

Quantity Calculations
Module 3

Quantity Calculations

- Specifications
- Post-Bid Quantity Calculations
- Production Quantity Calculations
 - Checking Yield
 - Tracking Quantities
- Check Weights

Specifications (2008)

00190.10(c) Area – Area will be square foot, square yard, or acre, unless otherwise specified in the Contract and will be determined by measuring the width and length (or height) at least to the nearest 0.1 foot and computed at least to the nearest 0.1 square foot, nearest 0.1 square yard or nearest 0.1 acre, as applicable, unless otherwise specified in the Contract.

Specifications (2008)

Measurement

00620.80 Measurement - The quantities of cold plane pavement removal will be measured on the area basis, in place.

When the depth of pavement to be removed is variable, the depth as shown is an estimate and is approximate only. No guarantee is made that the actual depth will be the same as the estimated depth.

Specifications (2008)

Payment

00620.90 Payment - The accepted quantities of work performed under this Section will be made at the Contract unit price, per square yard, for the item "Cold Plane Pavement Removal, _____ Deep".

The depth will be inserted in the blank. If the depth is variable, the depth range will be inserted in the blank.

Specifications (2008)

Payment (continued)

Payment will be payment in full for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

No separate or additional payment will be made for temporary wedges constructed, maintained, and removed under 00620.40(d), or for replacement of cutting teeth.

Specifications (2008)

00190.10(d) Weight - Weight will be determined on Contractor-provided scales as required under 00190.20 unless otherwise allowed by the Specifications. Weight will be measured at least to the nearest 0.01 ton unless otherwise specified in the Contract.

If bituminous materials, portland cement, lime, and similar bulk materials are shipped by truck or rail, the supplier's shipping invoice with net scale weights, or volumes converted to weights, may be used for Pay Item quantity determination in place of weights determined on the Contractor-provided vehicle scales.

NOTE: THIS A SUMMERIZATION SEE SPECS FOR COMPLETE LANGUAGE

Specifications (2008)

Measurement

00730.80 Measurement - The quantities of emulsified asphalt cement used as tack will be measured on the weight basis.

Payment

00730.90 Payment - The accepted quantities of emulsified asphalt cement used as tack coat will be paid for at the Contract unit price, per ton, for the item "Emulsified Asphalt for Tack Coat".

Payment will be payment in full for furnishing, mixing with water, and placing the materials, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

No separate or additional payment will be made for water added to dilute the emulsified asphalt used as tack coat.

Specifications (2008)

00745.80 Measurement - The quantities of HMAC will be measured on the weight basis, with separate measurement being made for the asphalt concrete mixture and the asphalt cement contained in the mixture. No deduction will be made for lime or any other additive used in the mixture.

When RAP materials are used, measurement of the total asphalt quantity will be based on quality control tests averaged to the nearest 0.01%.

Specifications

00745.90 General - The accepted quantities of HMAC incorporated into the project, whether or not recycled materials are used, will be paid for at the Contract price per ton for the following items:

Pay Item

- (a) Level (1,2,3,4), size, admix, HMAC, leveling and/or temporary
- (b) grade Asphalt in type HMAC

Post-Bid HMAC Quantity Calculations

00745.80 If an estimated bulk specific gravity for the aggregates is shown in the Special Provisions, determine the actual bulk specific gravity for the aggregates, recompute the quantities of HMAC to be used, and inform the Agency in writing. The quantities of HMAC will be adjusted accordingly with no adjustment in Contract unit prices. The provisions of 00140.20 and 00195.20 will apply.

Recalculate Quantities with Actual Aggregate Specific Gravity and Target Asphalt Content from JMF

Conversion of Interest
1 Mile = 5280 ft

Post-Bid HMAC Quantity Calculations

Why is this tonnage too high?

Post-Bid HMAC Quantity Calculations

Example Post-Bid Quantity Calculation

Post Bid Quantity Calculations

Length (miles) = 9.55 Width (ft) = 27.6
 Length (ft) = Length (miles) x 5280 ft/mile = 50424 ft
 Surface Area (sqft) = 27.6 ft x 50424 ft = 1,391,703 ft²
 1st Lift = 3 in = 0.25 ft
 Volume (cu ft) = 1,391,703 ft² x 0.25 ft = 347,926 ft³
 Other 3 Lifts = 2 in = 0.17 ft
 Volume (cu ft) = 1,391,703 ft² x 0.17 ft = 236,590 ft³

Estimated Quantities
 Gmm = 2.362 x 62.4 lb/cu ft = 147.4 lb/ft³
 1st Lift Min Compaction = 91%
 Mass1 = 347,926 ft³ x 147.4 lb/ft³ x $\frac{(91)}{100}$ x $\frac{1,000}{2,000}$ = 23,591 tons
 Other 3 Lifts Min Compaction = 92%
 Mass2-4 = 236,590 ft³ x 147.4 lb/ft³ x $\frac{(92)}{100}$ x $\frac{1,000}{2,000}$ = 48,649 tons

Total Estimated Mixture Quantity = 72240
 Plan Mixture Quantity = 77160
 Total Estimated Asphalt Quantity = 72,240 x $\frac{6.1}{100}$ = 4840 tons
 Plan Asphalt Quantity = 4409

Tracking Quantities and Yields During Production

- Weigh Memo Requirements
- Duties of Ticket Taker
 - Must be safe!!!!!!!!
 - Check quantities (yields) daily (minimum)
 - Periodically during the day if safe
 - Early in the day is best
 - Check weights

Yield Check

- Actual Gmm (MAMD from CDT)
- Actual Compaction (from CDT)
- Expected Average Yield =
 MAMD(lb/cu ft) x (%compaction/100) x
 Depth(ft) x Width(ft) x Length(ft) / 2000
 lb/ton

Example Yield Check

1st Base Lift

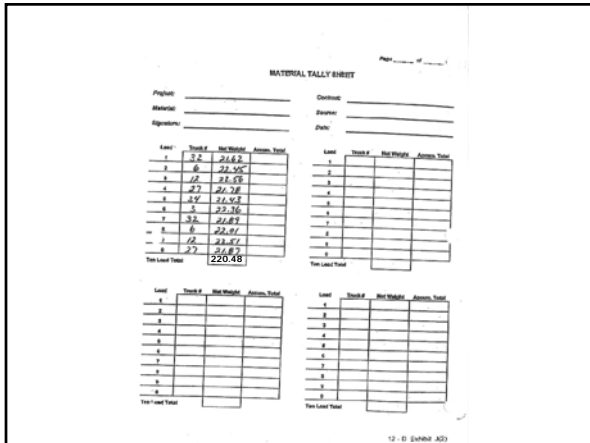
Complete attached material tally sheet for the first 10 load total for the first base lift.

Actual GMM = 2.351
 Actual MAMD = 2.351 x 62.4 lb/cu ft = 146.7 lb/ft³
 Actual % Compaction = 91.9 %
 Plan Lift Thickness = 3 in = .25 ft
 Paved Width = 13.8 ft
 Beginning Station for ten load total = 0 + 00
 Ending Station for ten load total = 9 + 00

Anticipated Yield for Length Paved =
 $900 \text{ ft} \times 13.8 \text{ ft} \times 0.25 \text{ ft} \times 146 \text{ lb/ft}^3 \times \frac{1.10 \text{ ton}}{2000 \text{ lb}} = 209.3 \text{ tons}$

Actual Quantity Placed = 220.48

Actions to be taken ????????



Check Weights (2008)

00190.20(f) Contractor-Provided Weigh Technician -
 The Contractor shall provide a technician to operate Contractor-provided vehicle weigh scales. The Agency will observe procedures and require check weighing in accordance with the following:

(1) Scale with Automatic Printer - If the scales have an automatic weigh memo printer that does not require manual entry of gross weight information, the Agency may periodically have a representative at the scales to observe the weighing procedures. In addition, the Engineer may periodically check the weight for a load of Materials by directing the haul vehicle to reweigh on a different scale that has been inspected and certified in accordance with 00190.20(b) and (d).

Check Weights

00190.20(f) If a different scale is not available within a 30 mile round trip from the regular haul route the Agency will allow check weighing on an approved alternate basis. Check weights within 0.4% of the Contractor-provided weight are acceptable. The Engineer will resolve discrepancies found by check weighing. Agency employee costs will be paid by the Agency. The Contractor shall pay all other costs resulting from the check weighings, including without limitation the use of other scales.

Check Weights (2008)

If more than 50 tons per day of all types of Materials are received from a scale, the Contractor shall make random check weighings at least every tenth day on which more than 50 tons is received or at each interval that 10,000 tons has been weighed, whichever occurs first, or as directed by the Engineer. The Contractor shall make at least one check weighing on projects where more than 2,000 tons of all types of Materials are received from a scale. The Contractor shall provide the Engineer with the results of the check weighing.

Construction Manual Requirements for Weigh Memos and Receipt of Material on the Project

Located in Chapter 12-D of the
Construction Manual

Check Weights

Perform check weighing as required, and at the frequency specified, in Section 00190.20(f). Record the results of the check weighing and the comparison in the scale diary, as indicated in the example below.

CHECK WEIGHING EXAMPLE		
	Project or Contractor Scale	Check Scale
Gross	35.84	35.94
Tare	<u>11.97</u>	<u>12.04</u>
Net	23.87	23.90

$$\frac{(23.87 - 23.90) \times 100}{23.87} = 0.1 \text{ percent difference}$$

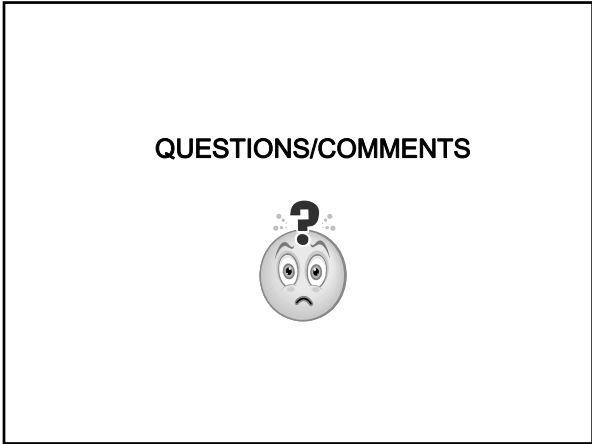
Check weighing is not necessary when an ODOT weigh witness observes or performs the weighing procedure.

Check Weight Example

- Contractor Scale Net Weight = 23.21
- Check Scale Net Weight = 23.45
- % Difference = $(23.21-23.45)/23.21 \times 100$
- % Difference = -1.0%

Check Weight Example

- Action To be taken??
- Per Construction Manual:
 - Immediately order the scale operation to be corrected and
 - Determine which weigh memos were impacted by the incorrect scale and resolve that information



Post Bid Quantity Calculations

Length(miles) = _____ Width(ft) = _____

Length(ft) = Length(miles) x 5280 ft/mile = _____

Surface Area(sqft) = _____

1st Lift = 3 in = 0.25 ft

Volume(cu ft) = _____

Other 3 Lifts = 2 in = 0.17 ft

Volume(cu ft) = _____

Estimated Quantities

Gmm = _____ x 62.4 lb/cu ft = _____

1st Lift Min Compaction = _____

Mass1 = _____

Other 3 Lifts Min Compaction = _____

Mass2-4 = _____

Total Estimated Mixture Quantity = _____

Plan Mixture Quantity = _____

Total Estimated Asphalt Quantity = _____

Plan Asphalt Quantity = _____