

CC8 NDT Test Plan – Strength and Fatigue

The FAA rigid pavement design procedure uses a failure model in which SCI is the measure of performance. In this model, the SCI follows an approximately linear deterioration function of the logarithm of coverages (N), as shown in Figure 1. The number of coverages to the first observed thorough crack, i.e., at which SCI just begins to diminish from its initial level of 100, is defined as Point B. An SCI of 80 (Point C in Fig. 1) is the FAA definition of structural failure of a rigid pavement. However, the above relationship between SCI and coverages does not reflect the complex failure mechanism of concrete pavements. Specifically, there is a lack of an adequate model of fatigue damage accumulation in the major stage of rigid pavement life before the appearance of significant cracks (i.e., Point A in Fig. 1).

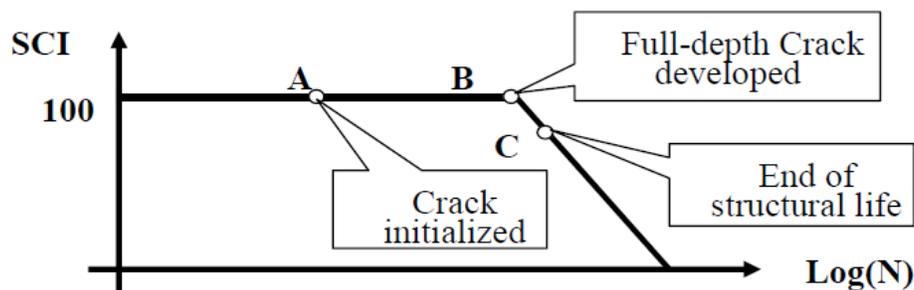


Figure 1. Rigid pavement failure model in FAARFIELD.

The goal of fatigue/strength test is to isolate these three phases and obtain data from individual slabs regarding: (1) cracking strength of slab (for comparison to ASTM C78); (2) Bottom-up crack propagation in a notched slab (Stage 1); (3) crack initiation and propagation in unnotched slab (Stage 1 and 2); (4) trade-off between strength and thickness of PCC in terms of fatigue life. In addition, two CBR values (3-4 and 7-8) of subgrade provide more performance data points to calibrate the FAARFIELD failure model.

Prior to the start of traffic testing on (8/21/18), the CSRA NDT team will perform the following tasks. Each task will be completed once before placing any loads.

1. **SurPro (Duration – 1 hr):** Take longitudinal and transverse profiles using the SurPro profiling device. Due to the short section length, this profiler will be used in lieu of the NDT Van. This will ensure that the profiles cover the trafficked and non-trafficked areas as shown in the plan layout below. The profiles will be used to determine the longitudinal and transverse changes in the test section after testing is completed.
2. **PSPA (Duration – 4 hrs):** PSPA testing will be conducted in accordance to the CC8 test plan. The testing will be done to determine the seismic modulus of each section before and after trafficking. PSPA will be collected in the longitudinal and transverse direction for each location. This data can be analyzed alongside the HWD data collected during trafficking. PSPA data will be used to monitor the condition of the pavement throughout trafficking. Changes in the seismic modulus can be attributed to cracking or other pavement distresses that may not be visible from the surface. **The PSPA is currently out for repair and the dates of return will be updated upon notice from the manufacturer.**
3. **HWD (Duration – 4 hrs):** HWD testing will be conducted following the CC8 test plan. The target loading sequence will be: 12,000 lbs, 24,000 lbs, and 36,000 lbs with an approximate 36,000-lb seating load. HWD testing will be done to monitor the changes in deflection and modulus during the course of trafficking. The HWD data will be analyzed using the methods used in the IPRF study and used to determine the effectiveness of each joint type as described in the CC8 Joint Comparison traffic plan.
4. **Walk Behind GPR (Duration – 1hr):** The walk behind GPR will be used to determine the layer thicknesses across multiple stations of the test section. This testing will be done to verify the construction thickness of each layer and to monitor layer thickness changes during the duration of testing of the subgrade layers as it is assumed the rigid pavement layers will not change.
5. **Leica 3D Scan (Duration – 2hrs):** The Leica Scan will take a 3D scan of the pavement surface across the entirety of the test section. From this data, profile lines can be determined and any slab movement can be monitored. The Leica data will provide a timeline of any slab movement and distress formation that the device is capable of picking up.
6. **2D/3D Imaging (Duration – 30min):** 2D/3D imaging data will be collected to monitor pavement distresses. The collected imaging lines will be stitched in the associated software and then analyzed using the updated crack detection software.
7. Prior to the start of trafficking, CSRA will conduct a baseline visual distress survey on the concrete slab surface. The collected distress data will be uploaded into the PAVEAIR database. Prior to the distress survey, CSRA will establish a suitable database in PAVEAIR in which visual distress survey data will be entered.

Due to the ability to run multiple devices simultaneously, it is believed that all of the NDT testing can be completed within 6 hours.

All the collected data will be stored on the G: drive under the CC8 Phase II Strength and Fatigue folder. Data files will be accessible on the G: drive within a week of the measurements. Pictures will be taken during testing to be uploaded to the photo database.

Baseline for all of the NDT devices will be after the seating load. Following the initial baseline data collection. Following the baseline data collection, the NDT testing schedule will go as follows:

Testing During Traffic [On-Going]:

At the end of each day’s trafficking, CSRA will perform a visual distress survey for rigid pavements in accordance with ASTM D5340. SCI calculations will consider the following distresses in accordance with AC 150/5320-6E: longitudinal, transverse, and diagonal cracking, corner breaks, intersecting cracks and shattered slabs, joint spalling, corner spalling, and shrinkage cracking. The collected data and calculated SCI will be updated daily in the PAVEAIR database by end of the day. The updated SCI will be reported to the FAA by the end of the day to facilitate go/no go decisions on traffic.

NDT Devices and Frequency of Data Collection:

Device	Frequency	Testing Duration
SurPro Profiler	Pre-Trafficking, Midway*, Post-Trafficking	1 Hours
PSPA	Weekly	4 Hours
HWD	Weekly	4 Hours
Walk Behind GPR	Pre-Trafficking, Midway*, Post-Trafficking	1 Hour
Leica Scan	Pre-Trafficking, Post-Trafficking	3 Hours
2D/3D Imaging	Pre-Trafficking, Midway*, Post-Trafficking	½ Hour

*The Midway through trafficking collection date will occur between stage 1 and stage 2 of the test objectives.

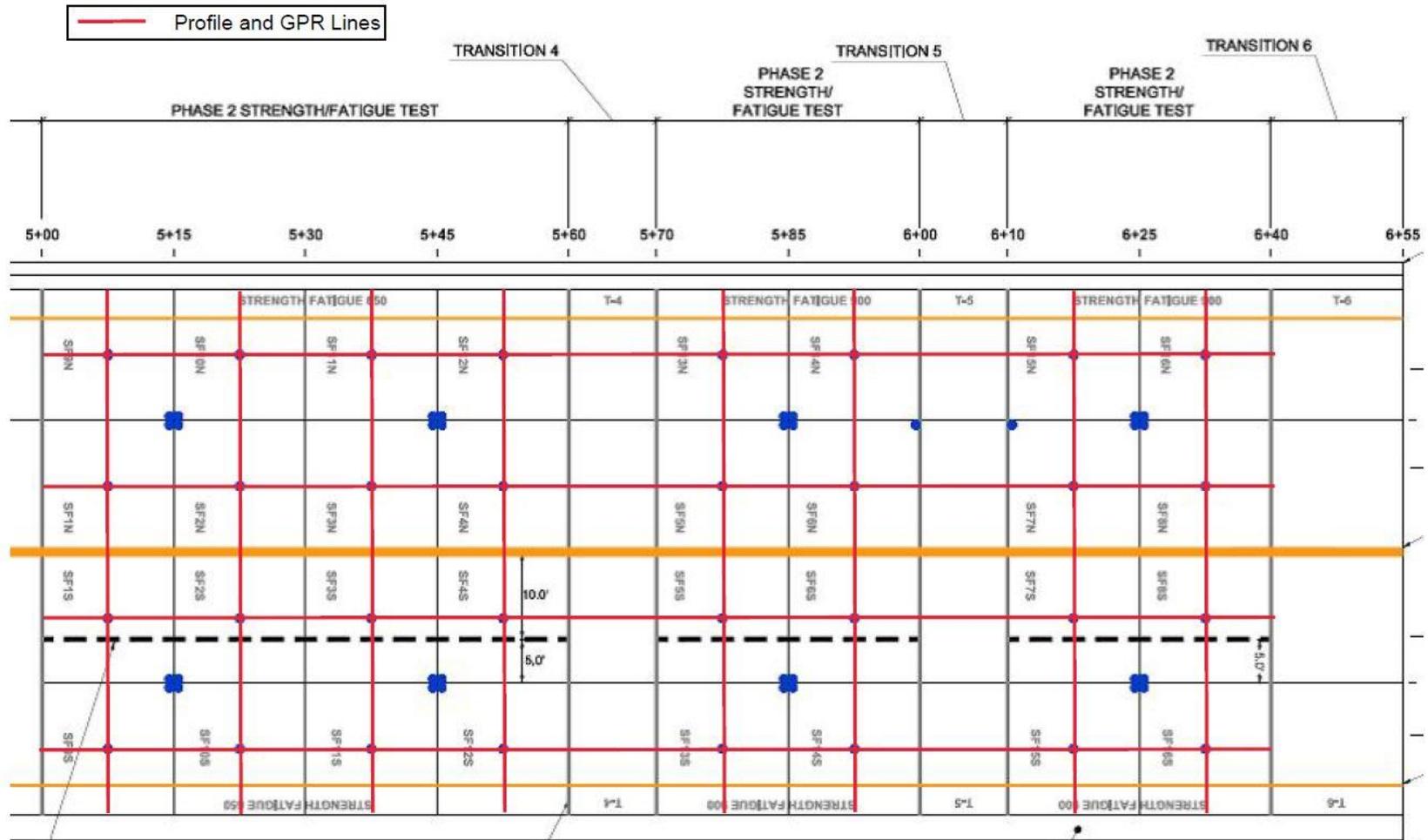


Figure 2. NDT Locations for Strength and Fatigue Test Section