South Central Superpave Center News

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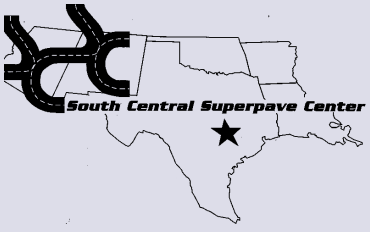
Inside this issue

Regional News

National News



Superpave and Texas Gyratory Compactors: How Do They Compare?

Mansour Solaimanian, Project Manager and
Yetkin Yildirim, Graduate Research Assistant
South Central Superpave Center

The Texas Department of Transportation (TxDOT) has been using the Texas gyratory compactor (TGC) for years. There are about 300 units of this compactor available in different districts of the state. In addition, as of today, approximately 30 Superpave gyratory compactors (SGC) are available in the districts. TxDOT has been investigating the relationship between the results from these two machines for Superpave mixes.

Three independent studies have been conducted for this purpose. The first study was conducted on laboratory prepared mixtures. The loose mixtures were sent to various districts for compaction. The specimens were compacted in both types of compactors in the districts. In another study, TxDOT collected density data from various districts on plant mixes. These mixes were compacted with both the TGC and SGC at different districts. The design number of

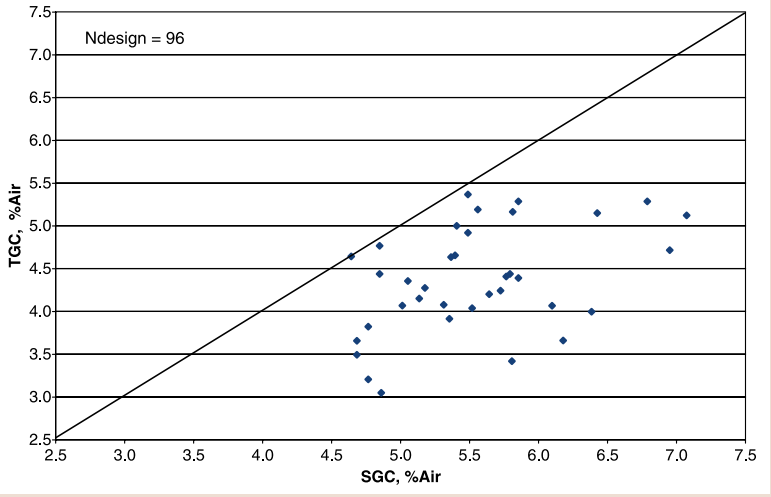


Figure 1. Comparison of Air Voids from SGC and TGC. Data based on compaction of lab mixed specimens. Courtesy of TxDOT Materials Section.

Continued Page 2

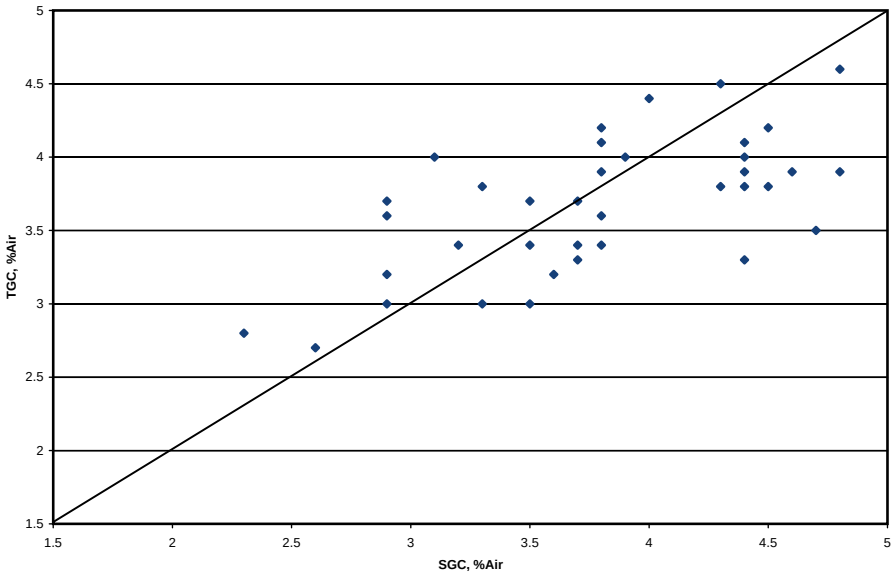


Figure 2. Comparison of Air Voids between SGC and TGC. Data based on SCSC test on plant mixes from districts.

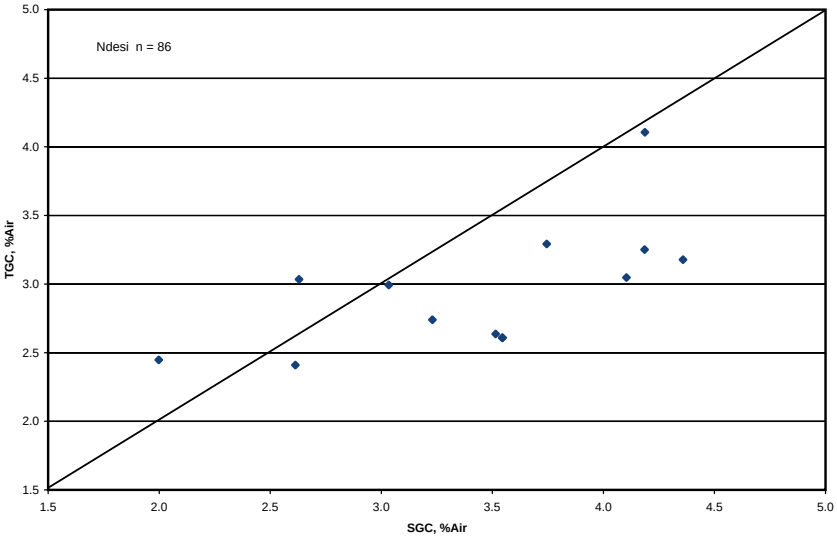
Figure 3. Comparison of air voids between SGC and TGC. Data based on SCSC test on plant mixes from districts.

gyrations for this comparison was 96. Later, a third study was conducted on plant mixes with the idea of having all the compaction completed at a central laboratory. This way, the variability in operation and equipment is significantly reduced. Superpave plant mixes were shipped from different districts to the SCSC where they were compacted with both the SGC and TGC. The same mixing and compaction temperatures were used for both compactors. One operator was used for each compactor to reduce the variability.

The results of the three studies are presented in Figures 1 through 3, respectively. Figure 1, which is based on laboratory mixes, does not exhibit a good correlation. However, Figures 2 and 3 indicate that there is a relatively good correlation between the two compactors. As shown in Figure 4, the largest difference in magnitude of air voids from the two compactors is about one percent. In most cases, the difference is less than 0.6 percent. The same conclusion can be drawn based on the results presented in Figure 3.

An important consideration in making a comparison between the SGC and TGC is the design number of gyrations (N_{des}). Obviously, as N_{des} changes, the air voids from the SGC will change. Figures 1 and 2 are based on an N_{des} of 96 while Figure 3 is based on an N_{des} of 86. If an N_{des} of 96 had been used for this last study, there would have been a shift of data points to the left presenting results similar to what is shown in Figure 2.

Considering the above correlation, as well as the fact that in most cases the difference between air voids from the two compactors is less than 0.6 percent (only for the N_{des} used in this study), one could conclude that the results are comparable within reasonable limits. There may be the possibility of developing shift factors between the results from the machines for other N_{des} values.



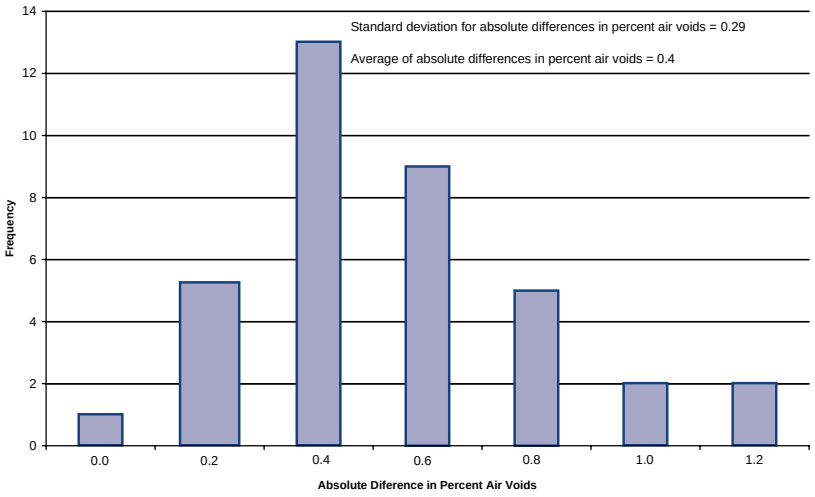


Figure 4. Histogram showing percent air voids difference for SGC vs. TGC. Based on data of Figure 2.

Kennedy Honored for Studies With Asphalt

Kathryn A. Wolfe
Reprinted From The UT Daily Texan

The Association of Asphalt Paving Technologists named Thomas W. Kennedy, UT professor of civil engineering, an honorary member at their 75th annual meeting in March. Fewer than 20 people have received honorary membership in the AAPT's 75 year history, Kennedy said. It is the highest award the Association confers.

"I was surprised when I found I'd been nominated and very pleased," Kennedy said. "When your peers and colleagues come forth and honor you this way, it's something you feel very strongly about." To be named an honorary member, a candidate must be nominated by a current member, be unanimously approved by the board of directors and pass a majority vote by the AAPT's membership.

Dr. Thomas W. Kennedy
Technical Director, SCSC

Kennedy, whose focus is the development of new materials and technical procedures, has been involved in the management of several large governmental programs for asphalt paving currently being implemented internationally.

Kennedy began at UT Austin in 1964 as an assistant professor and has since served as associate chairman of the Department of Civil Engineering, associate vice president for the University and associate dean for research and development for the College of Engineering. He was also previously the president of the AAPT and a member of its board of directors. Kennedy also received the Ron Kenyon Award from the National Asphalt Paving Association in February 1991.

AAPT, established in 1924, consists of approximately 2,000 members worldwide. Its membership is drawn mainly from oil refineries, chemical companies, consultants and universities. Its emphasis is primarily on the development of new technologies and the promotion of quality products for paving purposes, Kennedy said.

Research in Progress:

Static Creep Behavior of Superpave Mixes

Mansour Solaimanian, Project Manager
South Central Superpave Center

The Texas Department of Transportation (TxDOT) has been utilizing the static creep test as an integral part of mix design for Coarse Matrix High Binder (CMHB) asphalt mixtures. The test has been successful in ensuring proper design for these mixes. The test results are compared with the pass/fail criteria on stiffness, permanent stain and creep slope.

TxDOT is investigating the possibility of using static creep as a strength test for Superpave mixes. A comprehensive research project is currently being pursued by the South Central Superpave Center (SCSC), in cooperation with TxDOT, to address this issue. At present, the static creep test for designing CMHB mixes is conducted on 100-mm specimens compacted with a Texas gyratory compactor. Specimens for Superpave mix design are produced using a Superpave gyratory compactor and measure 150 mm in diameter. The current study includes a comparison of results for 100-mm and 150-mm specimens, as well as the effect of compactor type on the results. The effect of temperature is also being investigated. The tests are conducted with both the current creep test equipment of TxDOT and the Superpave shear tester (SST) located at the SCSC. Part of the research is also dealing with static versus dynamic creep behavior of Superpave mixes.

As an important part of the study, performance of previously constructed projects with Superpave, CMHB, and Texas Type C mixes are being evaluated. Both poor and good performing mixtures are included in the study. The original creep test is conducted in the axial mode. Tests are being conducted to compare the creep behavior of mixes in both shear and axial modes.

Results so far indicate that the axial creep test distinguishes between different mixes better when 150-mm specimens are used. Table 1 presents the results for three mixes produced as 150-mm specimens with Superpave gyratory compactor. The results are for tests under 70 kPa axial stress at 40 °C. Gradations for mixes A and C are Superpave coarse and fine, passing below and above the restricted zone, respectively. Mix B is a Texas Type C mix passing through the restricted zone. As presented, the coarse mix produces the highest stiffness with the lowest permanent deformation. The results are displayed as the average of five replicates for each type of mix.

The study is generating a tremendous amount of useful data. Conducting tests, comparing results against field performance, and analysis of data are currently underway. The results and findings will be submitted to TxDOT where the applicability and use of the creep test and developed criteria for design and construction of Superpave projects will be decided.

Table 1. Summary of Results for Creep Test at 40° C for 150-mm mixes

Mix Type	Stiffness, kPa	Permanent Strain, 10^{-3}	Creep Slope, 10^{-8}
A(1)	100,720	0.28	2.5
B(2)	93,284	0.35	3.3
C(3)	99,566	0.32	3.5

1: Mix A: Superpave Coarse Mix (above restricted zone)
2: Mix B: Texas Type C Mix (through restricted zone)
3: Mix C: Superpave Fine Mix (below restricted zone)

South Central Superpave Center
The University of Texas at Austin
2311 West Rundberg Lane
Austin, TX 78758

Mr. Maghsoud Tahmoressi (512) 232-1903
Superpave Director
mtahmor@mailgw.dot.state.tx.us

Dr. Thomas W. Kennedy (512) 232-7741
Technical Director

Dr. Mansour Solaimanian (512) 232-1930
Project Manager

Ms. Clair LaVaye (512) 232-3129
Website Administrator
clair@mail.utexas.edu

FAX: (512) 475-7914

WebSite: www.utexas.edu/research/superpave

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Lynn J. Warble (765) 463-2317
Coordinating Editor

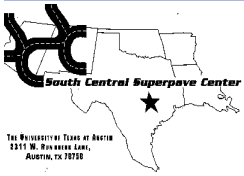
Calendar of Events

October 18-20, 1999	International Conference on Accelerated Pavement Testing Reno, NV Contact: Nevada T2 Center, (702) 784-1433
October 27-29, 1999	7th Annual U.S. Hot Mix Asphalt Conference Orlando, FL Contact: NAPA @ 1 - 888 - HOT – MIXX
November 18, 1999	39th Annual Bituminous Paving Conference University of Illinois Contact: Sam Carpenter, scarpent@uiuc.edu
Nov. 30- Dec. 2, 1999	Southeastern Asphalt User/Producer Group (SEAUPG) Annual Meeting Bay Point Resort Village – Marriott Panama City, Florida Contact: Jill Baumgardner, SEAUPG, (601) 206-5330
January 9-13, 2000	79th Annual Transportation Research Board Meeting Washington, DC Contact: TRB (202) 334-3214 www.nas.edu/trb
March 12-15, 2000	Association of Asphalt Paving Technologists Reno, NV Contact: AAPT, (651) 293-9188
April 10-12, 2000	Superpave: Building Roads for the 21st Century Denver Marriott Tech Center 4900 S. Syracuse Street Denver, CO 80237 Phone: (303) 740-2531

Training Calendar - Superpave Courses

Mixture Design & Analysis	June 14-17, 1999
Binder Testing & Characterization	July 26-29, 1999
Mixture Design & Analysis	August 9-12, 1999

All classes to be held at the South Central Superpave Center, University of Texas at Austin, Austin, TX. For registration information call Sharon Campos at (512) 471-3506, scampos@mail.utexas.edu. For technical information call Dr. Mansour Solaimanian at (512) 232-1932. For web site go to http://www.utexas.edu/research/superpave/train



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The University of Texas at Austin
2311 W. Rundberg Lane
Austin, TX 78758

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