CLT
CHARLOTTE DOUGLAS INTERNATIONAL AIRPORT

NC Concrete Pavement Conference

Ashton, B. Watson, PE, CM, ACE

November 29, 2023

CITY OF CHARLOTTE DEPARTMENT

About Me: Ashton B. Watson

- BSCE 2006 / MSCE 2009
- PE License #36863
- 18 years of Experience (CDOT & CLT Airport)
- Airport Engineering Program Director (Manage Staff of 75)
- Husband and Father of 3 children
- UNC Charlotte Sophomore Design, Senior Design, other initiatives with students

CLT FAST FACTS

ABOUT CLT AIRPORT

TERMINAL OPENED
MAY 2, 1982

114 GATES

1,400 DAILY AIRCRAFT MOVEMENTS

118,000 DAILY PASSENGERS

21,000 PARKING SPACES

6,000 ACRES OF LAND

1.8M Sq. Ft. TERMINAL WITH 5 CONCOURSES

3 TOTAL RUNWAYS

100+ CONCESSIONS

NUMBERS & RANKINGS

2022
NUMBERS

47,758,605 PASSENGERS

505,589 AIRCRAFT MOVEMENTS

207,608 TONS OF CARGO

2021
ACI RANKINGS*

5th IN AIRCRAFT MOVEMENTS

6th IN TOTAL PASSENGERS

34th IN TOTAL ** CARGO

* Worldwide ACI rankings

** Nationwide ACI rankings

ECONOMIC IMPACT

$32B ANNUAL ECONOMIC IMPACT

5% OF STATE GROSS PRODUCT

$1.82B IN TAX REVENUE

Source: NC Department of Transportation Division of Aviation

AIRLINES

184 NONSTOP DESTINATIONS

37 INTERNATIONAL DESTINATIONS

3 US TERRITORIES

8 DOMESTIC AIRLINES

3 FOREIGN FLAG AIRLINES

@CLTAirport

CITY OF CHARLOTTE DEPARTMENT | cltairport.com | JANUARY 2023

Pavement Inventory at CLT

CLT Pavement Distributions

19.5
million total sq. feet of pavement

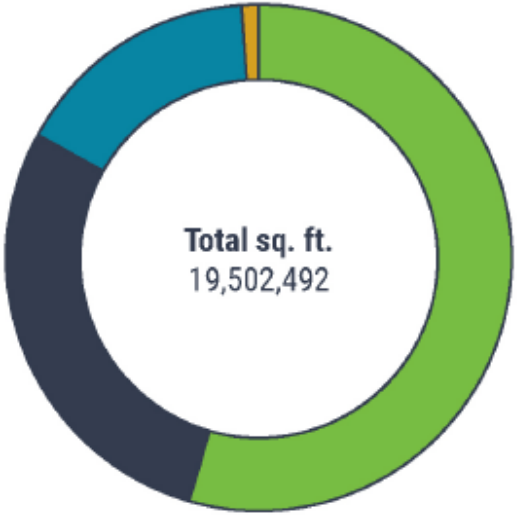
46%
9.1 million sq. feet of **taxiway** pavement

27%
5.2 million sq. feet of **runway** pavement

25%
4.8 million sq. feet of **shoulder** pavement

2%
313 thousand sq. feet of **overrun** pavement

Pavement Area by Surface Type



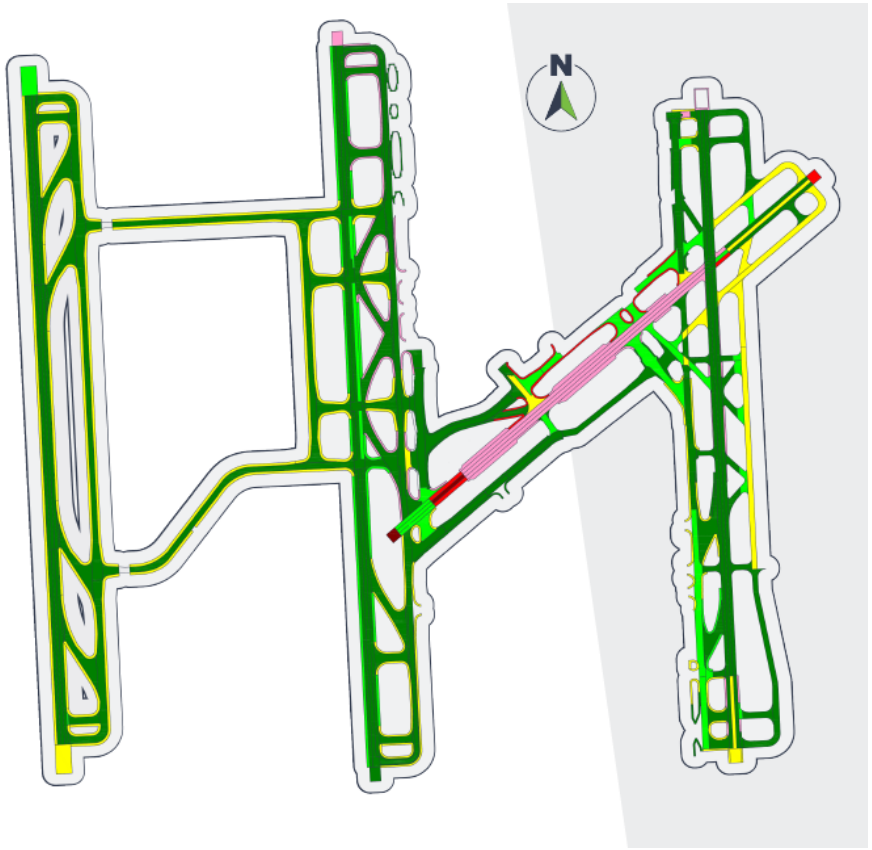
- **Portland Cement Concrete (PCC)**
  10,825,758 sq. ft.
  55%
- **Asphalt Concrete (AC)**
  5,572,671 sq. ft.
  29%
- **Asphalt over Asphalt Concrete (AAC)**
  3,088,644 sq. ft.
  16%
- **Asphalt over Portland Cement Concrete (APC)**
  15,419 sq. ft.
  <1%

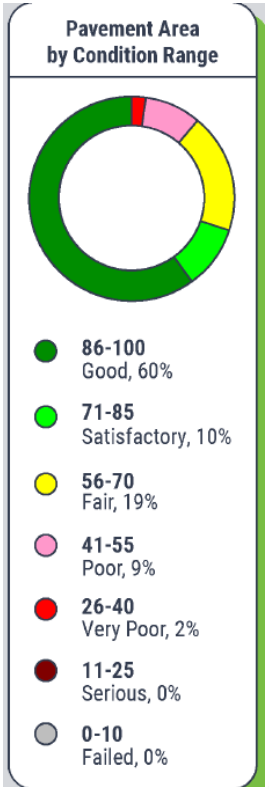
Types of Distresses on Airfield Pavements

Code	Flexible Pavement Distresses Description	Code	Rigid Pavement Distresses Description
41	***Alligator Cracking** *	61	Blow up
42	***Bleeding** *	62	***Corner Break** *
43	***Block Cracking** *	63	***Longitudinal, Transverse & Diagonal Cracks****
44	Corrugation	64	Durability Cracking
45	***Depression** *	65	***Joint Seal Damage** *
46	Jet Blast	66	***Small Patch** *
47	Joint Reflection Cracking	67	***Large Patch** *
48	***Longitudinal & Transverse Cracking** *	68	***Pop Outs** *
49	Oil Spillage	69	***Pumping** *
50	***Patching** *	70	***Scaling** *
51	Polished Aggregate	71	***Faulting** *
52	***Raveling** *	72	***Shattered Slab****
53	***Rutting** *	73	***Shrinkage Cracking** *
54	Shoving	74	***Joint Spalls** *
55	***Slippage Cracking** *	75	***Corner Spalls** *
56	***Swelling** *	76	Alkali Silica Reactivity
57	***Weathering** *		

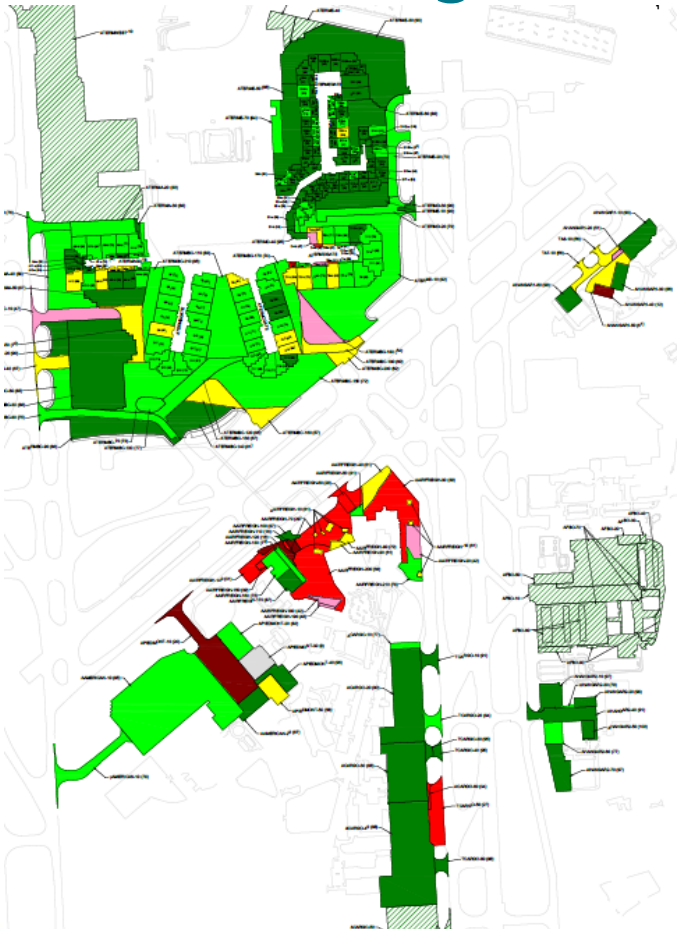
*Note: * = Distresses Found in CLT Pavements.*

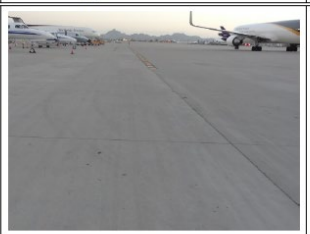
Pavement Management Program: Movement Areas





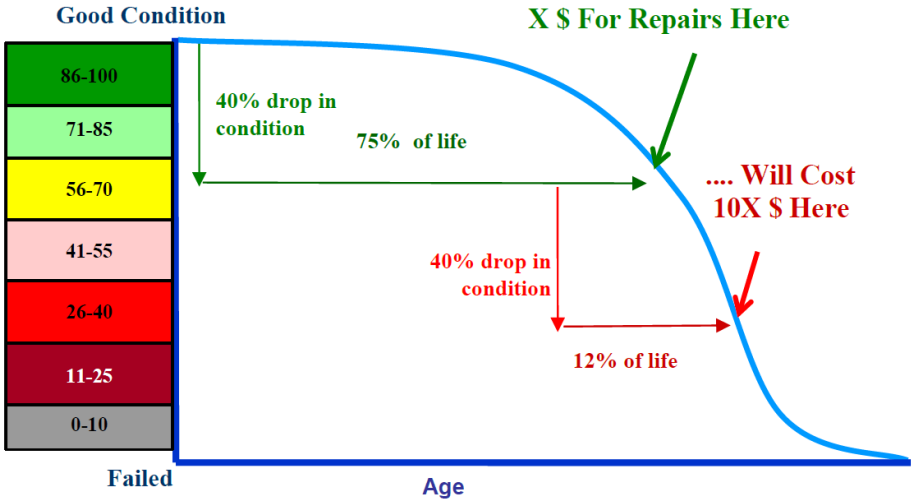
Pavement Management Program: Ramp Areas

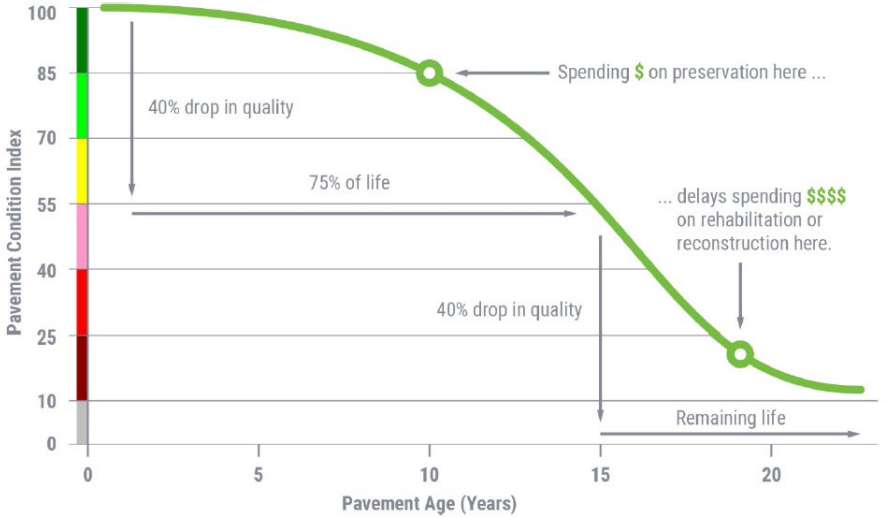


Typical AC-Surfaced Pavement	Typical PCC Pavement	PCI
		100
		60
		10

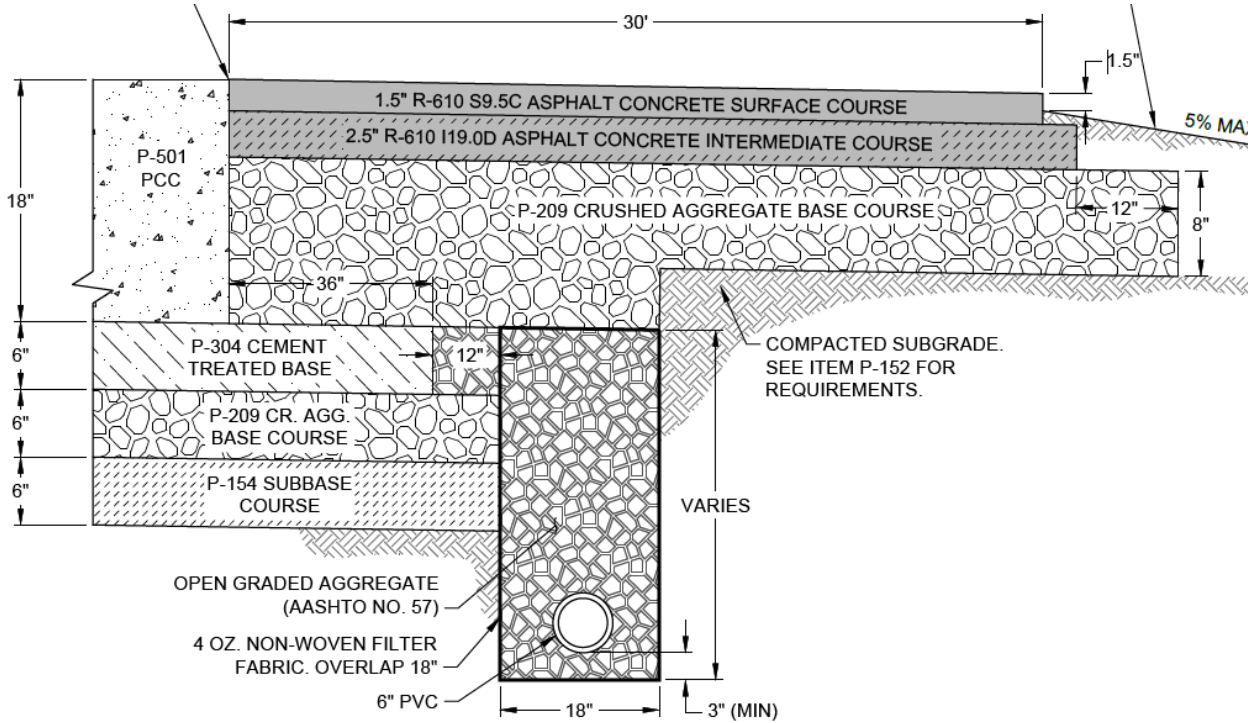
- Good (86-100)
- Satisfactory (71-85)
- Fair (56-70)
- Poor (41-55)
- Very Poor (26-40)
- Serious (11-25)
- Failed (0-10)

Pavement Condition Index: Time and $$





Pavement Cross Section



EDGE DRAIN DETAIL
(BITUMINOUS TAXIWAY SHOULDER PAVEMENT SECTION)

Subgrade

Crushed Concrete- Recycled for Base

Crushed Concrete- Recycled for Base

Soil-Cement Treated Base

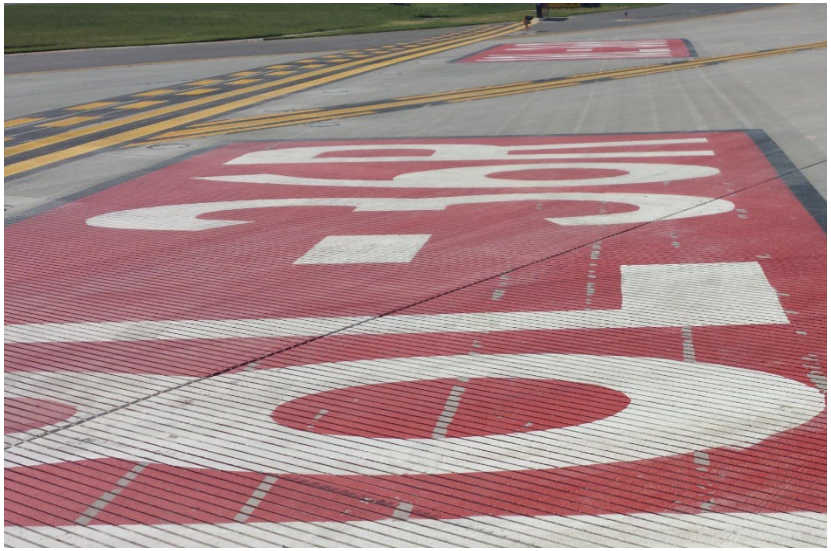
Cement Treated Base

TWY Alpha Rehab – Production Concrete Pour

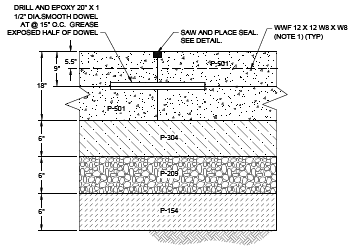
TWY Alpha Rehab – Production Concrete Pour

Production Concrete Pour

Finished Product: Sealing Joints, Grooving, Painting



Joint Details

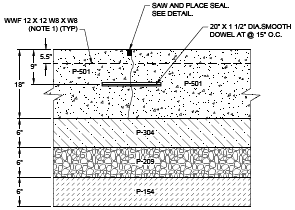


TYPE E - DOWELED CONSTRUCTION JOINT

NTS

NOTE:

1. WELDED WIRE FABRIC (WWF) SHALL BE INSTALLED AS SHOWN ON THE PLANS. END AND SIDE CLEARANCES SHALL BE A MINIMUM OF 2" AND A MAXIMUM OF 6". SEE "TYPICAL SLAB REINFORCEMENT DETAIL".

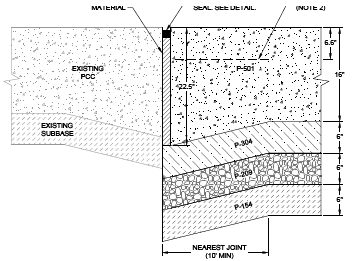


TYPE C - SAWED CONTRACTION JOINT WITH DOWELS

NTS

NOTE:

1. WELDED WIRE FABRIC (WWF) SHALL BE INSTALLED AS SHOWN ON THE PLANS. END AND SIDE CLEARANCES SHALL BE A MINIMUM OF 2" AND A MAXIMUM OF 6". SEE "TYPICAL SLAB REPLACEMENT DETAIL".

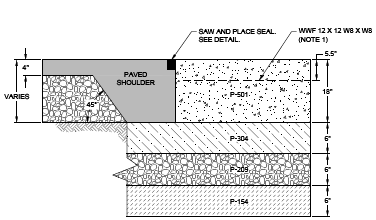


TYPE A1 - THICKENED EDGE ISOLATION JOINT (EXISTING/PROPOSED CONCRETE)

NTS

NOTES:

1. CONTRACTOR SHALL PROTECT EXPANSION MATERIAL UNTIL COMPLETION OF ADJOINING PAVEMENTS AND JOINT SEAL IS PLACED.
2. WELDED WIRE FABRIC (WWF) SHALL BE INSTALLED AS SHOWN ON THE PLANS. END AND SIDE CLEARANCES SHALL BE A MIMIMUM OF 2" AND A MAXIMUM OF 6". SEE "TYPICAL SLAB REINFORCEMENT DETAIL".

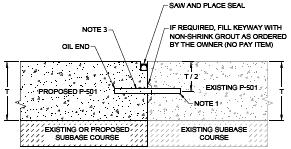


TYPE F - SHOULDER BUTT CONSTRUCTION JOINT

NTS

NOTE:

1. WELDED WIRE FABRIC (WWF) SHALL BE INSTALLED AS SHOWN ON THE PLANS. END AND SIDE CLEARANCES SHALL BE A MINIMUM OF 2" AND A MAXIMUM OF 6". SEE "TYPICAL SLAB REINFORCEMENT DETAIL".

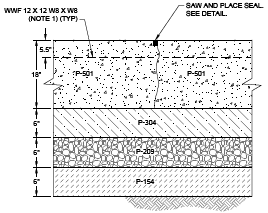


TYPE E1 - DOWELED CONSTRUCTION JOINT WITH EXISTING

NTS

NOTES:

1. CONTRACTOR SHALL SAWCUT PAVEMENT FULL DEPTH. IF PRESENT, DOWELS AND/OR KEYWAYS SHALL BE SAWCUT. DRILL AND EPOXY NEW DOWELS AS SHOWN (SEE "DOWEL INSTALLATION DETAIL").
2. DOWELS SHALL BE INSTALLED TO MEET THE SPECIFICATION TOLERANCE WITH NO VOIDS AT THE INTERFACE BETWEEN THE DOWELS AND THE CONCRETE.
3. DOWELS SHALL BE 1" DIA, 18" LONG FOR 7.5-12" THICK SLABS; 1-1/4" DIA, 20" LONG FOR 12.5-16" THICK SLABS; AND 1-1/2" DIA, 20" LONG FOR 16.5-20" THICK SLABS.

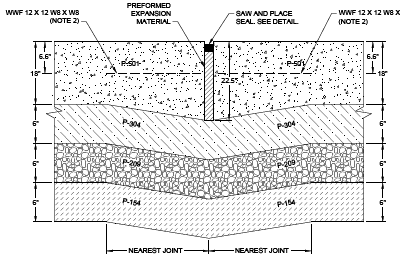


TYPE D - SAWED DUMMY CONTRACTION JOINT

NTS

NOTE:

1. WELDED WIRE FABRIC (WWF) SHALL BE INSTALLED AS SHOWN ON THE PLANS. END AND SIDE CLEARANCES SHALL BE A MINIMUM OF 2" AND A MAXIMUM OF 6". SEE "TYPICAL SLAB REINFORCEMENT DETAIL".



TYPE A2 - THICKENED EDGE ISOLATION JOINT (PROPOSED/PROPOSED CONCRETE)

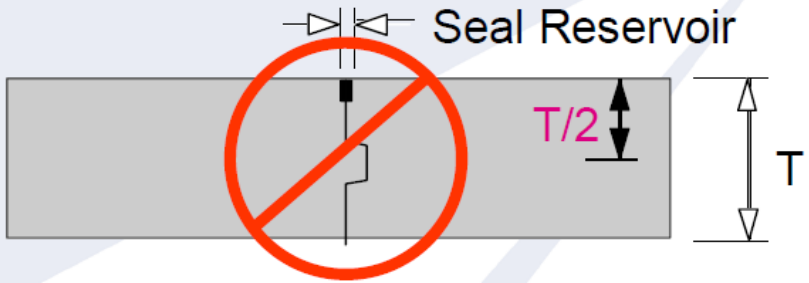
NTS

NOTES:

1. CONTRACTOR SHALL PROTECT EXPANSION MATERIAL UNTIL COMPLETION OF ADJOINING PAVEMENTS AND JOINT SEAL IS PLACED.
2. WELDED WIRE FABRIC (WWF) SHALL BE INSTALLED AS SHOWN ON

Keyway Joints

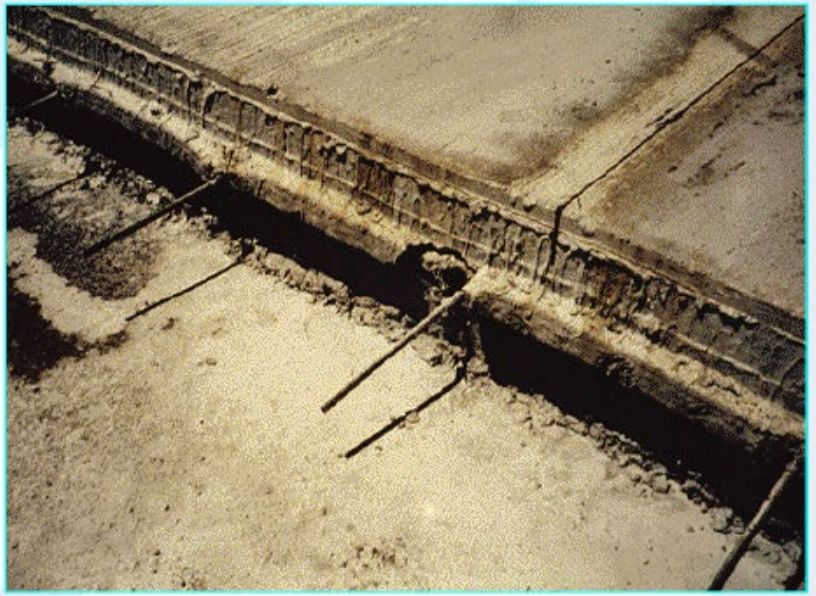
Keyed



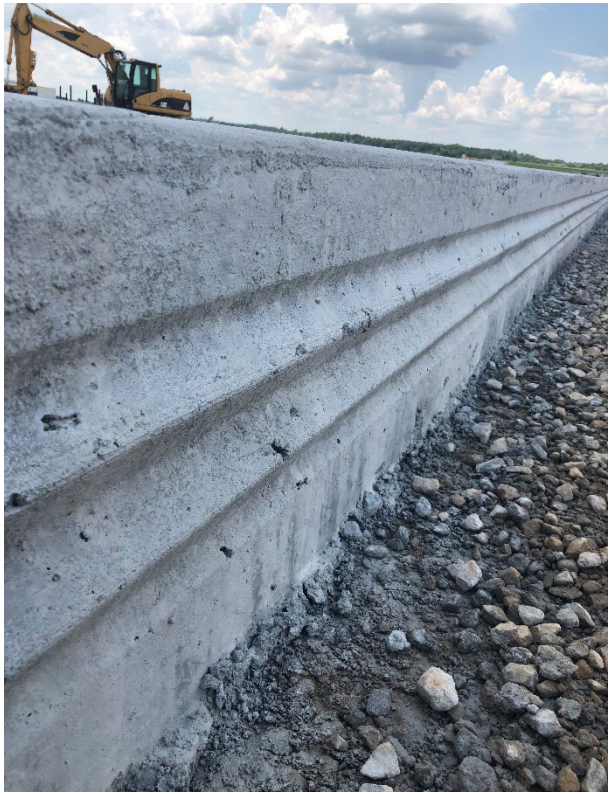
FAA AC/150-5320-6D - Do not use for pavement
less than 9-inches. Not recommended for use at
airports with wide-body traffic.

Keyway Joints

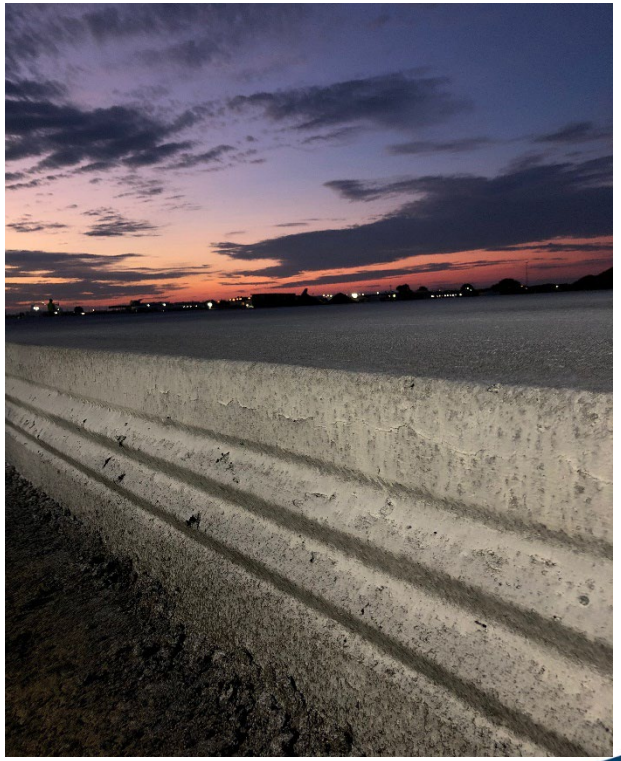
Bad Male Keyways



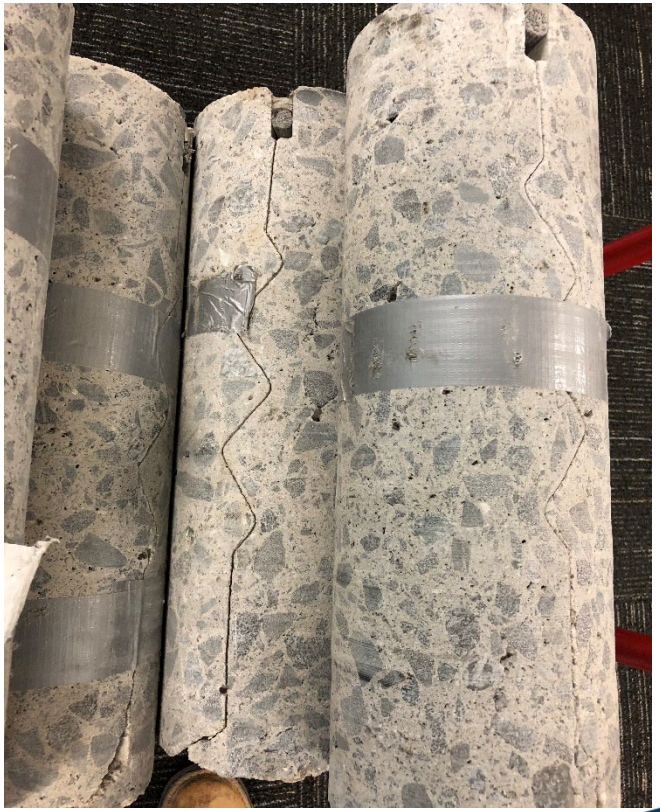
TWY Mike Rehab – Sinusoidal Joint



TWY Mike Rehab – Sinusoidal Joint



TWY Mike Rehab – Sinusoidal Joint



TWY Mike Rehab – Sinusoidal Joint

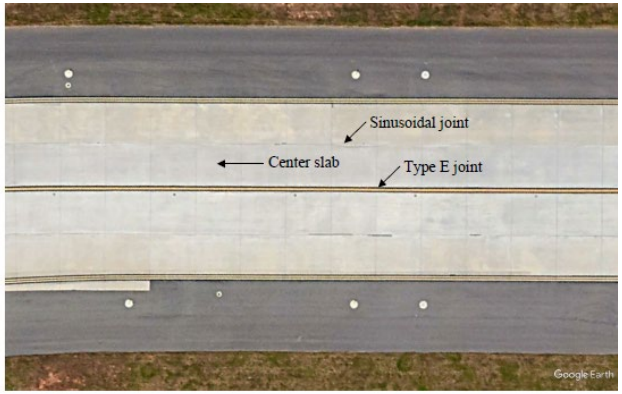
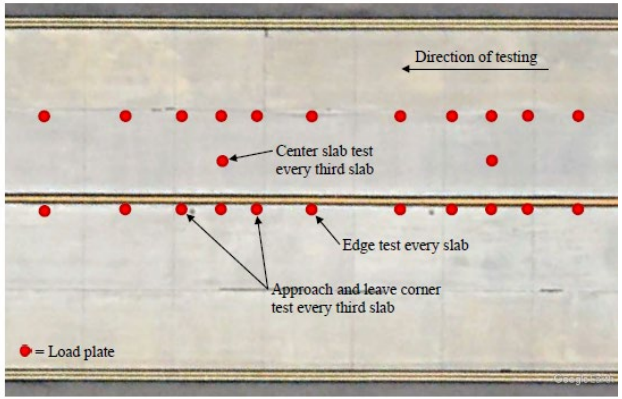
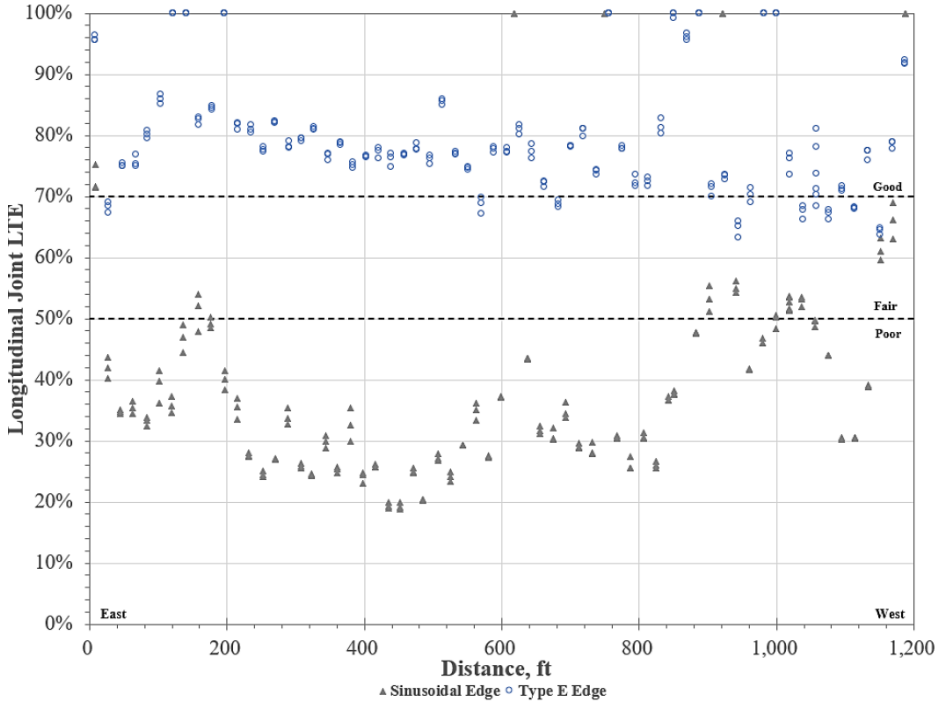
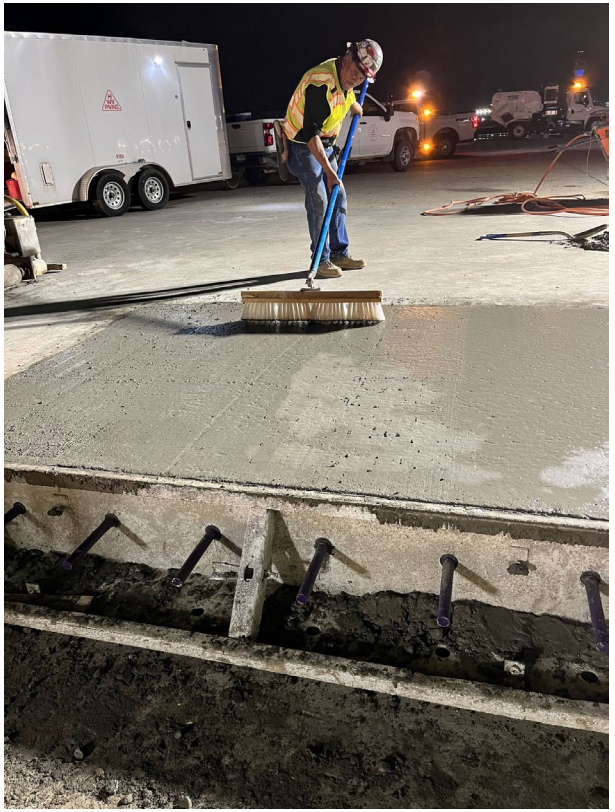


Figure 4. Overview of Taxiway M FWD testing lanes.

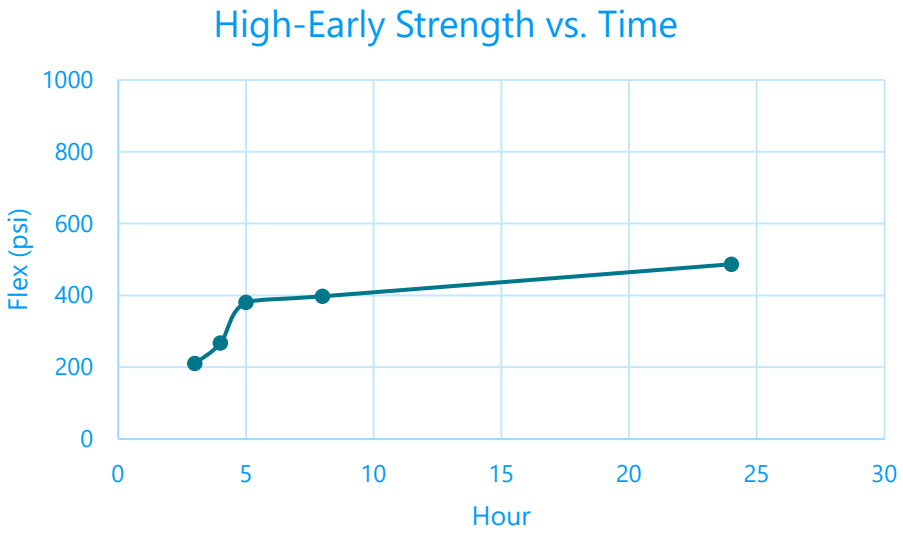


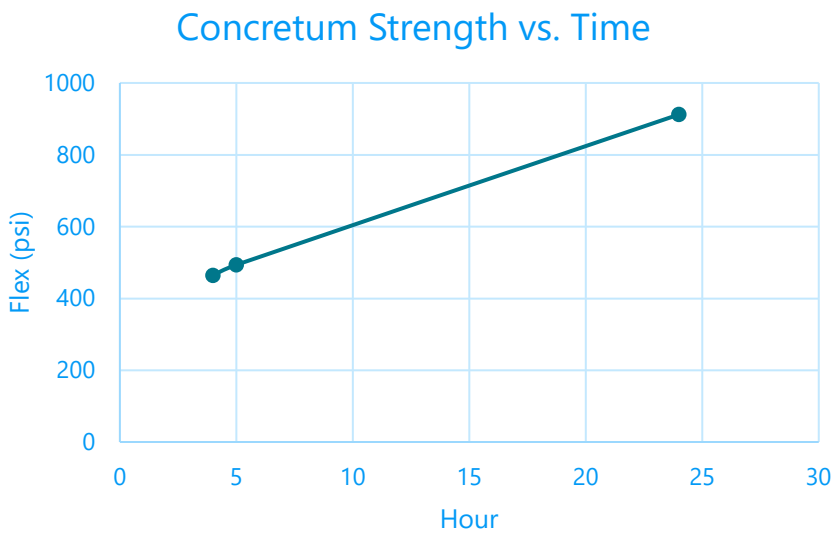


CONCRETUM



CONCRETUM


High-Early Strength vs. Time
Flex (psi)
1000
800
600
400
200
0
0
5
10
15
20
25
30
Hour


Concretum Strength vs. Time
Flex (psi)
1000
800
600
400
200
0
0
5
10
15
20
25
30
Hour

OTHER INITIATIVES

- **ACPTP-2021-2** Performance engineered mixtures for airfield pavements
- **ACPTP-2021-3** Best practices for rapid repair, rehabilitation, and reconstruction of concrete airport pavements
- **ACPTP-2022-4** Quality Control and Quality Acceptance of Airport Pavement
- **ACPTP-2023-8** Concrete Airfield Paving Continuity – Best Practices Guide

Charlotte Aviation Innovation and Research Institute

AIR

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https://youtu.be/Fh-GQNiunqU?si=wmBZ86nSkwj_tzVP

Thank you!

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