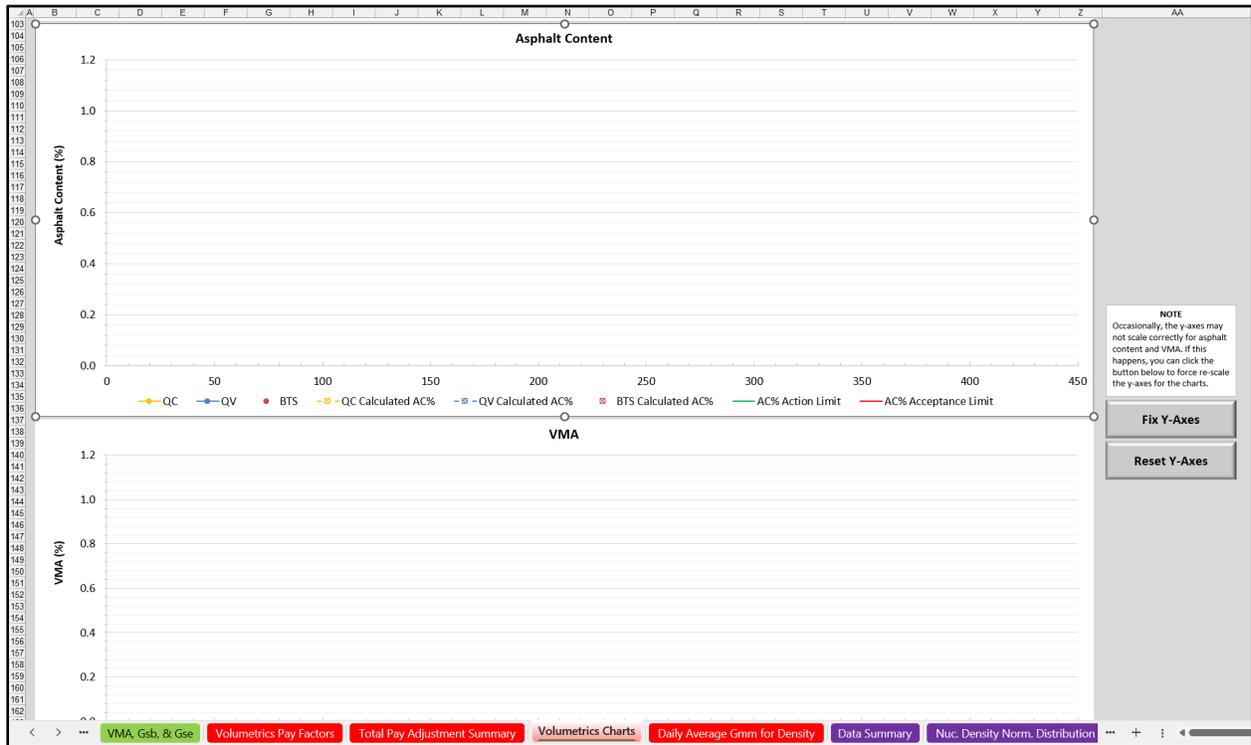


Figure 47: Location of “Fix Y-Axes” and “Reset Y-Axes” buttons.

19. Daily Average Gmm for Density

This worksheet is used to determine the Daily Average Gmm for Density according to WisDOT's Manual of Test Procedures WTM T355 section 10.1.1 (Figure 48). These average Gmm values are used to determine the Gmm that is to be used for final adjustment of field density results prior to entering the density results in either the *Nuc Density F&t* or *LJ Nuc Density F&t* worksheets.

Notes:

- The Gmm values in this table are used to adjust field density results in V2.2 or newer of the HMA Field Density worksheet.
- The values in this table are automatically calculated and account for any dispute resolution testing.
- This table will only show a Gmm for dates where the Gmms were tested. If there is a day of small tonnage paving and no Gmm values were taken that day, you will need to use the previous day's Daily Average Gmm for Density. Refer to WisDOT's Manual of Test Procedures for additional guidance on selection of the Daily Average Gmm.

	A	B	C	D
1		INSTRUCTIONS		
2		This table provides the Daily Average Gmm to be entered in the HMA Field Density Worksheet (V2.2+) to adjust the density results for final acceptance and pay adjustment. The adjusted density results should then be entered into the Nuc Density F&t and LJ Nuc Density F&t worksheets.		
3				
4				
5		Date	Daily Average Gmm	
6		5/30/2024	2.494	
7		5/31/2024	2.496	
8		6/4/2024	2.500	
9		6/6/2024	2.494	
10		6/7/2024	2.495	
11		6/10/2024	2.499	
12		6/12/2024	2.487	
13		6/13/2024	2.499	
14		6/14/2024	2.499	
15		6/17/2024	2.494	
16		6/18/2024	2.497	
17		6/19/2024	2.501	
18		6/24/2024	2.501	
19		6/25/2024	2.505	
20		6/26/2024	2.505	

Figure 48: Daily Average Gmm for Density Example.

20. Appendix

20.1 F&t Testing

The spreadsheet adheres to the specifications for determining whether QC and QV data compare by conducting paired F- and t-tests on rolling windows of lots.

Notes:

- Density testing uses a three (3) lot rolling window (Figure 49).
- Volumetrics testing begins with a three (3) lot window that grows with each lot after the 3rd lot into a rolling five (5) lot window (Figure 50).

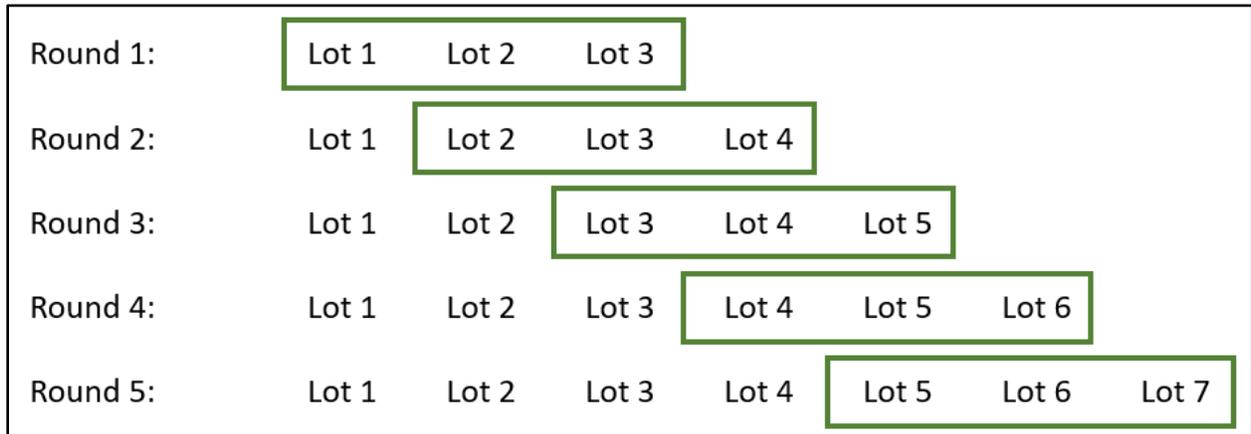


Figure 49: F&t Rolling Window - Density

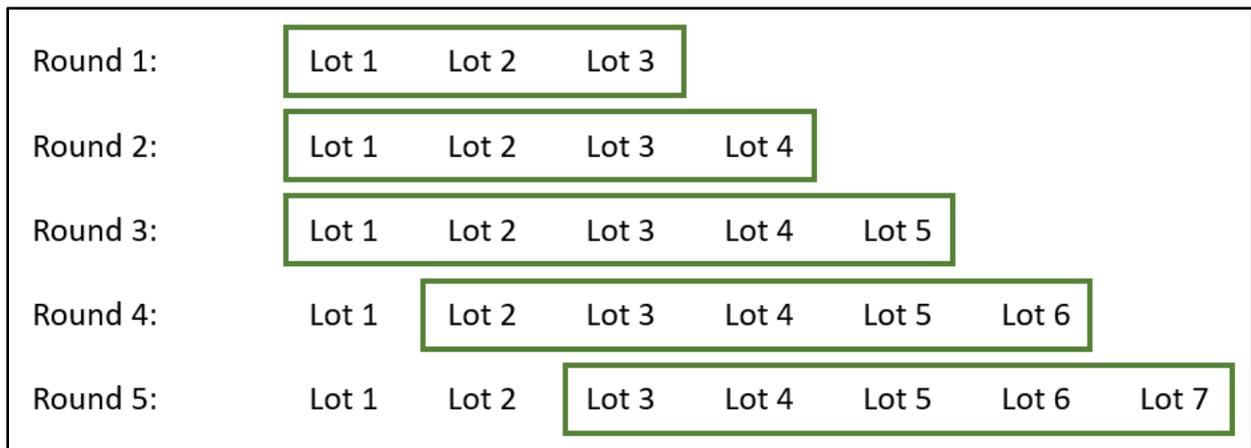


Figure 50: F&t Rolling Window – Volumetrics

These rolling windows for both density and volumetrics were selected such that the power of the tests is reasonable as shown in Figure 51 and Figure 52.

Power of the *F*-test ($1-\beta$)

Ratio of Standard Deviations	Number of Contractor Tests	Number of Agency Tests	Probability of Detecting a Difference
2	3	3	0.10
	5	5	0.21
	20	5	0.49
	⋮	⋮	⋮
	40	10	0.77
	50	15	0.90

40

Figure 51: Power of the F-Test.

Power of the (paired) *t*-test ($1-\beta$)

Difference in Means	Number of Contractor Tests	Number of Agency Tests	Probability of Detecting a Difference
2	2	2	0.17
	3	3	0.47
	4	4	0.73
	⋮	⋮	⋮
	7	7	0.98
	10	10	1.00

41

Figure 52: Power of the t-Test.

F- and t-tests use an alpha value of 0.025. The alpha value determines the likelihood of a “false flag” or a failed comparison due to factors other than an actual difference in the population (or material source). Using an alpha value of 0.025, the F-test or t-test will fail 1 in 40 times (or

about 2.5% of the time) when the two datasets are actually from the same population. F- and t-tests “pass” or compare when the p-value from either test is greater than alpha. The alpha value of 0.025 was determined to be the optimal value for alpha by FHWA.

20.2 Volumetric Dispute Resolution Flowchart

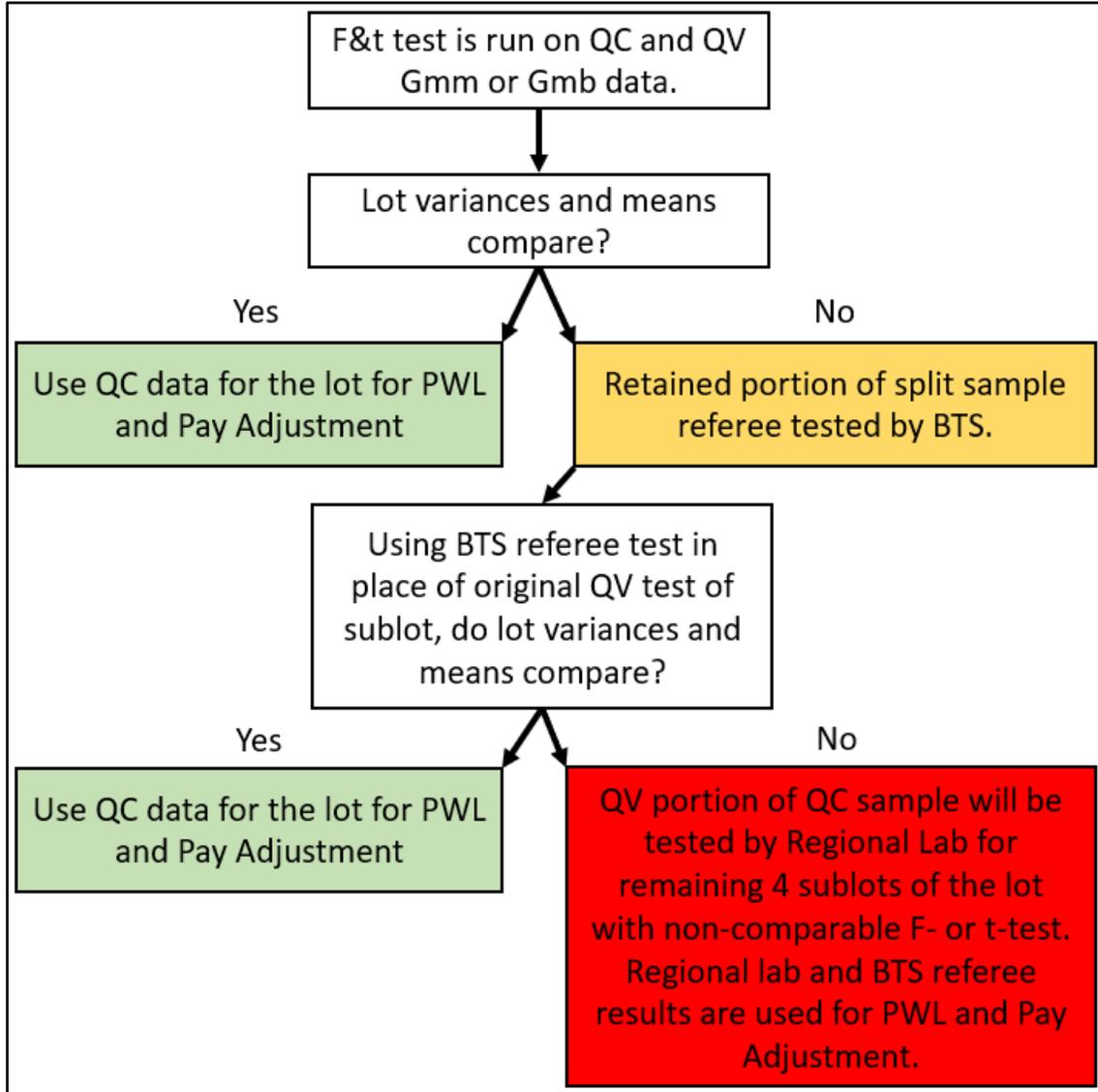


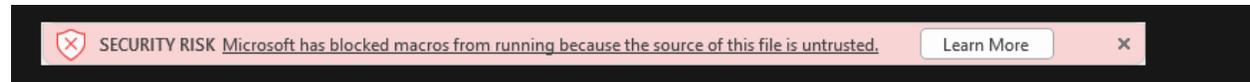
Figure 53: Volumetric Dispute Resolution Flowchart

Notes:

- If the contractor chooses to dispute the Regional Lab and BTS test results, the retained portion of each subplot will be referee tested by BTS and the results used for PWL and pay adjustment.
 - If the pay factor increases, there is no fee for the additional testing.
 - If the pay factor decreases, there is a fee for the additional testing.
 - The spreadsheet will automatically determine if a fee will be assessed.

20.3 Enabling Macros (Red Banner)

As of February 23, 2023, Microsoft has blocked macros by default from spreadsheets downloaded from the internet (i.e.: Pantry) to provide additional protection from malicious macros. When this occurs, you will see an error like this at the top of the spreadsheet:

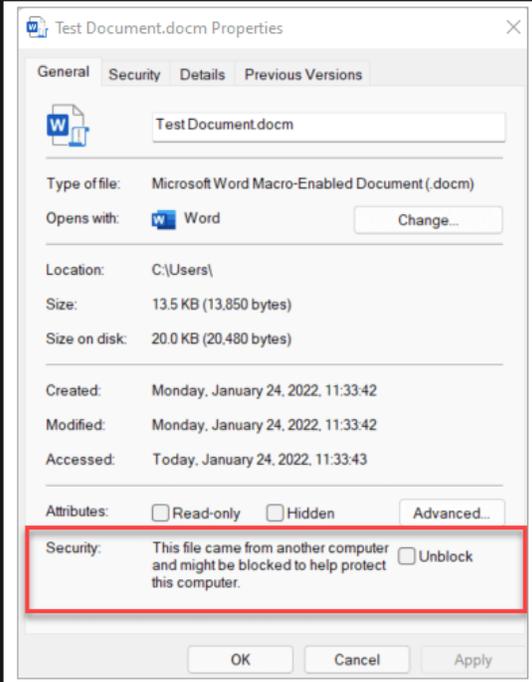


When this error is presented, you will be unable to enable macros using old methods where you could simply click the button in the banner to enable macros. Additional steps are required to enable the macros. Perform the following steps to enable macros:

Guidance on allowing VBA macros to run in files you trust

Remove Mark of the Web from a file

For an individual file, such as a file downloaded from an internet location or an email attachment the user has saved to their local device, the simplest way to unblock macros is to remove Mark of the Web. To remove, right-click on the file, choose **Properties**, and then select the **Unblock** checkbox on the **General** tab.



Additional information about this change can be found on Microsoft's website at: <https://learn.microsoft.com/en-us/deployoffice/security/internet-macros-blocked>

20.4 Rounding and Precision

The PWL Production Worksheet performs many calculations automatically. In all cases where values are calculated, such as Air Voids, VMA, Gse, etc., the values are rounded to the precision that they are specified to in the Standard Specifications. PWL specification limits are based on the JMF of the mixture. JMF specifications for mixes are currently found in Standard Specification 460.2 and with the AWP Standard Specification are found in section 705. The following precisions are used for the following parameters:

- Air Voids: 0.1
- VMA: 0.1
- Gse: 0.001

The Lot Means, Standard Deviations, PWL Values, and Pay Factors are NOT rounded and use the full precision through their subsequent calculations.

Additionally, while not rounded, the following values are shown in the worksheet with the following precision:

- Length: 0.1
- Width: 0.1
- Thickness: 0.01
- Tonnage: 0.01
- Means: Precision specified in the Standard Spec for the respective JMF parameter.
 - Example: Standard Spec 460.2.1(2) states that the JMF Air Void target during production is 3.0 percent. Therefore, the average is shown to this precision, 0.1 percent.
- Variances & Standard Deviations: One more decimal than the precision of the associated Mean.
 - Example: Air Voids are specified to 0.1 precision, so the variance and standard deviation precision is 0.01.
- PWL: 0.01
- Pay Factor (PF): 0.01

20.5 User Modes

The PWL Production worksheet can operate in 3 selectable User Modes:

- User Mode
 - The default operational mode.
 - This mode should be used most of the time.
 - Workbook integrity is locked.
 - Worksheet integrity is locked.
 - Hides all TSS and Administrator mode worksheets.
 - Access via hotkey: CTRL + W
 - No password required.
- TSS Mode
 - Elevated privilege mode.
 - Use to change worksheet pre-programmed behaviors such as pay adjustments.
 - Workbook integrity is locked.
 - Worksheet integrity is unlocked.
 - Reveals additional worksheets:
 - Data Summary
 - Nuc. Density Norm. Distribution
 - Air Voids Norm. Distribution
 - Va Pay Factor_Comparison
 - Access via hotkey: CTRL + Q
 - No password required.
- Administrator Mode
 - Highest privilege mode.
 - Only available to BTS.
 - Workbook integrity is unlocked.
 - Worksheet integrity is unlocked.
 - Reveals ALL hidden worksheets, including the TSS worksheets and the following Administrator Worksheets:
 - INTERNAL_SYS_MSGS
 - INTERNAL_SYS_VAR
 - County-Region Database
 - Data Density
 - Data Volumetrics
 - Distribution Graph Data
 - Access via hotkey: CTRL + G
 - Password Required.