Chavani & The Fort Miller Co., Inc. (Exclusive License Agreement)

Applications for Super-Slab® in Southern Africa Precast Concrete Pavement

RPF Durban, May 20, 2014

Frikkie du Plessis

CHAVANI (PTY) Ltd

SUPER-SLAB®

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Important to Remember

- Precast pavement will never compete directly with cast-in-place pavement
- Precast pavement is a “tool in the toolbox” that allows pavement managers to maintain existing concrete pavements
- It’s also a way to turn some asphalt pavement into concrete !

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Reasons (Litmus Test) for Using Precast Pavement

- Heavy traffic
  - Requires most durable repair
  - Urban arterials most likely candidates
- Long term detours are not an option
  - Access ramps, intersections prime candidates
- Traffic volumes require short work windows
  - If you have only 8 hrs., you need to strongly consider precast pavement
  - If you have only 5 hrs., precast likely your best option

Why Precast Pavement Is Important To DOTs and Public Works Departments

High-Traffic Areas with Short Work Windows

145,000 ADT

I-287, Tarrytown, NY

180,000 ADT

Cross Bronx Exp.

162,000 ADT

Brooklyn-Queens Exp.

To Repair What's Out There Right Now - Failed Pavement !

Shattered Slabs

Failed Rapid Set Patches

Heavily Faulted Slabs

Urban Arterial & Intersection
Pavement in Poor Condition

50 Year Old Pavement

Poor Surface Drainage

Many Utilities

Shoved Black Top

Grade-Supported, Bottom-Slot Super-Slab® System

- Simple slab-on-grade system
- Standard dowels and tie bars (JRCP)
- Built-in bedding grout distribution
- Precision grading equipment
- Planar and warped surfaces
- 15,000 + slabs = over 2,000,000 sq.ft. installed

(100+ projects, 33 lane-miles completed in United States and Canada)

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Field Installation Process

- Lay out slab locations and limits
- Cut and remove existing slabs
  - May be a single or a multiple of single slabs
- Install load transfer dowels and tie bars
- Place, grade and compact bedding material
  - Mainline or ramps
- Place slabs
  - At specified locations
- Install dowel and bedding grout
- Grind (if necessary) to achieve smoothness requirements

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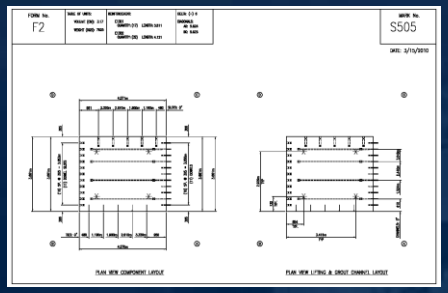
Controlled Fabrication Conditions

Forms Accurate to 1.5mm ±

Roller Screed Insures Accurate Top Surface



Accurate Piece Drawings

(every dimension critical)

Ideal Finishing (and curing) Conditions

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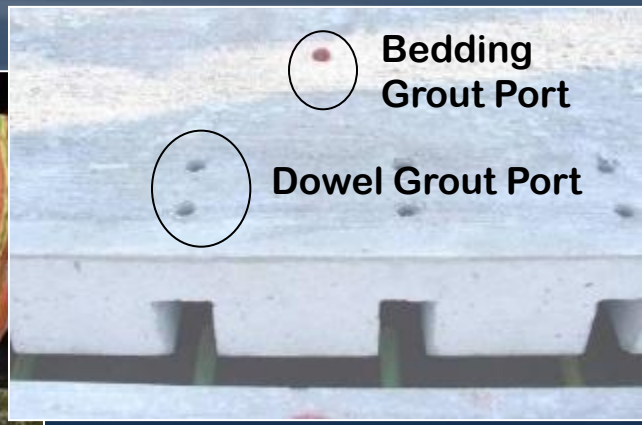
Dowel and Tie Bar Connection

- Slots on the bottom distribute grout evenly
- Dove tail slots provide resistance to dowel pop-out



Dowel Grout

2500 psi before traffic

Bedded (primarily) With Precisely Graded Fine Aggregate Material

SIZE	WCS
#4	99
#8	88
#16	65
#30	37
#50	15
#100	5
#200	1.8
FM	2.91

Fine Bedding Material

- **Fully compacted subgrade**
- **Acts as cushion on CTB**
- **Bond breaker between CTB and new slabs**
- **Provide grade control for new slabs**

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Benefits of Super-Grading

- Provides accurate grade control for slabs
  - Set slabs only once
- Super-Slab system Provides “nearly complete” subgrade support without grout
  - Slabs can be opened to traffic right away
  - Minimizes volume of bedding grout required
- Allows un-grouted slabs to be used immediately

Bedding Insured By Filling Voids (if they exist) With Bedding Grout

Installing Bedding Grout

- Used only to fill voids
- Flow rate : 17 – 20 seconds
- 600 psi in 12 hours

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Indicators for Long Life!

Full scale load testing in California

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Falling Weight Deflectometer

Test results show no cracks or distress

Heavy vehicle simulator

143 Million ESALs (100 KN Load)

4.3 Million Cycles

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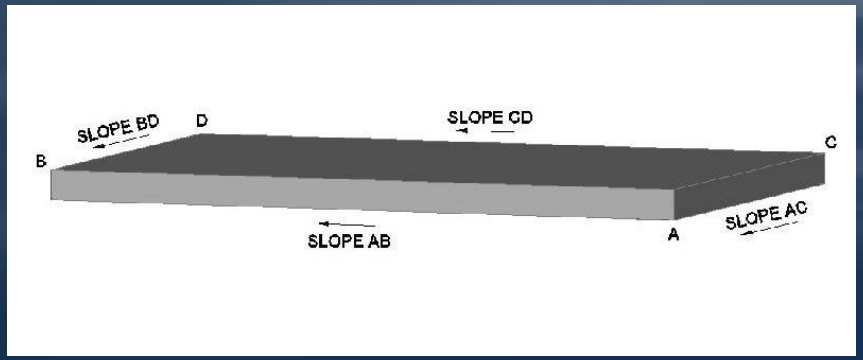
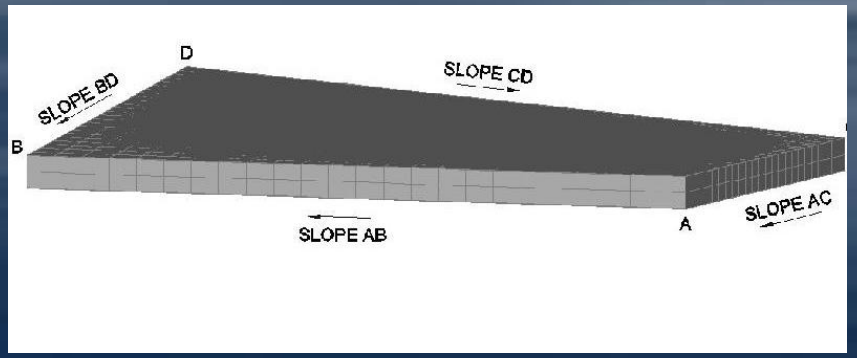
Slab Surface Geometry





Single Plane

- Slopes of opposite sides are equal

Warped Plane

- Slopes of opposite sides are un-equal

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Problem Spots Easily Solved with *Super-Slab®*

(Completed Projects)

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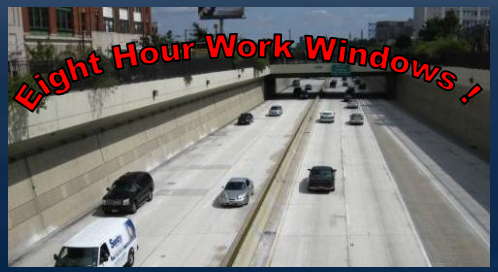
Intermittent Repairs (Patching)

I- 90

Albany, NY

(2004)



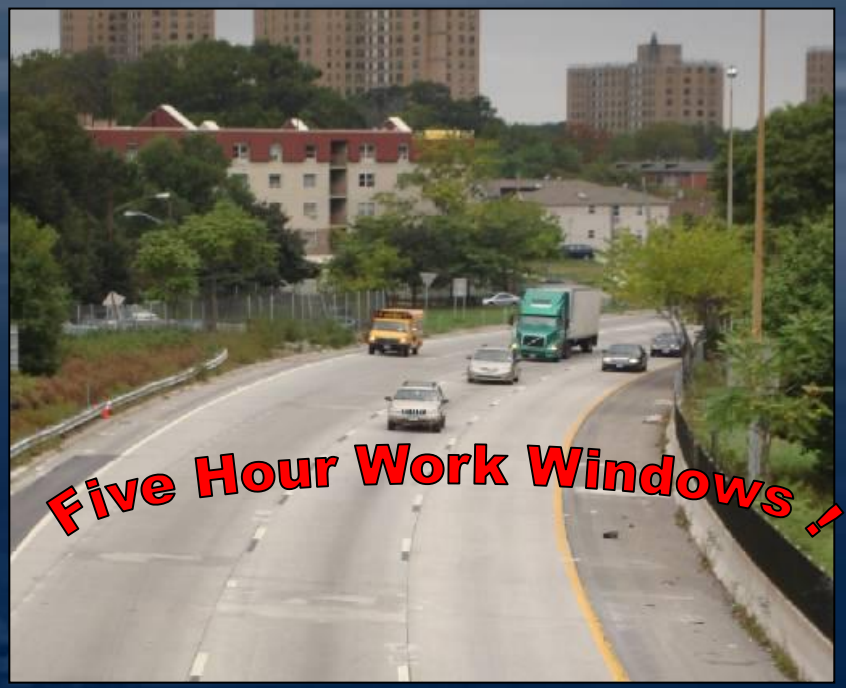
I-676 Vine St Expressway

Philadelphia, PA

(2009)

I-15 Salt Lake City, Utah

(2012)



I-95, New Rochelle, NY

(2007)

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Mainline (continuous) Replacement

Mainline I-15, Ontario, CA

(200,000 VPD)

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Toll Plazas
(Tappan Zee Bridge Toll Plaza)

This

(3,000 SF Per Eight Hour Shift)

(Within ± 3mm accuracy)

In 2001 and 2002

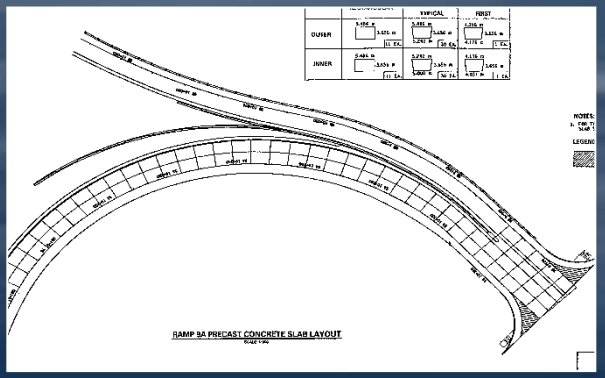
While Maintaining

This

(135,000 Vehicles per Day)

Ramps and Ramp-Termini

Chicago, Il



Plan View Tarrytown

Brooklyn, NY

Tarrytown, NY

Intersections – Replacing Composite Pavement, – Rotterdam, NY - 2006

New & Old

Complex Geometry

Undercuts

Replaced in 17 Nights!

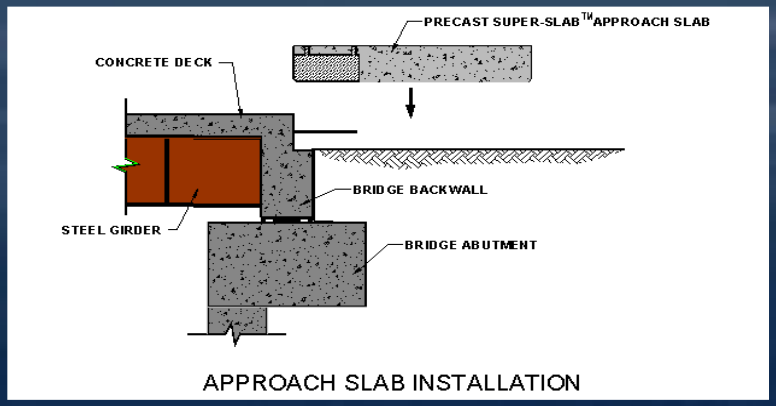
Intersection Approaches – Replacing Full Depth Asphalt

Farmers Blvd

Guy R. Brewer Blvd.

Intersection Approaches Only
Rockaway Blvd., Queens, NY, 2010

Bridge Approach Slabs (Existing Bridges)



APPROACH SLAB INSTALLATION

Cross Section at Abutment

Binghamton, NY (2009)

NY State DOT

Bus Bays, Hollywood & Santa Monica Blvd.
North Hollywood, CA

Grading

Placing

Last Slab

Finished, Next Day

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Industrial & Commercial Driveways

City of Mamaroneck, NY

Continuous Access During Construction

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Airport Taxiways

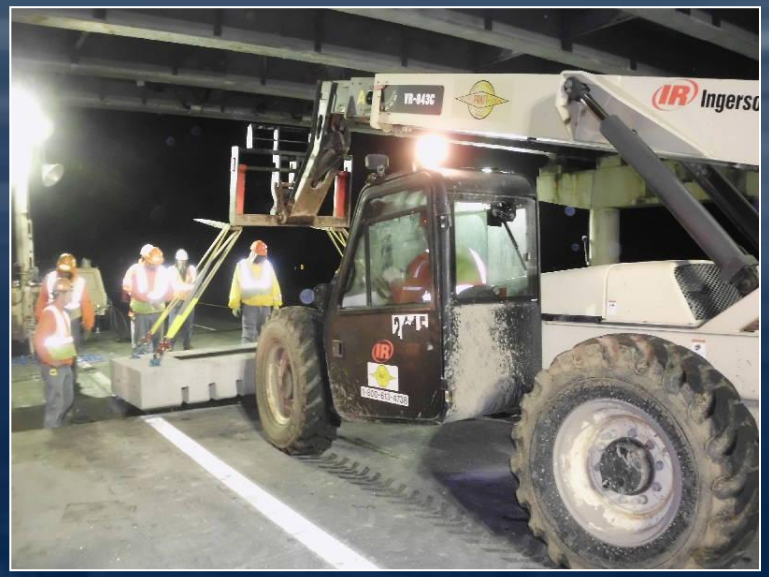
Dulles International Airport

October - 2002

Overnight Installation

Other Places for Fast-Track Precast Pavement

- Toll Plazas
- Weigh in Motion Stations
- Round-Abouts
- Utility corridors
- Bus Rapid Transit Routes
- Airport Aprons, Runways & Taxiways
- Container Terminals
- Warehouse parking areas
- Climbing Lanes on Roads with heavy traffic



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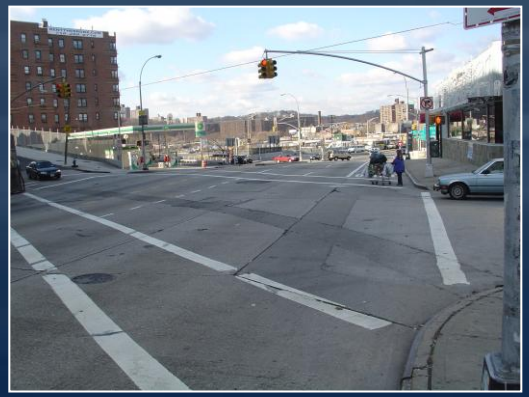
What about Utility-Intensive Roadways and Intersections?



Bronx

Manhattan

Queens

New York City Intersections

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What's Underneath – That Must Be Maintained

(Underneath Boston Central Artery)

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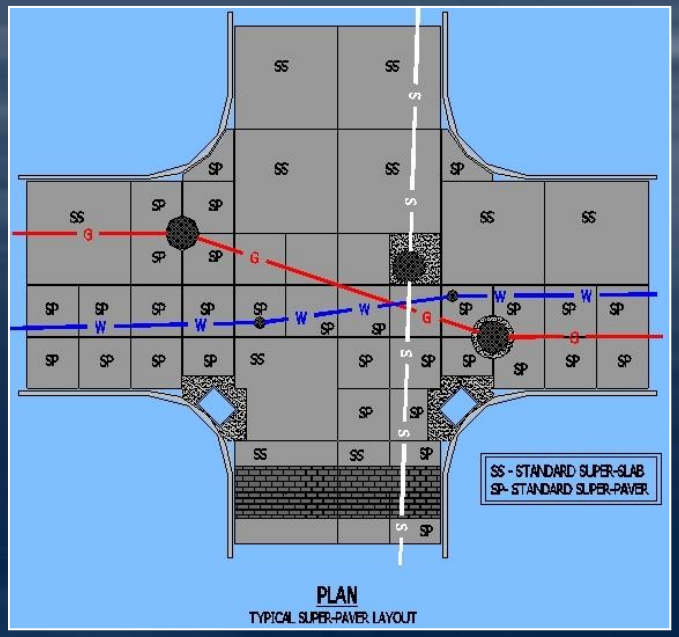
A Better Alternative

First Avenue, NY City, NY



Size Slabs as Needed

Precast Slabs

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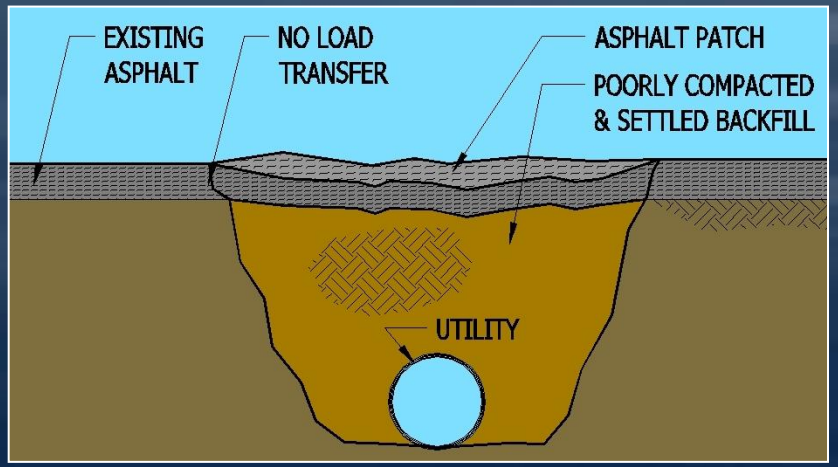
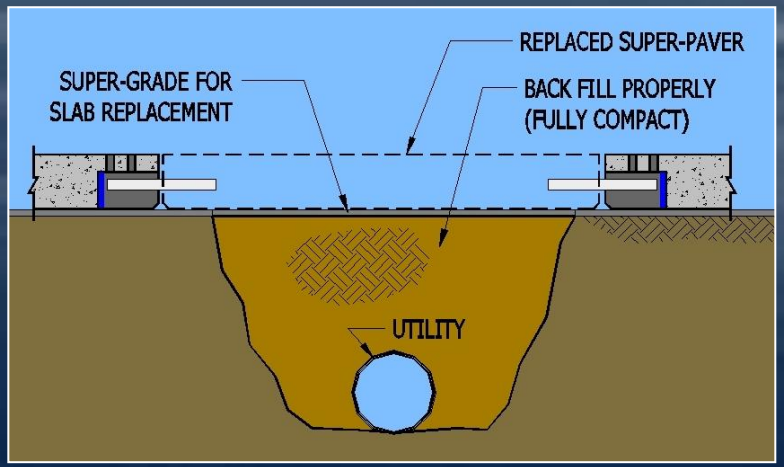
Replacing Pavement



Asphalt Repair



Precast Pavement – a Better Repair

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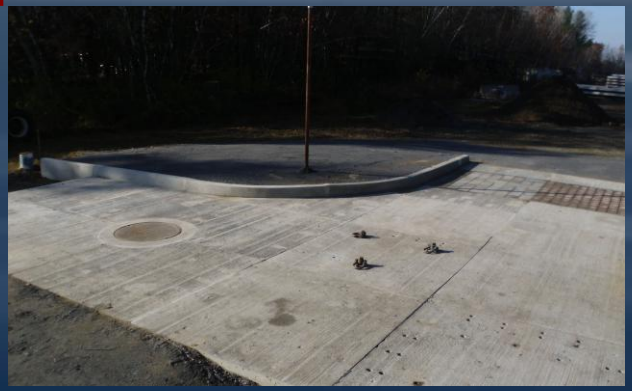
Newest Innovation :
Removable Urban Pavement



First full-scale project scheduled for installation in NYC 2014 at Broadway Junction

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The Super Paver System

Prototypical Slabs

- Light weight
  - 6’ x 6’ weighs 2 T
- Vertically removable
  - Remove only what’s needed
- Warped as required to fit any surface

- Removable and reusable

(Designed specifically for utility-intensive urban highways and intersections)

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Installation

Each Paver Set To A Mark

Independent Dowels Placed in Slots

Accommodating Man Holes

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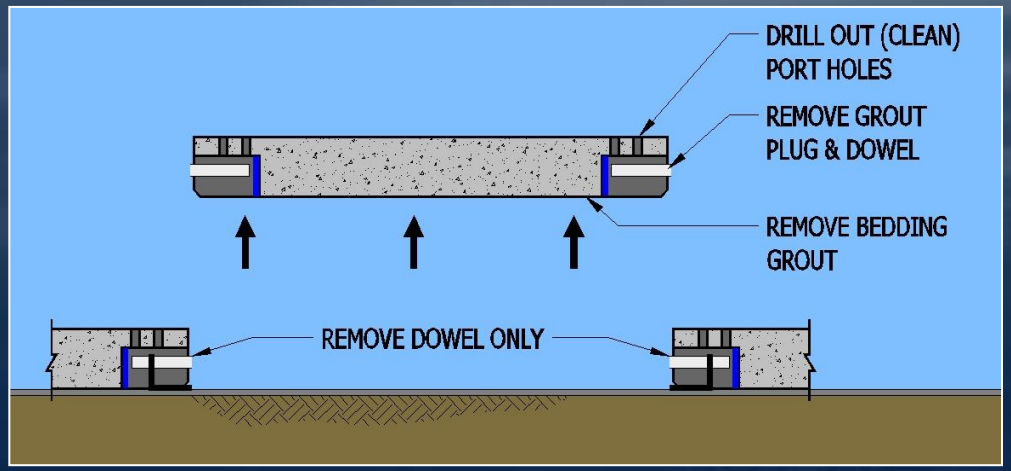
Slab Removal – Step 2



Steps for Removal

Removal

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Installing New Slab (Step 7)

One Man in Each Corner

Be Sure Surfaces Match Before Unhooking

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Smoothness is Imperative!

- Small differences are expected
  - Fabrication tolerance
  - Grading tolerance
- Super-Slab® finished surfaces ± 3mm
  - May be acceptable for slow speed traffic
- Grind for best International Roughness Index (IRI)
  - Diamond Grinding is an accepted and cost-effective practice

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Pavement (Asset) Management Strategies With Precast Available

- Use quality material (precast) every time
  - You won't have to replace it (for 40 years)
- Use maintenance Rands for good repairs, not temporary ones
- Consider life cycle rather than first costs
- Rather than patching, consider "intermittent total replacement"
  - Keep adding on to good precast repair slabs
- Consider "re-usable" precast pavement in utility-intensive areas
- Consider Lane Rental cost

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Benefits of Precast Pavement

Reduce construction-related traffic congestion

Longer lasting pavement repairs – Asset Preservation

- 40+ years
- Reduced (long-term) repair costs
- "Get in, get out and stay out"
- "Incremental Total Replacement" – now possible

Reduces field inspection time and cost

- Precast slabs – plant inspected

Pre-engineered, pre-inspected slabs result in a superior finished pavement

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Precast Pavement

Is

Premium Pavement Under Pressure

A Good Tool For Difficult Locations

Keys to Success
(Still More to Learn)

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Good engineering

Open minds

Real partnering