STATEWIDE AIRFIELD PAVEMENT MANAGEMENT PROGRAM

AVIATION OFFICE

(2011)

INSPECTION METHODOLOGY for WHITETOPPING

Purpose of this paper

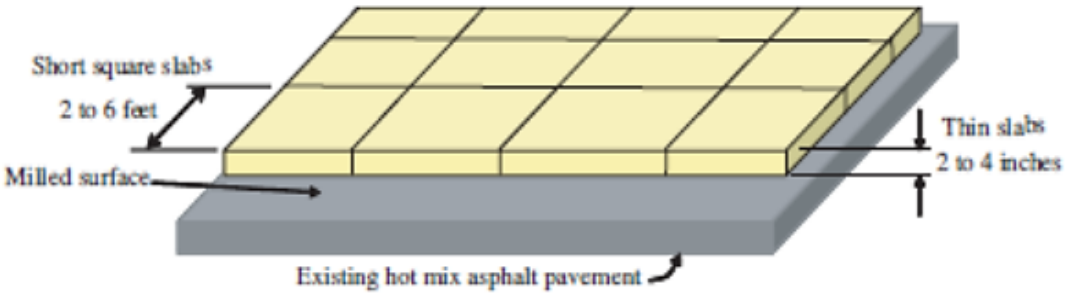
The Florida Department of Transportation (FDOT) is conducting Phase II of the Statewide Airfield Pavement Management Program. Forty-percent of the total number of airports has been completed during Phase I, with 47 airports. During Phase II, there will be 60%, or 43 airports, will be completed. Please note that the percentage of Phase II is more than Phase I, but the number of airports is less because most of the airports that were inspected during Phase I were General Aviation (GA) airports, and are normally much smaller than Commercial airports.

Typically there are two types of pavement that used at the airports, which are Rigid and Flexible pavements. However from time to time, we can also find Composite pavement. For the last decade, the new type of pavement that has been used in the aviation industry is called Whitetopping.

In Florida, there are three airports that are currently using whitetopping; New Smyrna Beach, Williston, and Fernandina Beach airports. All three airports have not been inspected during Phase I.

Whitetopping consists of three categories:

- Conventional whitetopping
    - ≥ 6 inches thick
- Thin whitetopping (TWT)
    - Between 4-6 inches thick
- Ultra-thin whitetopping (UTW)
    - Between 2-4 inches thick



Ultra-thin Whitetopping Pavement Rehabilitation Method

While the top two categories of whitetopping are frequently used at highways and roads, the Ultra-Thin whitetopping seems to be limited in use, especially when the FAA does not include this type of whitetopping in their pavement design (less than 5 inches) and that also it is not eligible for AIP funding.

Ultra-Thin Whitetopping (UTW) is a viable rehabilitation method that consists of a layer of PCC (2 to 4 inches thick) that is bonded to the milled AC pavement to form a composite surface, with a new wearing surface. The slabs of UTW are short and square, normally ranging from 2 to 6 feet (as shown in the previous illustration). For the other two whitetopping variations, Thin Whitetopping thickness is more than 4 inches and less than 8 inches, and Conventional Whitetopping thickness exceeds 8 inches.

Construction Specification Guideline for Ultra-Thin Whitetopping
Ultra-Thin Whitetopping

Ultra-thin whitetopping (UTW) is a process where a thin layer of concrete [50 to 100 mm (2 to 4 in.)], usually with fibers and often of high strength, is placed over a prepared surface of distressed asphalt pavement. In addition to the thinness of the concrete overlay, other factors differentiate UTW from conventional concrete overlays of existing asphalt pavement (conventional whitetopping). These are: (1) a substantial degree of bond between the concrete overlay and the prepared asphalt surface, and (2) much closer joint spacing.

UTW Applications

Ultra-thin whitetopping provides a durable wearing surface for pavements. Since the first experimental project, when a landfill access road near Louisville Kentucky was overlaid with UTW in 1991, about 200 UTW projects have been built through 1998. The predominant use has been to rehabilitate distressed asphalt pavement at intersections where rutting and washboarding was a recurring problem. Other uses include: city streets, general aviation airfields, automobile parking lots, bus lanes, and rural highways.

For More Information

For more information about UTW, including applications, history and use, material requirements, project selection criteria, load-carrying capacity, research and performance, joint design, construction procedures and repair, obtain these publications from the American Concrete Pavement Association:

- Ultra-thin Whitetopping (IS100P)
- Whitetopping - State of the Practice (EB210P)

Foreword to Guideline

This document provides guideline specifications useful for developing concrete project specifications for ultra-thin whitetopping pavement. These guidelines should not be used as a specification by reference in contract documents.
A contracting agency must modify these guidelines for local conditions, preferences and construction practices. Project specifications denote specific requirements for construction. They are not intended to provide general or educational information about material, equipment or construction procedures. Therefore, the language in these guidelines is generally imperative and terse as would be used in project specifications.

A contracting agency must specify items designated in the "Mandatory Specification Checklist" portion of this document. The contracting agency may also choose from the provisions in the "Optional Specification Checklist" portion of this document. Checklists are to assist in properly choosing and specifying requirements for the project specifications. These checklists should not be part of the final project specifications.
This document references appropriate material standards, test methods and specifications of the American Society of Testing and Materials (ASTM), American Association of State Highway and Transportation Officials (AASHTO), and Canadian Standards Association (CSA).

These references assume that the contractor and the engineer will use the applicable standards or methods that are in effect when bids are solicited for the project or at the time of construction. It also assumes that the specification writer will choose the standard or test most suitable for their agency and project. These guidelines are written in the three-part section format of the Construction Specifications Institute.

Several factors are involved in the structural design of concrete pavements:

- Supporting strength of the existing asphalt pavement
- Flexural strength of the concrete
- Design procedure—the expected service life of the pavement before any major structural rehabilitation is required
- Amount of truck or aircraft traffic expected

TABLE 1: PAVEMENT CONDITION INDEX FOR AIRPORT PAVEMENTS

PCI Rating	Description	Applicable Pavement Preservation Treatments
86 – 100	Good – only minor distress	Routine maintenance only
71 – 85	Satisfactory – low and medium distress	Preventive maintenance
56 – 70	Fair, some distresses are severe	Corrective maintenance and rehabilitation
41 – 55	Poor – severity of some of the distresses can cause operational problems	Rehabilitationand reconstruction
26 – 40	Very Poor – severe distresses cause operational problems	Rehabilitation and reconstruction
11 – 25	Serious – many severe distresses cause operational restrictions	Immediate repairs and reconstruction
0 – 10	Failed – pavement deterioration prevents safe aircraft operations	Reconstruction

PCI PAVEMENT SURFACE CONDITION RATING

(Source: © American Concrete Pavement Association 1999)

TABLE 9 JOINT SPACINGS FOR PLAIN CONCRETE WHITETOPPING

Slab thickness		Maximum Joint Spacing[1]	
mm	in	m	ft
100	4	2.1	7
150	6	3.2	10.5
200	8	4.3	14
250	10	5.3	17.5
300	12	6.4	21
350 or more	14 or more	7.6	25

[1] Joint spacing may also be based on local experience for pavements that have provided good service.

TABLE OF JOINT SPACING FOR WHITETOPPING

TABLE 18 ALLOWABLE NUMBER OF CHANNELIZED PASSES AIRCRAFT (TOTAL IN THOUSANDS)
5,400 KG GROSS WEIGHT AIRCRAFT WITH DUAL WHEEL GERA, OR
4,100 KG GROSS WEIGHT AIRCRAFT WITH SINGLE WHEEL GEAR
K = 27 MPA/M

Average Flexural Strength MPa	H_2, Asphalt thickness, mm	H_1, UTW thickness					
		50 mm		75 mm		100 mm	
		Joint Spacing					
		0.9m	0.6m	1.2m	0.9m	1.8m	1.2m
4.8	3	42	84	118	161	297	396
4.8	4	102	190	223	302	483	(unlim.)
4.8	5	233	426	437	(unlim.)	(unlim.)	(unlim.)
4.8	6 or more	(unlim.)	(unlim.)	(unlim.)	(unlim.)	361	(unlim.)
5.5	3	51	96	143	189	(unlim.)	475
5.5	4	116	211	260	346	(unlim.)	(unlim.)
5.5	5	259	468	498	(unlim.)	(unlim.)	(unlim.)
5.5	6 or more	(unlim.)	(unlim.)	(unlim.)	(unlim.)	(unlim.)	(unlim.)

Unlimited (unlim). For practical purposes, 500,000 is taken as the upper limit of channelized passes of aircraft that are heavy enough to affect tickness requirements of general aviation airport pavements.

THICKNESS TABLE FOR UTW WHITETOPPING

At New Smyrna Beach airport, Ultra-Thin whitetopping has been used. And the other two categories of whitetopping have been applied at the Williston and Fernandina Beach airports.

The inspection procedure for the flexible and rigid pavement has been clearly detailed in ASTM 5380-10 and discussed in advisory Circular (AC) 150/5380-6B. Unfortunately, none of these documents have mentioned anything about whitetopping.

Matter of fact, research proves that there is no whitetopping pavement inspection documentation. There is a document that discusses ultra-thin whitetopping for roadways and airfields done by the American Concrete and Pavement Association. But this only characterizes repair, and not inspection. Another document that relates to ultra-thin whitetopping is the construction specification guideline for ultra-thin whitetopping. This source is also produced by the American Concrete Pavement Association. It should be noted that if there is any procedure for whitetopping pavement inspection, it must be somehow compatible to the Pavement Condition Index (PCI) system, since the product is installed at the facilities and airports like other types of pavement.

The FAA has discussed concrete airfield pavement, but only for regular concrete pavement surfaces. The FAA refers all of the pavement inspection to the American Society of Testing Materials (ASTM). As mentioned before, the ASTM does not characterize the inspection methodology for whitetopping.

According to the newest version of the ASTM, the rules and regulations for the number of slabs for each sample unit remains the same as the previous, which is 20±8 (Please see below).

> *2.1.7 pavement sample unit—a subdivision of a pavement section that has a standard size range: 20 contiguous slabs (±8 slabs if the total number of slabs in the section is not evenly divided by 20, or to accommodate specific field condition) for PCC airfield pavement and 5000 contiguous square feet (± 2000 ft2 (450 ± 180 m2) if the pavement is not evenly divided by 5000, or to accommodate specific field condition) for AC airfield pavement and porous friction surfaces .*
>
> ***(ASTM)***

A typical sample unit should have between 12 and 28 slabs. And the typical standards of the slab dimensions are 12.5 x 20 = 250 square feet. The dimensions for whitetopping slabs vary, ranging from 2x2 up to 15x115. For instance, if the area of the smaller lab of ultra-thin whitetopping is 2x2 = 4 square feet, and the area of the concrete sample unit defined by the FAA, is 5,000 square feet. As a result, the number of slabs in ultra-thin whitetopping can be 5000 ÷ 4 = 1,250 slabs compared to the maximum of 28 defined by the ASTM.

Moreover, many of these small sizes are not sawed all the way down. Rather they just score the slab to a very shallow depth on top of the whitetopping pavement surface. The joint between those slabs are not sealed. Overall the unit structure of whitetopping is significantly different from the normal concrete pavement system. Those specifics have been designed to reduce the maintenance of the project.

So far, the top two types of whitetopping, which are Conventional and Thin whitetopping, seem to function reasonably. However, the third category of whitetopping, Ultra-Thin, appears to be a little bit troublesome. For instance, the Innovative Pavement Research Foundation does not recommend that American Concrete Pavement Association request for FAA to approve Ultra-Thin whitetopping as a rehabilitation technique.

Typically, whitetopping is a modification of the commonly used Portland Cement Concrete (PCC). The product uses more fiber to improve the endurance of the concrete surface. It would allow Ultra-Thin and Thin whitetopping to provide more resistance to rutting, eliminate reflective cracking, and to increase the ability to reduce the progress of those distresses that are affected by traffic loads.

Regarding the whitetopping that is being used at the Florida airports, which are New Smyrna Beach airport, Williston airport, and the Fernandina Beach Municipal airport, here is more information on those airports.

Whitetopping Categorization

A. Conventional whitetopping (CW) (≥ 6 inches thick)
B. Thin whitetopping (TWT) (Between 4-6 inches thick)
C. Ultra-thin whitetopping (UTW) (Between 2-4 inches thick)

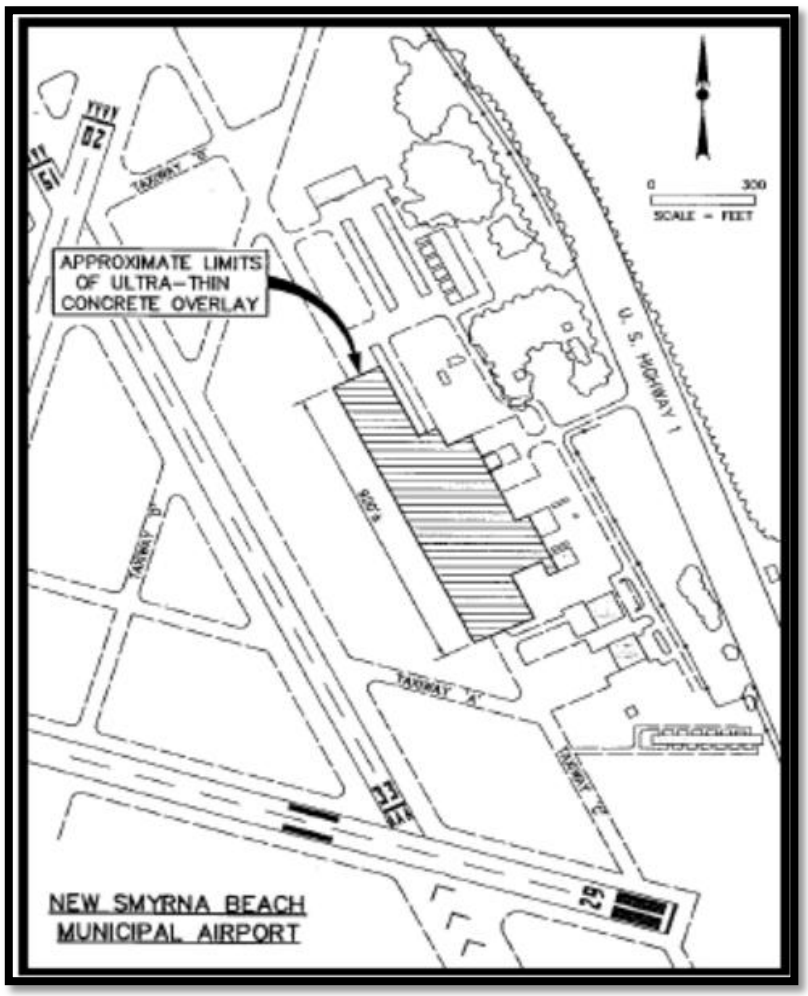
WHITETOPPING USED AT THE AIRPORTS IN FLORIDA

AIRPORT	YEAR OF CONSTRUCTION	WHITETOPPING TYPE	PANAL/SLAB's SIZES	PAVEMENT THICKNESS
New Smyrna Beach Airport	1997	C	Varied	2 – 2. 1/2"
Williston Municipal Airport	2006	B	Varied	4 – 5"
Fernandina Beach Municipal Airport	2003	A & B	5x6.25' / 4x4'	5 – 11"

New Smyrna Airport

The whitetopping project was used at the New Smyrna Beach airport in 1997. Since this is the first time whitetopping was used in a Florida airport, the testing was considered to be a pilot project. The overall thickness of the whitetopping product that has been used at this airport is between 2 to 3.5 inches. The local airport authority decided to use the whitetopping product as a rehabilitation alternative to restore the pavement life on severe cracks as well as taxiways and aprons.

The airport was told the product would last them for approximately 10 years. However, the product was proved to deteriorate much earlier. As a result, many areas of the ultra-thin whitetopping, especially areas with a lot of traffic, were badly deteriorated. The airport has since then decided to replace a large portion of the whitetopping where it is considered inoperable, which is located around the apron area.



Whitetopping Area

Whitetopping (Ultra-thin) pavement has deteriorated badly
at New Smyrna Airport

Joint Spalling

Multiple Corner-Cracks

Transverse Cracks

Severe Corner Breaks

Whitetopping has badly deteriorated

Irregular panel sizes at New Smyrna Airport

Fernandina Beach Municipal Airport

The whitetopping product was approved to be used at the Fernandina Beach Municipal airport in 2003. At this airport, the product was chosen to repair the structural and functional service that was affected by the badly deteriorated cracks or severely rutted areas. The category of whitetopping pavement for Fernandina Beach Municipal airport is Conventional whitetopping, which has the depth that is greater than 8 inches. The actual thickness of whitetopping pavement that is used at this airport is 11 inches. The size of the slabs at this airport also varies, depending on the facility. The size of slabs of whitetopping at this airport is 5 feet by 6.25 feet at the Runway 8-26 and 4-22. However, on the Taxiway C, the size is 4 by 4 feet.

Design & Material Specification Table at Fernandina Airport

Whitetopping used	Thickness	Slab Size
RW 8-26	6”	5’ x 6.25’
Taxiway C	5”	4’ x 4’
RW 4 - 22	5”	5’ x 6.25’
N/A (Some areas)	11”	N/A

Whitetopping at Fernandina Beach Municipal Airport

Whitetopping at Fernandina Beach Municipal Airport

The design work at the airport was performed by Passero Associates. The thicknesses of whitetopping were five–inches for Taxiway C and Runway 4-22, and six-inches for Runway 8-26. The size of the whitetopping panels for Runways 8-26 and 4-22 were 5 feet by 6.25 feet, and for Taxiway C, 4 feet by 4 feet. The project also included full-depth, 11-inch concrete, which would extend the length of both runways and Taxiway C.

Currently, the whitetopping surface condition at Fernandina Beach Airport is at level 6-H which is approximately between 96- 99 PCI.

Williston Airport

The whitetopping product was approved to be used at the Williston airport in 2005. The category of whitetopping that was used is Thin whitetopping, which is between 4 to 6 inches. The actual thickness of whitetopping that was used at this airport is between 4 and 5 inches.

Since the product that has been installed at this airport is only 6 years old, the life surface for the whitetopping can easily go up to 10 years. There are several signs of early deterioration of whitetopping at this airport.

The size of the panels at this airport for whitetoppings is mostly 5 feet x 5 feet. However, at some places, the panel size is 5 feet x 5.2 feet. The airport is approximately 7000 feet long and 100 feet wide. There are four lanes on the runway, and each lane is 25 feet long. So therefore a total of 20 slabs are across the runway. During the inspection, the Aviation Office engineer found that there are a minimum of three areas that contain corner breaks and LTD cracks. Joint spalling and corner spalling have also been found in many places along the runway. In a few cases, all three kinds of distresses appear in conjunction in one 5x5 panel, and those distresses are expanding forward to threaten the group of panels surrounding them. Although these distresses are not affecting the current PCI of this runway, the early signs of deterioration may lead to rapid deterioration of the whitetopping at this airport. It should be noted that the three early deterioration areas mentioned above should be monitored annually to see how fast the deterioration develops in order to determine or find the remedy to control the early signs of distresses.

As of today, Phase II of the FDOT Airfield Pavement Management Program shows that the pavement condition of the whitetopping at Williston is in relatively very good condition. Regarding the equivalent PCI evaluation for the current whitetopping pavement condition at the Williston airport, it could be easily assumed that the overall condition will be at “Good” with a low severity condition, which is approximately between 94 and 97 PCI.

The above observation concludes that the ten year “maintenance free” for whitetopping may still be reasonable, although the early signs of deterioration may lead to rapid breakdown of this whitetopping pavement. The answer will remain to be seen based on the annual visit to this airport to observe how the deterioration progresses.

Before…

During…

After!

Whitetopping at Williston Airport

5-6 YEARS-OLD WHITETOPPING at Williston Airport

CORNER BREAKS (T) & JOINT SPALLING (B)

L/T CRACKINGS (T) & JOINT SPALLING (B)

Conclusion:

Conventional whitetopping is identical to new PCC overlay in design and construction, highlighted by the fact that it needs minimal pre-overlay repair and no surface preparation. However, for UTW, more effort is needed to achieve a bond between the PCC overlay and Hot Mix Asphalt (HMA) substrate. In UTW, more engineering evaluation, more intensive pre-overlay repairs and surface preparation, better topping materials, and better HMA conditions are practiced, and this leads to consequent cost increases,

In TWT and UTW the HMA substrate meets the following requirements:

- Distresses are concentrated on the surfaces, such as rutting from unstable surface mix, top-down cracking resulting from surface shearing, oxidation and weathering.

- No stripping.

- Minimum thickness after milling of 3 inches.

The strength of the HMA substrate can be measured by the modulus of subgrade reaction (k-value) in the conventional design procedure. The thickness of TWT and UTW can be determined with by traffic loading, HMA thickness, PCC flexural strength and k-value using the ACPA design catalog.

In some cases such as in Minnesota and a few others states using whitetopping, the current practices of TWT have shown that TWT has been used successfully and is an important alternative for rehabilitating HMA pavements of medium volume roads. If designed and constructed properly, TWT is also an important alternative for rehabilitating HMA pavements of high volume roads with more requirements in HMA quality, bonding and fiber reinforcement.

The performance of current UTW projects in Minnesota ranges from very good to failing. The sections that perform poorly are short sections under stopping trucks or buses and over thin or poor HMA pavement. UTW has been used successfully in Minnesota when integrated into thick and sound HMA pavements under high volume traffic. Since there are limitations of UTW in requiring high quality of the HMA substrate, bonding, fiber reinforcement, and short joint spacing, caution should be used when rehabilitating HMA pavements at bus stops, weigh stations, and intersections.

The primary goal of the FDOT Central Aviation office is to inspect the airfield pavement condition at the statewide airports. All of the pavements (Rigid, Flexible, Composite, and Whitetopping) must be inspected under the guidelines and procedures provided by the FAA and ASTM. However, whitetopping is not considered within the FAA and ASTM guidelines. The Central Aviation Office must formulate a separate pavement surface rating system for whitetopping in order to compensate for its exclusion from the FAA and ASTM guidelines.

It should be noted that by having an airfield pavement surface inspection guideline for whitetopping, the FDOT Aviation Office will be the first state in the nation that has not only achieved the need to protect the investment from the FAA and the state, but also to improve the nationwide safety of airway transportation.

Listed below are the main purposes and benefits for creating the pavement surface inspection criteria for whitetopping:

1. Because the FAA does not support the commission and management of whitetopping products, a modified procedure will allow for a timely repair of whitetopping pavements and operational surfaces.

2. To be cost effective, the FDOT should monitor UTW and TWT surface conditions and conduct repairs to protect the investment in the pavement surface.

3. The Aviation Office will be able to conduct PCI surveys in the future that accurately reflect the condition of the UTW and TWT pavements, relative to the other traditional types of pavements that exist at other public use airports in Florida.

4. By having accurate and reliable PCI values for UTW and TWT pavements, the Aviation Office and Districts will be able to prioritize pavement repairs among many airports when funding is limited.

5. The FDOT MicroPAVER database can be utilized to conduct maintenance and rehabilitation work on UTW and TW pavements in a timely manner. PCI distress data and values can be integrated into the MicroPAVER database, and the PCI surveys can provide information on the types of pavements that have the best performance and the highest cost effectiveness.

Whitetopping Pavement Evaluation

The procedure for handling sample units goes as follows:

- Distress assessment is done only on selected sample units
- Average the results and use the average to report for the entire section
- The sample units are of uniform size and are selected by statistical sampling
- To achieve the desired accuracy and reliability, the number of sample units is chosen

The advantage of using the PCI procedure is that it is widely used, and has great objectivity and acceptance. PCI ratings allow for a good measure of functionality of the pavement and information about its structural condition. It alone can be used to estimate M&R needs for planning purposes.

Furthermore, approximately 78% of airports conduct PCI surveys on their runways at an average frequency of approximately 3.5 years. Airports who do not have a formal Pavement Management System (PMS) utilize the Florida Department of Transportation Aviation office to conduct PCI surveys on their runways.

It is also noted that 54% of survey respondents use the PCI methodology for taxiways and other facilities at an average of about 3.3 years between sessions.

Maintenance and Rehabilitation for Whitetopping

The proper maintenance and rehabilitation strategies for distressed TUT and UTW can be determined based on the distress survey taken by the engineers, and the analysis of their causes must be conducted to continue to rehabilitation efforts.

The rehabilitation method for TWT is very similar to that of Conventional Whitetopping. The method is similar for TWT 5 inches or thicker with a bond with the HMA not intentionally constructed. TWT overlays that are thinner, have short joint spacing, and are bonded to the HMA can be rehabilitated according to the same guidelines recommended for UTW.

Full-panel replacement is a common repair strategy for the distressed panels of UTW such as corner breaks. Using a milling machine with tungsten carbide teeth to remove concrete can reduce repair times, and it also creates a ridged surface that improves the

bonding between the HMA and new panel. Two repair strategies exist to deter reflective cracking in UTW, including placing a bond-breaking material over the cracks in the HMA and full-depth sawing along the longitudinal joints.

There is currently not much information regarding the optimal time for performing maintenance and rehabilitation of whitetopping. Research is needed to determine the most effective maintenance and rehabilitation treatments for whitetopping as well as the timing for optimum benefit.

Whitetopping Pavement Inspection Methodology Recommendation for the Airports in Florida

As previously mentioned, there are a total of three airports in Florida that are using whitetopping. As we discussed so far, the Conventional Whitetopping and Thin Whitetopping seem to perform well. The warrantee for these two types of whitetopping is for 10 years. Since the product installed at these airports is less than 10 years old, the condition of whitetopping at these two airports is considered good. It could range from Satisfactory to Very Good. The PCI equivalent for those two airports is between 91 and 96.

On the other hand, the last category of whitetopping, which is Ultra-Thin Whitetopping, at the New Smyrna Airport, was not functioning as well as it could be. As a result, a large portion of Ultra-Thin whitetopping at the apron area at the New Smyrna Airport has forced the airport to replace that area. Prior to replacement, the area was badly deteriorated. The distresses that were found in that area included Corner Breaks, Longitudinal, Transverse, and Diagonal cracks. Multiple shattered cracks were also found on many small slabs (see attached picture). It is understandable to see that the Ultra-Thin whitetopping is not performing well, construction methodology and materials have an impact more on the cohesiveness of UTW to function as a unit. As a matter of fact, many states have recommended not using Ultra-Thin whitetopping and the FAA decided not to fund any project using Ultra-Thin whitetopping. Moreover, Ultra-Thin whitetopping was not included in the FAA's advisory circular for airfield pavement design.

The network definition map of all of the airports in Florida is constructed to comply with the current FAA requirements in which all the pavements at the airports must be divided into three categories: Facilities, Sections, and Sample Units. The PCI methodology has also been chosen to comply with the recommendations from the FAA. For the best practice, the whitetopping pavement inspection must also take into consideration in

terms of the existing network definition and PCI airfield pavement inspection methodology.

Based on the circumstances, it is reasonable to recommend that the whitetopping pavement used the similar methodology of PASER which is characterized by the FAA. Please see the attached PASER concrete pavement inspection. By doing so, the new whitetopping pavement inspection methodology will be compatible to the PCI system, and also will be able to use in conjunction with the MicroPAVER software. (See below table for concrete pavement evaluation)

WHITETOPPING RATING SYSTEM TABLE

Rating System

Surface rating	Visible distress*	General Condition/treatment measures
5 Excellent	None.	New pavement or recent major concrete rehabilitation. Like-new condition. Less than 5 years old. No maintenance required.
4 Good	Hairline or sealed cracks 1/8" wide or less. Map cracking. Pop-outs.	Concrete over 5 years old. Signs of wear. Minor spot repair of cracks or joint sealant.
3 Fair	Several slabs broken into two pieces by slab cracks. Corner cracking on several slabs, 1/4"wide with no spalling. Joint sealant mostly in good condition, less than 10% needing replacement. Several patches in fair to good condition. Map cracking or scaling on 10% or less of the surface area. Slight faulting, less than 1/4", in several locations.	First sign of significant slab cracking, corner cracking, scaling, or faulting. Several patches. Joint sealant repair required. Isolated repair of joint or patch
2 Poor	Many slab cracks, some breaking the slab into three of more pieces. Cracks open 1/8" or cracks with spalling. Durability cracks at several joints. Sealant failure over 10% of joints. Several patches in fair to poor condition with cracks in patch and uneven surface. Faulting 1/4" to 1/2" in several locations. Severe or extensive scaling.	Needs sealant replacement on more than 10% of cracks or joints. Partial depth or full depth joint repairs or patch replacement. Repair faulted joints. Replace or overlay slabs with severe scaling. Bonded or unbounded concrete overlay.
1 Failed	Many wide cracks with failed sealant and grass. Extensive crack and joint spalling. Slabs extensively cracked or shattered. Many corner breaks with spalling. D-cracks with spalling. Patches in poor condition with spalling. Numerous faults over 1/2".	Extensive full depth joint repairs or slab replacements. Extensive patching and complete overlay. Complete reconstruction.

**A given pavement segment may not have all of the types of distresses listed for a particular rating. It may have only one or two types.*