

## **CHAPTER 7**

### **MATERIALS REFERENCE SECTION**

Most of the field work for the QCCS is described in the MFTP, by way of test procedures and QA program specifications. However, an inexperienced person may not always know what to look for when reviewing the QC/QA technicians' worksheets. The following pages try to give you a step-by-step checking procedure to help you catch problem areas before the technician gets too far with bad information.

The following is for some of the areas related to Field Tested Materials. For Non-Field Tested Materials see the Construction Manual section (12-B-1). The QCCS will also want to make sure that they review the Special Provision for any non-standard acceptance requirements for Materials to be incorporated into the project and are included in the Test Summary.

Another resource for material related applications and processes is Appendix E located in the MFTP (Manual of Field Test Procedures). This area is sectioned according to test procedure and contains language that may be helpful in identifying if field tested related documentation is correct.

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**EXHIBIT F**  
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## SECTION 330 – EARTHWORK

### Things to look for:

What are the appropriate tests?

Is it the appropriate worksheet for the test being run, and was all data filled out completely?

Did deflection pass?

Check math.

Were both wet density readings within 32Kg/m<sup>3</sup>?

Check percent retained calculations.

If the material was deemed too rocky to test, did the gradation come from this specific location, when compared to the criteria in AASHTO T224, fit into the non-density testable category?

### One Point

- Was the appropriate T99 method used for the percent retained?
- How did the technician determine moisture content? T217 (Speedy) is only allowed for T99 Method A on a one point.
- Was the appropriate multiplier used to determine wet density (1.06 or 0.471)?
- Was the moisture and dry density calculated correctly?

Did the technician pick the appropriate curve?

- Is it within 32kg/m<sup>3</sup> (2pcf) and 2%?
- Does the curve make sense (the right soil type, is it a valid curve, etc.)?
- Was the appropriate information taken from the curve?

Was the un-manipulated in-place combined moisture within 1% of nuclear gauge reading?

- If not within 1% of gauge % moisture, was the dry density corrected correctly?

Were the optimum combined moisture and relative maximum dry density calculated correctly?

Does the test meet specification for moisture and density?

Does the whole test make sense?

Did the paperwork come in on time?

If the answer to any of these questions is “no,” then you have a problem. Knowing whether or not you have a technician problem or material problem is a function of experience. When you have problems like this don’t hesitate to get advice from a peer, i.e., other QCCSs, QACs, or others around you that have a level of expertise in materials you can draw from.

## **SECTION 331 – 332 SUBGRADE STABILIZATION AND SURFACING STABILIZATION**

Things to look for:

Which materials listed in the Materials subsection (0033\_.10) apply?

Have the required test reports been submitted (Product Compliance as well as Quality Control)?

Are submitted test reports current? Do they accurately represent the material delivered? Are they within the minimum testing frequencies according to the selected material?

See the appropriate guidelines for each material included in this chapter.

Was all of the unstable material excavated?

If gradation is specified as “reasonably” or “visually” well graded, is the project inspector or manager satisfied or do you need a sample?

Does the moisture content *look* right, wet enough to hold together but not running off, and is the material homogenous?

Was the backfill placed in specified lift thickness and compacted so that there is no reaction or yielding under compactor?

Was the proper equipment used for placement, water spray bar or nozzle, pugmill, rollers or tamper?

Does it make sense to make a separate Lot # for the HMAC or EAC? Was it measured appropriately? Did the contractor support the quality of the material with field tests or by Small Quantity acceptance guidelines?

## SECTION 540 – CONCRETE

Things to look for:

### **Concrete Yield and W/C Ratio Worksheet (Form 3573ws)**

Is the form filled out completely?

Was data from load ticket transcribed to this worksheet accurately?

Are all calculations correct?

Are results from field tests within specification and on target (see special provisions and mix design)?

Did cement content meet or exceed specifications (see special provisions)?

Is W/C ratio within specification and on target (see special provisions and mix design)?

Did the paperwork come in on time?

If the answer to any of these questions is “no,” then you have a problem. Knowing whether or not you have a technician or material problem is a function of experience. When you have problems like this don't hesitate to get advice from a peer. You can draw from other QCCSs, a QAC, or those around you that have a level of expertise in materials.

The following is a list of things to check if you have a problem above:

- Yield – Was there an over/under-yield (compare with batch targets)? An over-yield results from a low density, which can be caused by too much air and/or water and vice versa.
- Batching – Are the individual masses of each material batched within the tolerances listed in Section 540.46(b) of the 2002 Oregon Standard Specifications for Construction? Compare the actual masses batched with the design masses (remember to take the free moisture out of the actual masses batched prior to comparing with the design masses, of the aggregates).

## SECTION 641 – AGGREGATE BASE

Things to look for:

### **Aggregate Production**

Are all test forms filled out completely and are they the appropriate forms (1792)?

Are all appropriate tests (per section 4D of the MFTP) being run with the appropriate spec limits? Were failing results circled?

- Most all Aggregate Production tests are reported on one form (1792), so check to see that all of them are being done per the MFTP (for applicable tests, frequency, and procedure).

Are there any problems that would make the test invalid?

- Overloaded sieves?
- Out of spec sieve loss?
- Wrong sample size?

Were the calculations made correctly?

- Look for wrong initial dry mass used for % retained calculation.
- Look for values calculated without subtracting pan tare.
- For Fineness Modulus, make sure the appropriate sieves were used for the calculation. ....not the .075mm(#200).

### **Compaction**

Did deflection pass?

Is the form filled out completely and is it the appropriate form (1793 B)?

Are both wet density readings within 32Kg/m<sup>3</sup> (2pcf)?

Were the wet density and moisture readings averaged correctly?

Was the dry density calculated correctly?

Was percent moisture calculated correctly?

Was the correct curve used?

- Check source and size of material used.
- Was the correct information used from the curve (relative maximum dry density and optimum moisture)?

Was percent compaction calculated correctly?

Did each of the 5 shots meet the appropriate spec?

Did the paperwork come in on time?

If the answer to any of these questions is “no,” then you have a problem. Knowing whether or not you have a technician problem or material problem is a function of experience. When you have problems like this don’t hesitate to get advice from a peer, i.e., other QCCSs, QACs, or others around you that have a level of expertise in materials you can draw from.

## T-99/T-180 MOISTURE DENSITY RELATIONSHIP

### Things to look for:

What are the appropriate tests? Only Methods A and D are allowed on ODOT projects.

Is it the appropriate worksheet for the test being run, and was all data filled out completely?

Was the appropriate T99 method used for the percent retained?

How did the technician determine moisture content? T217 (Speedy) is only allowed for T99 Method A on a one point.

Was the appropriate multiplier used to determine wet density (1.06 or 0.471)?

Was the moisture and dry density calculated correctly?

Were there at least three points on the dry side of optimum?

Was the Optimum Moisture and Max Density correctly determined?

Does the material require a Coarse Particle Correction, AASHTO T224?

If so: Does the T85 information make sense? Are the calculations correct and made with the right information for Maximum Combined Dry Density and Optimum Combined Moisture?

If the answer to any of these questions is “no,” then you have a problem. Knowing whether or not you have a technician problem or material problem is a function of experience. When you have problems like this don't hesitate to get advice from a peer, i.e., other QCCSs, QACs, or others around you that have a level of expertise in materials you can draw from.

## **SECTION 745 SPECIFIC GRAVITY AND MAXIMUM DENSITY OF HMAC**

### Things to look for:

Are all test forms filled out completely and are they the appropriate form (2050)?

Was the mass of dry sample calculated correctly?

Was the sample the appropriate size?

Was the MSG calculated correctly?

Was the maximum density (MDT) calculated correctly?

Is the difference between MAMD and the new MDT more than  $20\text{kg/m}^3$ ? If so restart MDV testing

Did the paperwork come in on time?

If the answer to any of these questions is no then you have a problem. Knowing whether or not you have a technician or material problem is a function of experience. When you have problems like this don't hesitate to get advice from a peer, other QCCSs, QACs, or others around you that have a level of expertise in materials you can draw from.

## **SECTION 745 DAILY ASPHALT PLANT PRODUCTION**

Things to look for:

### **Tank Stick**

Are all test forms filled out completely and are they the appropriate form (2401)?

Is the “material type” box filled in “HMAC” or “EAC?”

### **Aggregate Belt**

Are the meter readings given in dry mass? If so were they accurately corrected to wet mass?

Is the average cold feed moisture the average from the day’s sublots?

Was the weight of dry aggregate calculated correctly?

### **Rap Belt (if used)**

Are the meter readings given in dry mass? If so were they accurately corrected to wet mass?

Is the average RAP moisture the average from the day’s sublots?

Was the weight of dry RAP calculated correctly?

Is the method for asphalt meter correction factor shown?

Is the math for total asphalt correct?

Is the math for total antistriper correct?

Does the mix waste make sense and is it explained in the remarks box? If it is out of the ordinary get an explanation.

Is the mix total calculation correct?

Is the average mix moisture the average from the day’s sublots?

Was the total weight of dry materials calculated correctly?

Is the tank stick information the same as the information on the form 2043 report?

Are the calculations for boxes U, V, W, X, and Y done correctly?

Is the value in box X within  $\pm 1\%$ ? If not refer to ODOT TM 321 section 3.7 or 4.6.

Is the value in box Y within  $\pm 0.20\%$ ? If not refer to ODOT TM 321 section 3.7.

Did the paperwork come in on time?

If the answer to any of these questions is no then you have a problem. Knowing whether or not you have a technician or material problem is a function of experience. When you have problems like this don't hesitate to get advice from a peer. Other QCCSs, QAC, or others around you that have a level of expertise in materials you can draw from.

## SECTION 745 DAILY ASPHALT CEMENT REPORT

### Things to look for:

Are all test forms filled out completely and are they the appropriate form (2043)?

Does the number on line 1 match the number on line 8 from the previous report?

Were deliveries prior to beginning tank stick recorded and added correctly?

### Tank sticks

- Was the correct tank chart used for each tank recorded?
- Was the correct temperature correction factor taken from the chart?
- If more than one, were the tanks correctly summed for lines 5 and 8?

Were deliveries made during production recorded and added correctly?

Is there an explanation for any deductions made in the explanation box?

Was the total asphalt used (line 9) added correctly?

Check previous data and math for Asphalt Cement Summary.

Check previous data and math for Asphalt Mixture Summary.

Did the paperwork come in on time?

If the answer to any of these questions is no then you have a problem. Knowing weather or not you have a technician or material problem is a function of experience. When you have problems like this don't hesitate to get advice from a peer. Other QCCSs, QAC, or others around you that have a level of expertise in materials you can draw from.

## SECTION 745 HMAC VOIDS WORKSHEET

### Things to look for:

Are all test forms filled out completely and are they the appropriate form (2050GV)?

Is the heading data from the JMF complete and accurate?

Are the specimen heights within acceptable limits (110mm-120mm)?

Were the specimens compacted with the appropriate number of gyrations?

Was the Gmb calculated and averaged correctly?

Was the Gmm calculated correctly?

- Was the mass of dry sample calculated correctly?
- Was the sample the appropriate size?
- Was the maximum density (MDT) calculated correctly (form 2050)?
- Is the difference between MAMD and the new MDT more than 20kg/m<sup>3</sup>? If so restart MDV testing.

Were the voids, VMA, VFA and running averages calculated correctly?

Did the paperwork come in on time?

If the answer to any of these questions is no then you have a problem. Knowing whether or not you have a technician or material problem is a function of experience. When you have problems like this don't hesitate to get advice from a peer. Other QCCSs, QAC, or others around you that have a level of expertise in materials you can draw from.

## **SECTION 745 HMAC COMPACTION**

### Things to look for:

Are all test forms filled out completely and are they the appropriate form (1793-A)?

Are all of the listed rollers the appropriate size and type for the application?

Is the difference between the two density shots within the allowable (Max 40 kg/m<sup>3</sup>)?

Were the densities averaged correctly?

If a core correlation was used was it the correct correlation for that density gauge, JMF, lift, aggregate source, and asphalt cement supplier?

Is the MAMD correct for each test (sublots may include shots from different days that have different MAMDs)?

Was the % compaction for individual tests calculated correctly?

Was the average density calculated correctly and reported to the nearest 0.1%?

Did the paperwork come in on time?

If the answer to any of these questions is no then you have a problem. Knowing whether or not you have a technician or material problem is a function of experience. When you have problems like this don't hesitate to get advice from a peer. Other QCCSs, QAC, or others around you that have a level of expertise in materials you can draw from.

## **SECTION 745 PAVEMENT SMOOTHNESS**

### Basic inspection and trouble-shooting for the Profilometer:

First on your agenda should be to insure that the inspector and contractor have used the straightedge while the mixture is hot enough to work and get all “out of spec” bumps and dips taken care of.

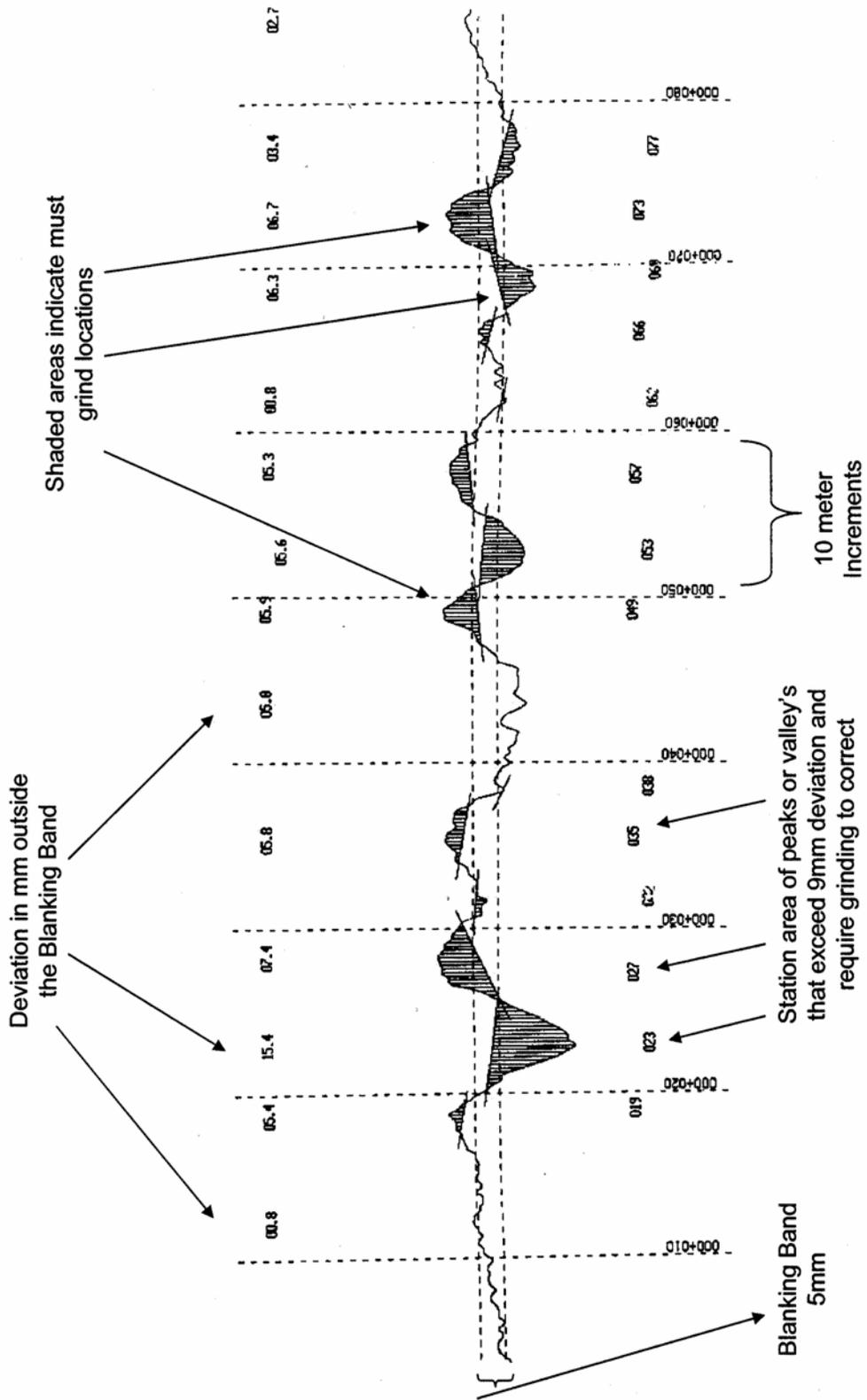
Profilometer – Discuss with the operator the operation and calibration checks prior to your project.

Witness the Calibration that is outlined in ODOT TM 770 (MFTP). When running the 200 m test section use a fog line with the drive wheel on the line to insure the repeatability of the two runs. Measure the segment with a chain to insure an accurate distance to compare the readout of the Profilometer.

It’s not a bad idea to have the operator demonstrate the blanking band to insure the blanking band is working properly. Some times the black band on the edge of the trace identifying excluded areas hasn’t shown up.

Remind the contractor that the trace needs to be continuous throughout the particular lane for the contract length.

See next sheet for an example of the trace.



Example Profile Trace

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