

DAPA/DelDot Density Gauge Evaluation
November 10th and 11th, 1999
I-495 Project (Greggo & Ferrara)

DelDot's plan to change the specification on how and who would evaluate the density in the field prompted questions on both sides to find a non-destructive way to accurately and quickly check density.

Both Troxler and TransTech were asked to participate in an evaluation of their gauges, to show how reliable they both can be with the proper calibration and usage.

The manufacturer representatives, DelDot's personnel, and DAPA met out on the site to calibrate their gauges on Wednesday morning (11/10/99).

The gauges were calibrated on a mat of 19mm 160Gyraton PG64-22 mix that was laid two days prior, and that traffic was closed to. Five locations were picked and used for the calibration process. For each of the nuclear gauges, two – 1 minute readings were taken over the area that was to be cored. The TransTech – PQI took a reading in the middle of area that the nuclear gauge calibrated too.

After each gauge had their readings, the DelDot lab personnel cut the cores to be taken to the lab and evaluated for the next day's test.

Thursday morning all were present again, and were given the core results to calibrate their gauge. Once the calibration was entered into the machine, they proceeded to go back in the same area as the cores were taken. They also selected three areas that were not tested the prior day. The gauge readings were recorded and given to the State Representative. When the readings were finished, the State again cut cores to evaluate the results.

On the other side of the project, the contractor began paving with the same mix as we had just calibrated. The manufacturers were then asked to take readings on the new mat. Once the gauges had taken their readings, cores were taken to evaluate the results.

The results of the first day calibration are as follows:

Troxler 4640 Gauge Reading (Thin Lift)	Actual Density (Core Method)	CF
147.5	151.6	-4.1
145.4	151.1	-5.7
145.6	151.5	-5.9
144.3	151.2	-6.9
146.5	150.6	-4.1
Ave Results:		
145.9	151.2	-5.3

Troxler 3450 Gauge Reading (Multi)	Actual Density (Core Method)	CF
146.8	151.6	-4.8
144.2	151.1	-6.9
144.4	151.5	-7.1
144.4	151.2	-6.8
144.5	150.6	-6.1
Ave Results:		
144.9	151.2	-6.3

TransTech PQI	Actual Density (Core Method)	CF
144.8	151.6	-6.8
141.3	151.1	-9.8
142.7	151.5	-8.8
143.2	151.2	-8.0
142.7	150.3	-7.9
Ave Results:		
142.9	151.2	-8.3

The results after the correction factor had been entered into the respective gauge on the second day:

Troxler 3450	Multi Purpose		
Location#	Gauge Result	Core Result	Difference pcf
1	151.5	151.8	-0.3
2	146.9	150.8	-3.9
3	150.2	152.2	-2.0
4	152.2	151.7	+0.5
5	147.2	151.4	-4.2
6	151.0	152.6	-1.6
7	150.8	151.9	-1.1
8	152.5	152.7	-0.2
9*	149.7	147.3	+2.4
10*	146.0	147.7	-1.7
11*	146.3	147.3	-1.0
12*	149.9	149.0	+0.9

Troxler 4640	Thin Lift		
Location#	Gauge Result	Core Result	Difference pcf
1	152.0	151.8	+0.2
2	146.7	150.8	-4.1
3	149.4	152.2	-2.8
4	151.3	151.7	-0.4
5	147.0	151.4	-4.4
6	150.7	152.6	-1.9
7	150.9	151.9	-1.0
8	151.9	152.7	-0.8
9*	148.7	147.3	+1.4
10*	144.6	147.7	-3.1
11*	145.8	147.3	-1.5
12*	148.2	149.0	-0.8

TransTech	PQI		
Location#	Gauge Result	Core Result	Difference pcf
1	151.7	151.8	-0.1
2	150.2	150.8	-0.6
3	151.7	152.2	-0.5
4	151.4	151.7	-0.3
5	146.6	151.4	-4.8
6	149.1	152.6	-3.5
7	150.2	151.9	-1.7
8	151.1	152.7	-1.6
9* **	149.2	147.3	+1.9
10* **	143.4	147.7	-4.3
11* **	145.9	147.3	-1.4
12* **	146.5	149.0	-2.5

* Hot mix that was just laid. Mat temperature of 220°F.

** PQI was calibrated on a mat that was 70°F, so therefore the manufacturer adjusted his calibration to compensate for the higher temperature on the mat.

Average	Results		
Cores	TransTech PQI	Troxler 3450 (Mutli Purpose)	Troxler 4640 (Thin Lift)
150.5	148.9	149.5	148.9

Both manufacturers mentioned that on a course graded mix like the one we were working with (19mm), that sometimes the results may vary because of no uniformity in the mat. With this in mind, the results of the three gauges were will within the proposed 3 pcf difference from the cores.

DAPA would like to thank DelDot, Troxler, TransTech, and Greggo & Ferrara for their time and involvement in this test.

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