Kentucky Method 64-312-08
Revised 02/22/08
Supersedes KM 64-312-04
Dated 06/10/04

CALIBRATION OF CONTINUOUS - TYPE MIXERS (CONCRETE MOBILES)

1. SCOPE: This method covers the calibration of continuous type mixers (concrete mobiles) used in producing latex concrete and low slump concrete for bridge deck overlays and Class A or B concrete. It also includes a procedure for checking and adjusting the yield of the actual concrete mix. (ASTM C 685 may be used instead of this method)

2. APPARATUS:

   2.1. Basic Apparatus

      2.1.1. Operating manual for truck being calibrated.

      2.1.2. Accurate stop watch - readable to 0.1 seconds.

      2.1.3. Accurate scales (platform or hanger type) readable to ½ lb.) with a minimum capacity of 200 lbs.

      2.1.4. One clean 20 gallon container.

   2.2. Additional Apparatus for low slump Concrete only: Thirty-two fluid ounce measuring cup.

   2.3. Additional Apparatus for Latex Concrete Only: Another clean 20 gallon container.

   2.4. Quick Yield Apparatus: A strong rigid box that will hold exactly ¼ cubic yard 36" x 36" x 9".

3. PRE-CALIBRATION INSPECTION: (To be performed by the concrete mobile operator in the presence of the inspector)

   3.1. Both aggregate bins should be empty and thoroughly cleaned.

   3.2. The main conveyor belt should be thoroughly cleaned, including the chain.

   3.3. Make sure that all bin vibrators are functioning properly. Check by "feel" of hand against the side of the bin to the vibrator.

   3.4. The cement meter-feeder wheel should be thoroughly cleaned.

   3.5. Check spring tines to make sure they are properly tensioned on cement meter-feeder.

3.6. Be certain that all "fingers" on cross-auger in cement bin are in place and straight.

3.7. Make sure the cement bin aeration system is functioning properly. The control valve should be depressed for about 10 seconds to fluff the cement in the bin prior to the calibration and prior to concrete production at the jobsite.

3.8. Make sure that the connections at both ends of the drive cable connecting the meter register and the cement feeder shaft are tight and that the cable is free of kinks.

3.9. Make sure that the concrete mobile is properly grounded. A build up of static electricity may prevent normal flow of the cement.

3.10. Make sure that the cement bin breather hole is open to free atmospheric pressure.

3.11. Put at least 36 bags (3384 lbs) of cement in the cement bin.

4. CEMENT CALIBRATION:

4.1. For units having a tachometer, the throttle shall be set to hold the specified tachometer reading (± 50 rpm under load). The correct tachometer reading is specified on the title page of the operating manual for each concrete mobile.

4.2. Set the cement meter register so it reads zero.

4.3. Obtain a tare weight or balance off the weight of a dry, clean container and place it under the swivel ring so that it will catch all of the cement discharge.

4.4. Engage the main clutch to make the concrete-mobile operative and precisely at the same time, start the stopwatch.

NOTE: The cement meter count for this check shall be whatever is required to discharge approximately 94 lbs. of cement.

4.5. Watch the cement meter register and when it registers the predetermined count, immediately disengage the main clutch and stop the watch simultaneously. Weigh the container and record the net weight of cement, the elapsed time, and the meter count on form TD 64-317.

4.6. Repeat steps 4.2, 4.3, 4.4 and 4.5 at least four additional times.

4.7. Based on the five "runs" calculate the "cement meter count" and "discharge time" for 94 lbs. (1 bag) of cement.

EXAMPLE:

Summation of lbs. = 93 + 94 + 94 + 95 + 94 = 470 lbs.
Summation of Meter Counts = 67 + 69 + 68 + 69 + 68 = 341 counts
Summation of Seconds = 28.2 + 28.2 + 28.1 + 28.2 + -28.3 = 141.0

$$Lbs/count = \frac{Total\ Lbs}{Total\ Count} = \frac{470}{341} = 1.38 lbs/count$$

$$Lbs/\sec ond = \frac{Total\ Lbs}{Total\ Seconds} = \frac{470}{141.0} = 3.33 lbs/\sec ond$$

$$Cement\ Meter\ Count\ for\ 94\ lbs.\ of\ Cement = \frac{94\ lbs./count}{1.38\ lbs./count} = 68.0\ counts$$

$$Discharge\ Time\ for\ 94\ lbs.\ cement = \frac{94\ lbs.}{3.33\ lbs./\sec.} = 28.2\ \sec s.$$

5. SAND CALIBRATION:

5.1. Add at least one or two tons (be sure the bottom of the bin is covered) of sand which is to be used on the project. The stone bin must be empty while calibrating the sand gate.

5.2. Be sure the concrete mobile is operating at the specified operating speed (check the tachometer). Be sure the sand bin vibrators are operational.

5.3. Obtain the tare weight (or balance off the weight on the scale) of the container which is to be used to catch the sand.

5.4. Select some gate setting for a starting point. The sand discharge shall be checked at gate openings that will deliver, 1) an amount less than the computed damp weight per bag, 2) an amount approximately equal to the computed damp weight per bag, 3) an amount greater than the computer damp weight per bag. This will require checking the sand discharge at a minimum of three gate opening and possibly more.

NOTE: Approximately damp weights of sand per bag of cement for the various concrete mixes are as follows:

Latex Concrete Overlay Mix - 230 $\pm$ 15 lbs.).
Low Slump Concrete Overlay Mix – 160 ± 5 lbs.
Class A Concrete Mix - 210 ± 10 lbs.
Class B Concrete Mix - 300 ± 10 lbs.

5.5. Charge the belt with sand by allowing at least five linear feet of the loaded belt to discharge

on the ground.

5.6. Position the container under the discharge so that it will catch all of the material. Engage the main conveyor control and allow to operate for exactly one-half of the discharge time determined in step 4.7 (1/2 of 28.2 seconds = 14.1 seconds for this example). Weigh the container and record the net weight of sand. Repeat the process again and record the net weight of sand. The weights of sand for the two trials should be within 5 lbs. of each other; if not, continue the procedure until two consecutive trials are within 5 lbs. The sum of the two acceptable consecutive trials is recorded on the form TD 64-317 along with that particular gate setting.

5.7. Based on the results obtained in step 5.6 select at least two additional gate settings to fulfill the requirements set forth in step 5.4.

EXAMPLE: Assume that you are calibrating for a low slump concrete overlay mix and that a gate setting of 3.0 discharged 79 and 77 lbs. during the two discharge times of 14.1 seconds. This results in a total of 156 lbs. which will probably be reasonably close to the actual damp weights per bag for this mix. Now the objective is to select a gate setting that will discharge about 20 to 40 lbs. more than the actual damp weights (try 3.3) and a gate setting that will discharge about to 40 lbs. less than the actual damp weights (try 2.7).

5.8. Accurately plot on a sheet of graph paper the gate settings versus the lbs. of sand discharged. Determine from the plot the gate setting which will supply the computed damp weight of sand and adjust the pointer on the sand gate accordingly. (See example # 1).

6. STONE CALIBRATION:

6.1. Add at least one or two tons (be sure the bottom of the bin is covered) of stone which is to be used on the project. The sand bin must be empty while calibrating the stone gate.

6.2. Follow the same procedure as for calibrating the sand discharge.

NOTE: Approximate damp weights of stone per bag for the various concrete mixes are as follows:
Latex Concrete Overlay Mix 180 ± 15 lbs.
Low Slump Concrete Overlay Mix – 160 ± 5 lbs.
Class A Concrete Mix - 300 ± 10 lbs.
Class B Concrete Mix – 390 ± 10 lbs.

7. WATER CALIBRATION:

7.1. Calibration of the flow meter or control valve:

7.1.1. It is possible to perform this test on mechanical units by opening the quick-acting water valve, and the cement and aggregate bins can remain loaded. On hydraulic units the aggregate bins must be empty.

7.1.2. Obtain the tare weight of the container.

7.1.3. Concrete mobile units are equipped with either a water flow meter graduated to indicate gallons per minute or a water control valve. Preset the water flow meter or the water control valve at some setting as a starting point.

7.1.4. Position the container so that it will catch all of the water discharge.

7.1.5. Open the quick-acting valve (mechanical units) manually and start the stopwatch at the same time. On hydraulic units engage the main conveyor and start the stopwatch at the same time. Observe the stopwatch and close the water valve or disengage the main conveyor when the discharge time as determined in step 4.7 has elapsed.

7.1.6. Weigh the container and record the net weight of water and the setting on for TD64-317.

7.1.7. Repeat steps 7.1.4, 7.1.5, and 7.1.6 at enough additional settings to include a discharge range of from 10 to 35 lbs. of water in the running time as determined in step 4.7.

7.1.8. Plot the weight of water discharged against the various settings on a sheet of graph paper.

7.2. Calibration of the Cumulative Water Meter:

7.2.1. Reset the cumulative water meter on zero and discharge 4 to 5 gallons into a container.

7.2.2. Determine the net weight of water and compare with the cumulative meter reading. The cumulative meter is required to be accurate within ± 1%.

8. LATEX CALIBRATION:

8.1. Calibration of the Latex Control Valve:

8.1.1. Assume that the latex weighs 8.4 lbs. per gallon unless the manufacturer's certification indicates the weight to be something greater.

8.1.2. Remove and clean the filter screen in the line between the latex tank and the pump.

8.1.3. Make sure the latex tank is vented before starting the pump. Then let the pump run for two minutes before calibrating.

8.1.4. Determine the control valve setting to discharge 3.5 gallons of latex during the discharge time determined in step 4.7 (8.4 x 3.5 = 29.4 lbs.) continue until two

consecutive trials discharge 29.5 lbs. ± 5 lbs.

8.2. Calibration of the Cumulative Latex Meter:

8.2.1. Reset the cumulative latex meter to zero and discharge 4 to 5 gallons into a container.

8.2.2. Determine the net weight of latex and compare with the cumulative meter reading. The cumulative meter is required to be accurate within ± 1%.

9. TYPE A OR D AND AIR ENTRAINING ADMIXTURE DISPENSER CALIBRATION:

9.1. Concrete mobiles are usually equipped with a Hi-Flo dispenser for dispensing Type A or D admixtures and a Low-Flo dispenser for dispensing air entraining admixtures.

9.2. It is necessary to dilute both admixtures. Usually both admixtures are diluted by mixing 5 parts of water to 1 part of admixture; however; some contractors prefer to dilute the air entraining admixture at the rate of 3 parts of water to 1 part of admixture. The dilution and mixing shall be done before the solution is put into the tanks.

9.3. The process of diluting admixtures should be observed by the inspector. The dispensing system should be clean and free of admixture solutions from other job prior to adding anew admixture solution to the tanks.

9.4. Select various settings on the Hi-Flo dispenser that will include a discharge range of from 2 to 5 fluid ounces of actual undiluted Type A or D admixture in the discharge time determined in step 4.7. Select various settings on the Low-Flo dispenser that will include a discharge range of from 0.5 to 3 fluid ounces of the actual undiluted air entraining admixture in the discharge time determined in step 4.7.

9.5. Select a setting to start with (read the top of the float) and position the measuring cup to catch the discharge. Activate the dispenser and start the stopwatch simultaneously and allow to run until the time as determined in step 4.7 has elapsed.

9.6. Continue this process at various settings to include the ranges listed in step 9.4. Record the dispenser settings and amount discharged on form TD 64-317. Plot the amount discharged against the dispenser setting on a sheet of graph paper and use the graph to select the setting needed to supply the amount desired. (See example # 3).

EXAMPLE: Assume that you are calibrating the air entraining dispenser using a dilution ratio of 3 parts of water to one part of air entraining admixture. Since the desired range of actual admixture discharge is from 5 to 3 fluid ounces, the range of total solution discharge would be from 2 to 12 fluid ounces ((3 x (.5)) + (1 x (.5)) = 2 fluid ounces and (3 x 3) + (1 x 3) =12 fluid ounces. An initial setting of .3 showed a discharge of 2 1/2 fluid ounces, next a setting of .7 discharged 6 fluid ounces, next a setting of 1.0 discharged 8 fluid ounces, and finally a setting of 1.5 discharged 12 fluid ounces. The dispenser settings are plotted on

graph paper against the total solution discharged for each setting.

10. YIELD CHECK AND MIX ADJUSTMENT: Quick Yield Procedure:

10.1. The initial yield check should be made with the proportioning controls set as determined during the calibration procedure. Also the slump and air content should be within the specification limits prior to performing the yield test.

10.2. Determine the cement meter count to produce 1/4 of a cubic yard of concrete. Do this by dividing the cement factor by 4 and multiply this figure times the meter count for one bag of cement.

EXAMPLE: Using the cement meter count of 68 as determined in the example in step 4.7, cement meter count for 1/4 cubic yard for the various mixes would be as follows:

$$Latex\ Overlay\ Concrete\ Mix = \frac{9.2\ BAGS}{4}\ X\ 68 = 156$$

$$Low\ SlumpOverlay = \frac{11.44\ BAGS}{4}\ X\ 68 = 194$$

$$Class\ A\ Concrete = \frac{7.85\ bags}{4}\ x\ 68 = 133$$

$$Class\ B\ Concrete = \frac{6.28\ bag}{4}\ x\ 68 = 107$$

10.3. Stop the main conveyor belt but allow the mix conveyor (auger) to run until empty and then clean the chute.

10.4. Take a reading on the cement meter register.

10.5. Engage the main conveyor and the mix conveyor simultaneously. Allow the main conveyor to run until the cement meter register has advanced by the number of counts required (see example in step 10.1.2) to discharge 1/4 cubic yard of concrete and then shut it off quickly. Again, allow the mix conveyor (auger) to run until empty and clean chute. The mix should be consolidated as the box is filling with a shovel or other satisfactory tool, especially in the corners.

10.6. If the yield is not such to fill the box within plus or minus one quarter inch of level full, the sand and stone dial openings shall be adjusted by an amount deemed necessary to produce the correct yield. Another yield determination should be made shortly after making adjustments in the aggregate dial openings.

10.7. If the yield is such to not fill the box within plus or minus one inch level full, the operation should be stopped until some determination can be made as to the reason for the discrepancy.

APPROVED _____

DIRECTOR
DIVISION OF MATERIALS

DATE 02/22/08

Attachment

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km31208.doc

KENTUCKY TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS
DIVISION OF MATERIALS

TC 64-317
Rev. 12/86

CONCRETE MOBILE CALIBRATION DATA SHEET

COUNTY _____ Project No. _____

CONTRACTOR _____ Date _____

TRUCK NO. _____ SERIAL NO. & CAPACITY _____

TRUCK R.P.M. _____ CALIBRATED BY _____

CEMENT

	Container Wt. _____		
	LBS.	COUNT	SECS.
1			
2			
3			
4			
5			
TOTALS			

Lbs./count = $\frac{\text{Total Lbs.}}{\text{Total Counts}}$ = _____ = _____

Lbs./sec. = $\frac{\text{Total Lbs.}}{\text{Total Secs.}}$ = _____ = _____

Counts for 94 Lbs. = $\frac{94}{\text{Lbs./Count}}$ = 94 = _____

Sec. for 94 Lbs. = $\frac{94}{\text{Lbs./Sec.}}$ = 94 = _____

SAND Sec. for Calibration _____ Container Wt. _____ Moisture Content _____

Dial Setting								
Lbs. of Sand								

STONE Sec. for Calibration _____ Container Wt. _____ Moisture Content _____

Dial Setting								
Lbs. of Sand								

AIR OR LATEX Sec. for Calibration _____

Setting								
Fl. Ozs. or Lbs.								

TYPE "A" or TYPE "D" ADMIXTURE Sec. for Calibration _____

Setting								
Fl. Ozs.								

WATER Sec. for Calibration _____ Container Wt. _____

Setting								
Lbs.								