Test Procedure for

COMBINED BITUMINOUS MIXTURE COLD-BELT SAMPLING AND TESTING PROCEDURE

TxDOT Designation: Tex-229-F

Effective Date: March 2016

1. SCOPE

1.1 Use this test method to sample and test combined aggregates from the bituminous mixture plant cold-feed belt, to verify the accuracy of the cold-feed belt analysis as compared to solvent extraction analysis and in conjunction with Tex-228-F.

1.2 The values given in parentheses (if provided) are not standard and may not be exact mathematical conversions. Use each system of units separately. Combining values from the two systems may result in nonconformance with the standard.

2. APPARATUS

2.1 *Sample template.*

2.2 *Sample-splitter, quartering machine, quartering cloth, or shovel, and a smooth surface.*

2.3 *Set of standard U. S. sieves*, meeting the requirements of Tex-907-K.

2.4 *Mechanical sieve shaker*.

2.5 *Balance*, Class G2 in accordance with Tex-901-K, with a minimum capacity of 10,000 g.

2.6 *Drying oven*, capable of maintaining a temperature of 177°C (350°F) or greater, or suitable microwave oven.

2.7 *Various pans, scoop, brushes, and spatulas.*

2.8 *Sink,* or other suitable device.

2.9 *Source of potable water,* with pressurized (minimum 137.9 kPa [20 psi]) spray attachment, (e.g, standard sink with spray head attachment).

3. REPORT FORMAT

3.1 Use the automated Microsoft Excel test data worksheets Tx2QCQA14.xlsm or Tx2mxprop.xlsm (in conjunction with hot mix specifications) for reporting purposes.

4. SAMPLING PROCEDURE

4.1 Secure sample from combined belt feed after all required mineral aggregates (except mineral filler when used) have been deposited, just before introduction into the mixing plant or chamber.

4.2 Take a belt sample with the belt stopped, except when an automatic cold-feed diverter chute is used. Take the sample across the entire width (cross-section) of the belt for a minimum 0.5 m (1.5 ft.) length along the belt.

4.3 Use the sampling template to enclose a section of the aggregate on the belt. Avoid segregation of the sample.

Note 1—Take all of the aggregate on the belt, including the fines, for the sample. The belt section sampled must be relatively clean after sampling

4.4 If a greater cross-sectional area is required for low plant production rates, reposition the template downstream of the original sample area. Additional sampling must be contiguous.

4.5 Secure a minimum representative sample of 16 kg (35 lb.) from the belt.

Note 2—Use other methods of securing representative, homogeneous samples as approved by the Engineer.

5. PREPARING SAMPLE

5.1 Mix the entire belt sample thoroughly to avoid segregation.

5.2 Quarter or split to yield a test minimum sample size in accordance with Table 1.

Table 1—Minimum Sample Size

Nominal Maximum Aggregate Size[1]		Min. Size
in.	**mm**	**g**
No. 4	4.75	500
3/8	9.5	1000
1/2	12.5	1500
3/4	19.0	2000
1	25.0	3000
1-1/2	37.5	4000

1. Nominal maximum aggregate size is one sieve size larger than the first sieve that retains more than 10% of the total aggregate.

5.3 Dry the test sample using either a conventional drying oven or microwave oven. Drying is adequate when a sample no more than 25 mm (1 in.) deep in the pan exhibits:

- a loss of less than 1.0 g occurs in 5 min. using a conventional oven maintained at a minimum temperature of 121°C (250°F) or
- a loss of less than 1.0 g after an additional 2 min. of heating in a microwave oven of minimum 700-watt capacity.

Note 3—When drying with a microwave oven, do not heat so rapidly as to cause the sample to pop or sputter, as this may result in loss of fines.

6. SAMPLE TESTING

6.1 *Dry Sieve Analysis:*

6.1.1 Weigh the dried and cooled test sample to the nearest 0.1 g and record as total weight of the original dry sample.

6.1.2 Determine the dry sieve analysis in accordance with Tex-200-F, Part I.

6.2 *Washed Sieve Analysis:*

6.2.1 Weigh the dried and cooled test sample to the nearest 0.1 g and record as total weight of the original dry sample.

6.2.2 Determine the washed sieve analysis in accordance with Tex-200-F, Part II.

7. CORRELATION TESTING

7.1 Perform a minimum of three correlation tests for each mix design considered for cold-feed belt sampling gradation control.

7.2 One correlation test is a comparison of one mixture aggregate gradation determined by Tex-210-F to one gradation test made on the combined cold feed aggregates using Tex-200-F, Part I or Part II. Add quantities of mineral filler (other than baghouse fines) introduced during mixing operations within the drum or mixing chamber proportionally to the samples taken from the cold-feed belt.

7.3 The Engineer will determine the acceptability of the relationship between belt sample and extraction test results.

7.4 Expect some degree of difference when comparing test results from the two types of samples.

7.5 Consider both the consistency of this difference between pairs of compared values and the amount of the difference in determining if an acceptable correlation exists. Perform additional correlation tests whenever the acceptability of the correlation is questionable.

7.6 Do not use cold-feed belt sampling for mixtures containing aggregates prone to degradation during plant mixing, mixtures containing reclaimed asphalt pavement (RAP), or recycled asphalt shingles (RAS).

7.7 Adjust all cold feed belt samples results to account for the correlation between cold-feed belt samples and extracted aggregate samples.

8. CORRELATION EXAMPLES

8.1 Table 2 shows an example of Cold-Feed Belt and Extraction Pairs.

Table 2—Correlation Test Results

Sieve	Cold Feed Belt and Extraction Pairs					
	CFB 1	**EXT 1**	**CFB 2**	**EXT 2**	**CFB 3**	**EXT 3**
1/2 in. (12.5 mm)	100.0	100.0	100.00	100.0	100.0	100.0
3/8 in. (9.5 mm)	99.8	98.8	99.1	99.0	98.8	98.5
No. 4 (4.75 mm)	72.6	70.7	71.0	69.5	71.8	71.8
No. 10 (2.00 mm)	43.9	41.3	41.9	39.1	42.8	40.3
No. 40 (425 µm)	27.1	25.3	27.2	25.0	27.8	26.6
No. 80 (180 µm)	10.8	9.8	9.3	9.8	10.3	11.8
No. 200 (75 µm)	3.3	5.5	2.4	4.3	2.5	3.8

8.2 Table 3 shows an example of average differences among Cold Feed Belt and Extraction Pairs Average.

Table 3—Correlation Test Results

Sieve	CFB-1 EXT-1	CFB-2 EXT-2	CFB-3 EXT-3	Average
1/2 in. (12.5 mm)	0.0	0.0	0.0	0.0
3/8 in. (9.5 mm)	1.0	0.1	0.3	0.5
No. 4 (4.75 mm)	1.9	1.5	0.0	1.1
No. 10 (2.00 mm)	2.6	2.8	2.5	2.6
No. 40 (425 µm)	1.8	2.2	1.2	1.7
No. 80 (180 µm)	1.0	-0.5	-1.5	-0.3
No. 200 (75 µm)	-2.2	-1.9	-1.3	-1.8

Note 4—The average difference for each sieve is the correlation factor for that sieve.

8.3 Table 4 shows an example of using correlation factors to adjust cold-feed belt sample results.

Table 4—Correlation Factors to Adjust Cold Feed Belt Sample Results

Sieve	Cold-Feed Belt Gradation	Correlation Factors	Adjusted Gradations
1/2 in. (12.5 mm)	100.0	0.0	100.0
3/8 in. (9.5 mm)	99.5	0.5	99.0
No. 4 (4.75 mm)	70.8	1.1	69.7
No. 8 (2.36 mm)	42.8	2.6	40.2
No. 30 (600 µm)	26.9	1.7	25.2
No. 50 (300 µm)	10.3	-0.3	10.6
No. 200 (75 µm)	2.9	-1.8	4.7

8.4 Later changes in plant production rate, draft, temperature, etc., that may alter the amount of degradation and/or fines loss must warrant one or more correlation tests at the time of the production change.

9. ARCHIVED VERSIONS

9.1 Archived versions are available.