Case Study: Concrete Pavement

Florida Department of Transportation, District Seven

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FDOT Interstate Construction Project Manager

Case Study: Concrete Pavements

District Seven's Interstate Program

- Aggressive program to reconstruct and rehabilitate all Interstate systems in District Seven's Tampa Bay area
- Interstates 4 and 275 originally built in the 1960's
- Program began in the mid 90's in rural areas
- Progressed to urban areas

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Scope of work included:

- Complete Reconstruction
- Vertical and Horizontal Alignment Changes
- Rehabilitation
- Safety enhancements
- Operational Improvement's
- ITS

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- Existing Interstates were built using Concrete pavements

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- Reconstructed Rural Interstates utilized Asphalt for pavement structure

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- Reconstructed Urban Interstates utilized Concrete for pavement structure

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- Non-reconstructed Interstate received rehabilitation of existing concrete pavements and safety enhancements

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- District Seven decided that all Urban Interstate systems will be reconstructed utilizing Concrete Pavement
- Existing Interstates utilized Concrete Pavements and have been in service for 40 + years with little maintenance needs
- Traffic Volumes AADT's 160,000+
- Longevity of pavement
- Reduced impacts over the time and reduced maintenance needs

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Junction of I-275 & I-4 (operational improvements and safety enhancements)

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I-4 from I-275 to 50th Street (US 41) (complete reconstruction)

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I-275 from Roosevelt Boulevard to the Howard Frankland Bridge (complete reconstruction)

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I-275 from Downtown Tampa to Busch Boulevard (rehabilitation / safety enhancements)

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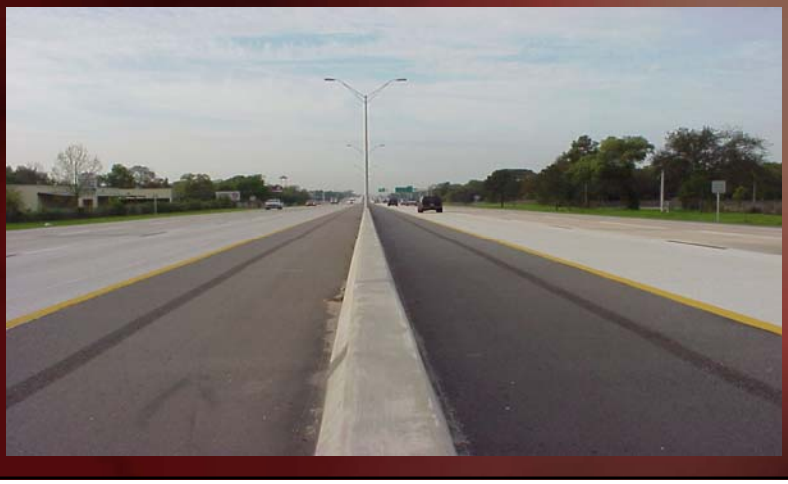
I-275 from Busch Boulevard to Bearss Avenue (rehabilitation and new lanes)



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- Original projects evaluated slab distress utilizing Rigid Pavement Design Manual
- 60 % of slabs met criteria for rehabilitation, mostly joints
- Rehabilitation exceeded original budget projections
- Plans were unclear and did not note specific slabs to rehab
- Rehabilitation scaled back and criteria revised to work only the worst slabs

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- The District 7 developed the "Concrete Pavement Rehabilitation Strategies and Techniques Guidelines" for use by Designers and Construction personnel

Concrete Pavement Rehabilitation Strategies and Techniques
District Seven Guidelines
May 2001

1. The Consultant/In-house Pavement Designer will hold two field meetings with the following personnel: District Maintenance (District Roadway Services Engineer), Resident Field Office (Project Engineer) and District Pavement Design Engineer or designee. The first meeting is to occur upon the Phase IV Plan submittal to review slab inventory and design intent. The second will occur upon commencement of construction and will include the contractor to verify existing conditions and ascertain design intent.

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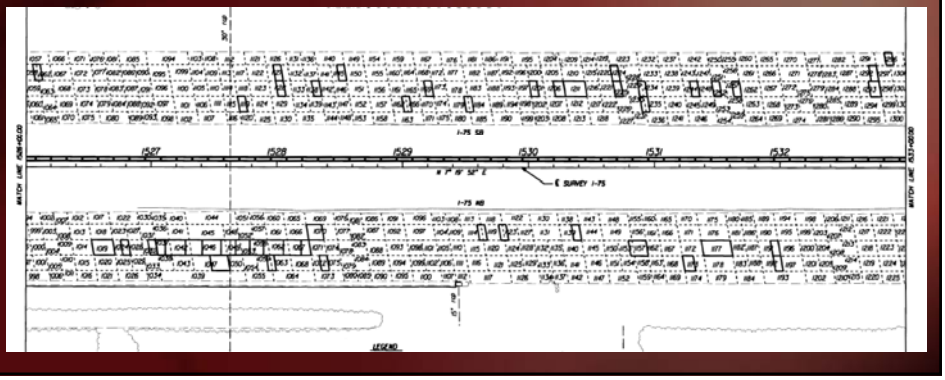
- Required designers to evaluate in the field and identify slabs during the design process



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TECHNIQUES

Typical operations

- Saw cut and remove slab, drill dowels holes, slab can be set back in place

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TECHNIQUES

- **Prep subgrade, drill (if not already done) and place load transfer dowel bars**

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TECHNIQUES

- **Most Contractors use gang drills to increase production**

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TECHNIQUES

- Pour area with high early strength concrete

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TECHNIQUES

- Screed and finish (work quickly!)

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TECHNIQUES

- **Cure for 6 hours**

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Lessons Learned

- **Use of Maturity Meters for compressive strength**
- **Past Rigid Pavement guidelines noted that a distressed joint would require a full width 6 foot replacement on each side of the joint**
- **Made a change to rehab the joint by centering the 6 foot slab on the joint**
- **Both sides of the joint rehabilitated**

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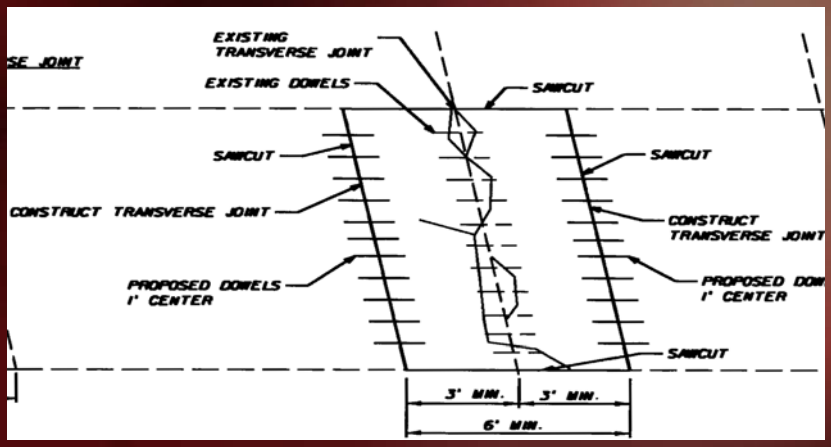
- Center 6 foot (min.) on the joint



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Maintenance of Traffic

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- Shifting of existing lanes must be considered

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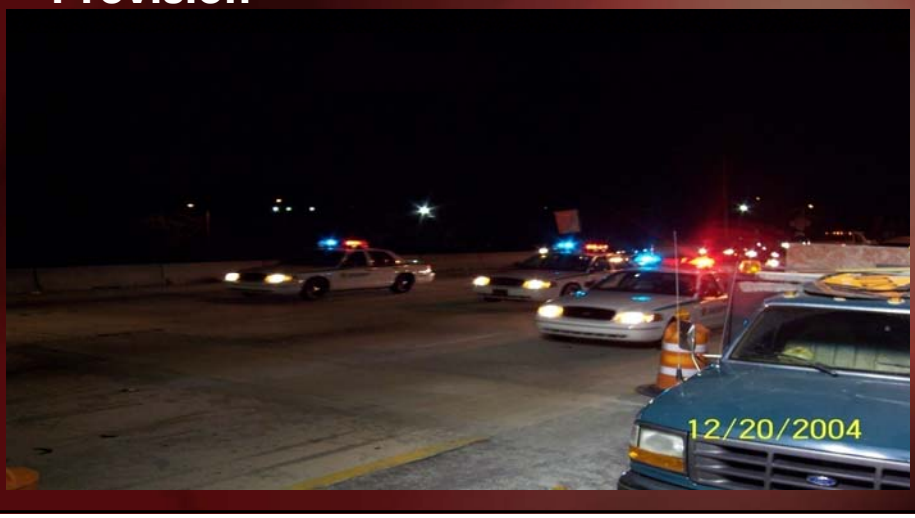
- Traffic Pacing Technical Special Provision



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- Used due to high volumes of traffic throughout the day periods and in to the night periods
- Necessary to move equipment and materials in and out of the work zone
- Also used to set-up initial lane closure taper and to set overhead sign structures

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- TSP allows for up to twenty minutes
- Must be managed and should strive for less impact time
- TSP should be precise in detailing what items the pacing should be used for and how long
- Number 1 complaint received ☹

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- Access to medians

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Traffic Pacing in action

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New Concrete Pavement

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I-4 Project Data

- 5,921 Sy. Meters of 290 mm Of Ramp Paving
- 7,071 Sy. Meters of 260 mm Of Ramp Paving
- 113,065 Sy. Meters of 330 mm Mainline Paving
- 225 + Pours
- 40,000 + Cubic Meters of Concrete Used
- $81 / M2

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Equipment
Gomaco 9500 Trimmer

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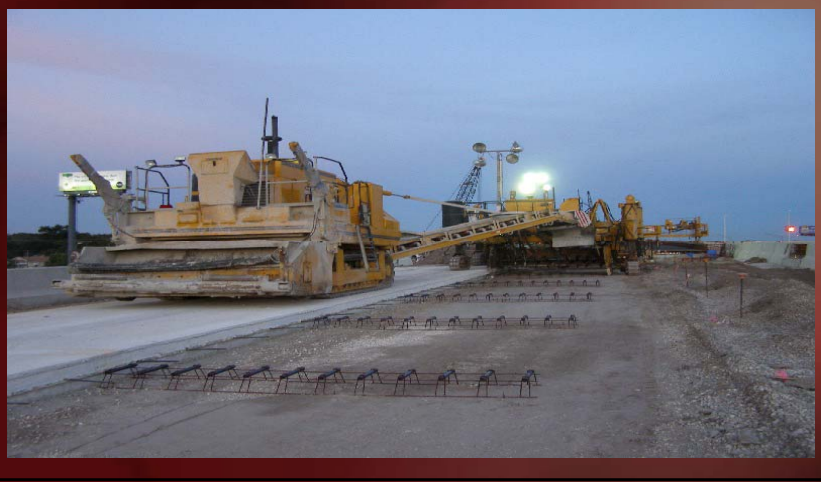
Equipment
Gomaco 9500 Placer



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Equipment
Gomaco GT 6300 Paver

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Gomaco TC600
Cure / Tine Machine

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Mixing 6 Inch Top Section

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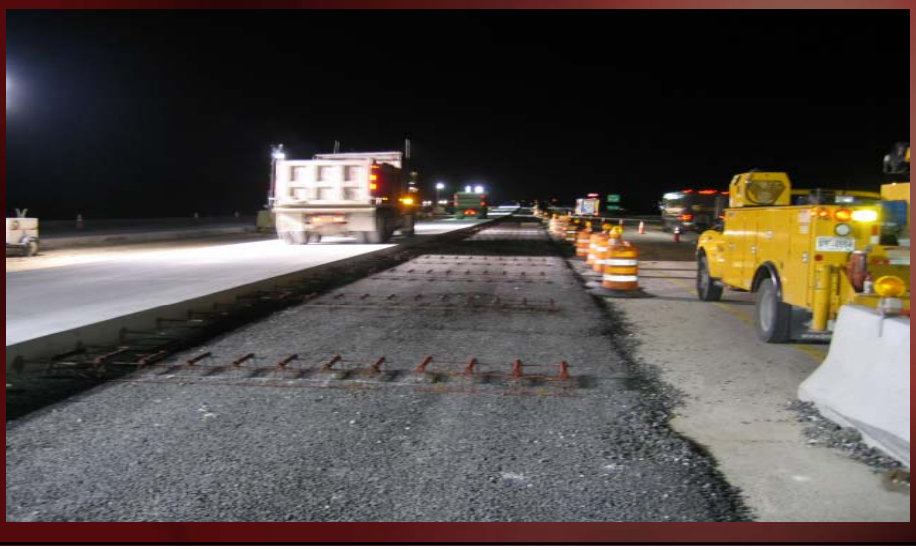
Asphalt Treated Permeable Base (ATPB)



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Cement Treated Permeable Base (CTPB)

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Compacting CTPB

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Control Wire Line

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Completed Sub-Base

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Dowel Baskets

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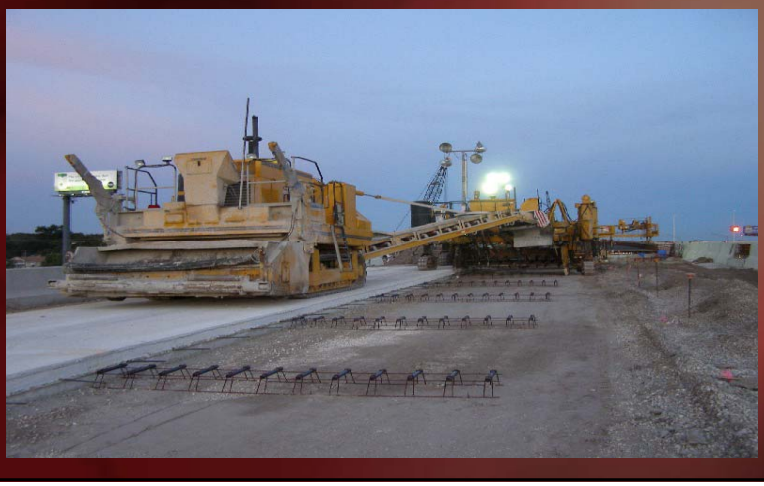
Preparing to Pave



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Preparing to Pave

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Electronics

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Wireless Electronics

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Loading the Trucks (onsite batch plant)

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Loading the Trucks (offsite batch plant)

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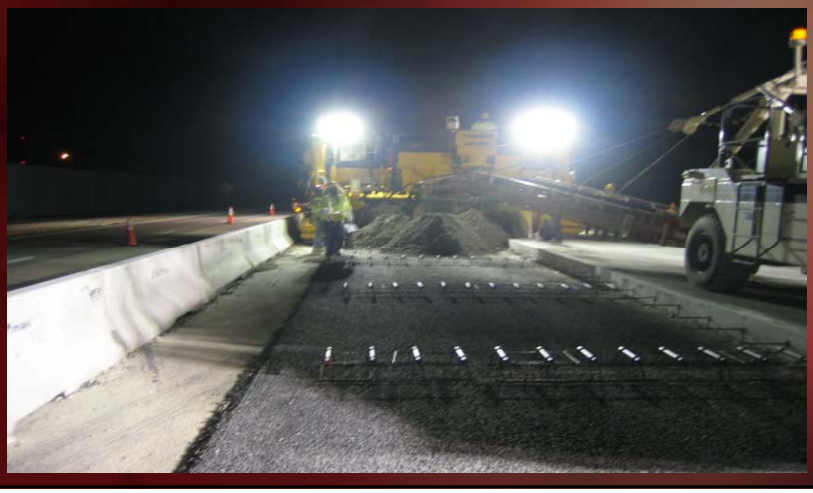
Delivering the concrete to the paver



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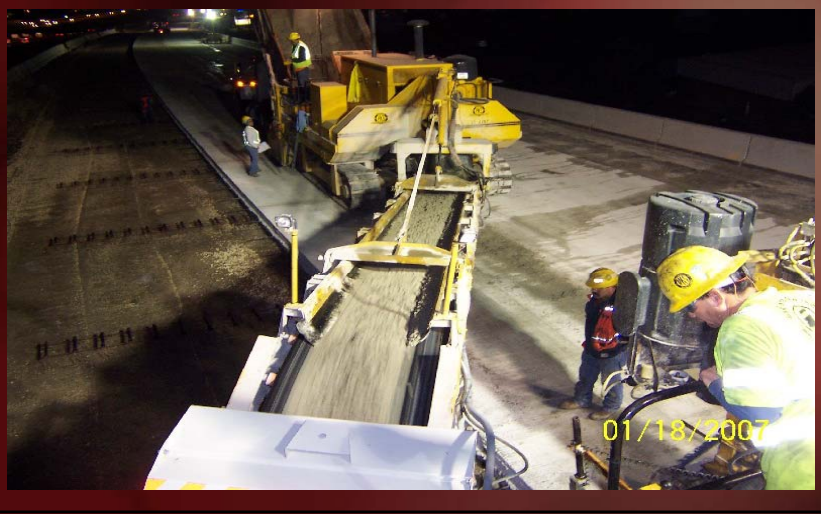

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Paving

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Paving

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Cross Slope Check

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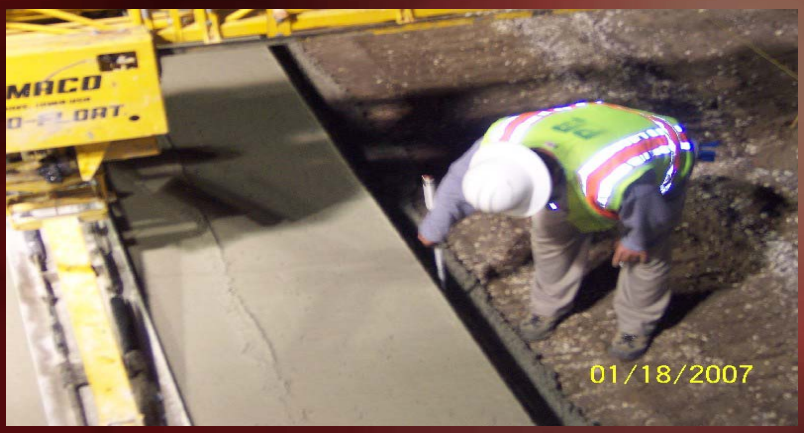
Depth Check



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Top Elevation

200mm offset

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Checking Alignment

1.7 m offset

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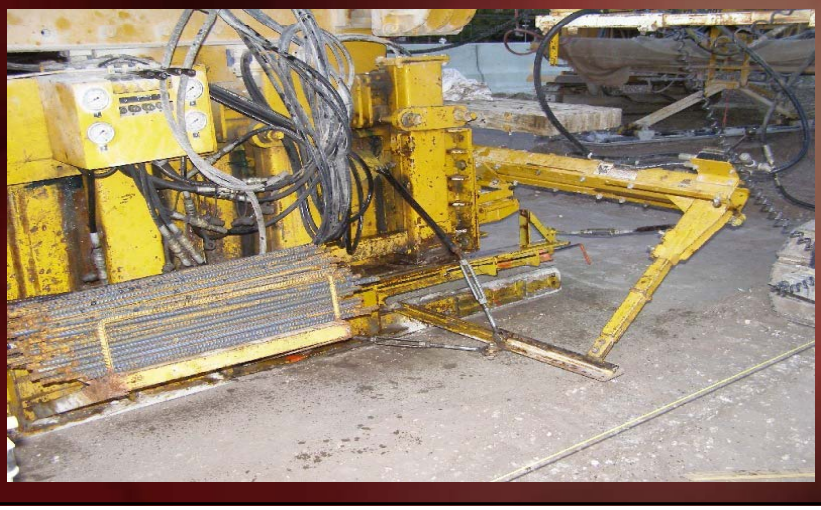
Bar Shooter



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Keyway and Lane Tie Bar

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Finishing

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Curing Compound

200 Sq Ft per gallon

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Saw Cutting Joints

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Saw Cutting Joints

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Grinding

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Profilograph and Grind

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Profilograph

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Challenges

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Challenges

- **95% Night Work**
- **Concrete Materials Shortage**
- **Concrete Delivery in Tight Areas**
- **Inexperienced Labor**
- **Lack of Supervision on Follow Up Work**

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Challenges

- **Haul Roads**

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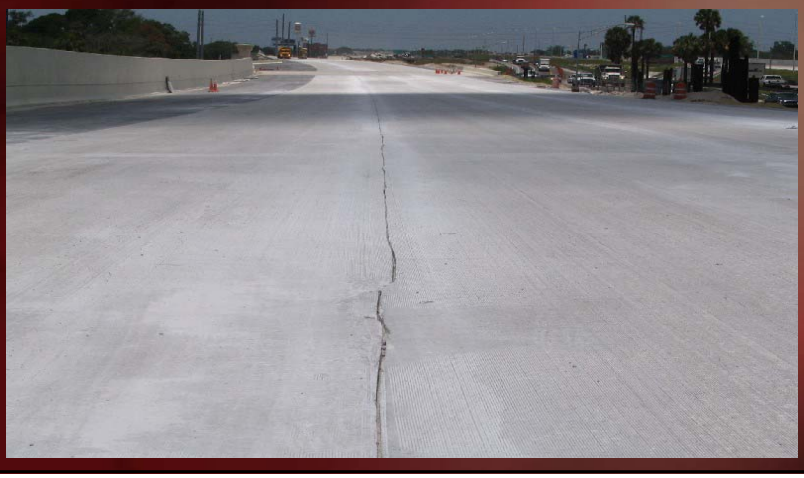
Challenges

- **Crooked Joints**



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Challenges

- **Ragged Edge**

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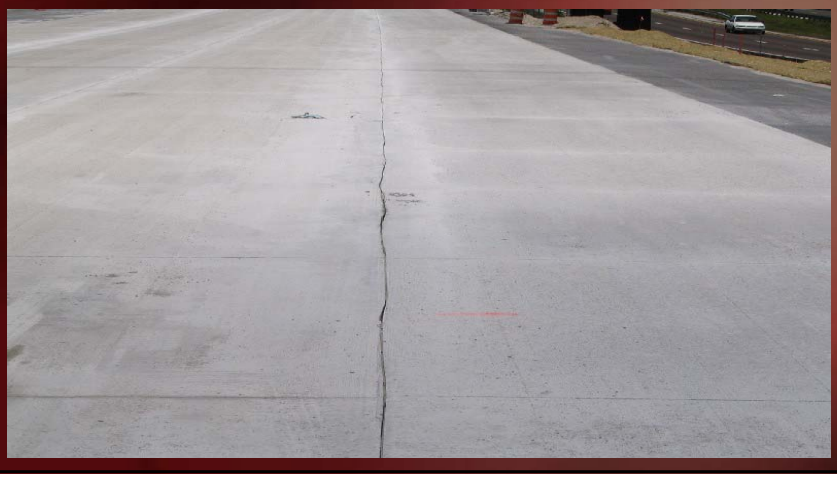
Challenges

- **Bad Saw Cuts**



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Challenges

- **Lane to Lane Joint**

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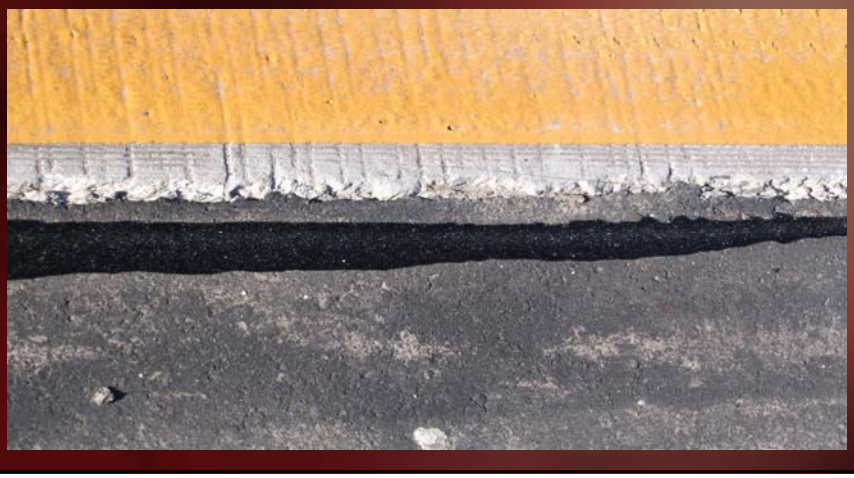
Challenges

- **Saw Cut in the Wrong Spot**



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Challenges

- Grinding to Deep

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Challenges

- Inconsistent Cross Slope

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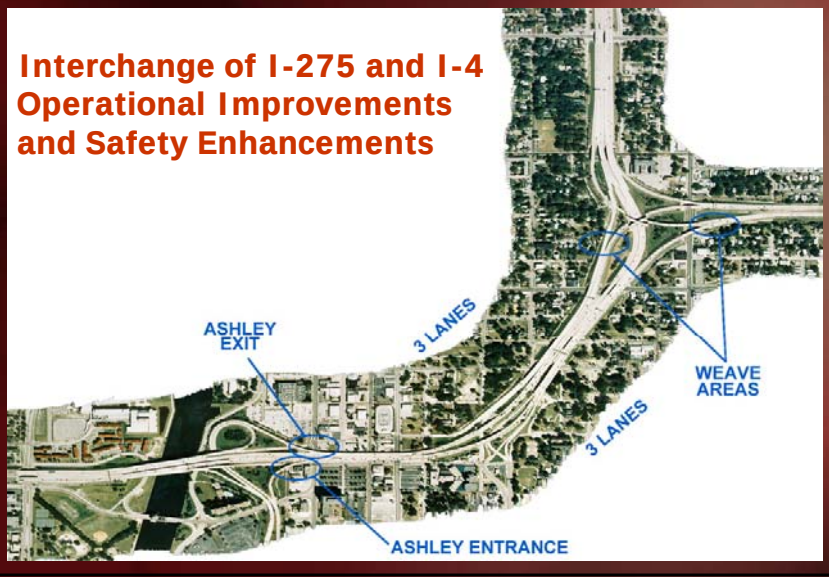
Interchange of I-275 and I-4 Operational Improvements and Safety Enhancements



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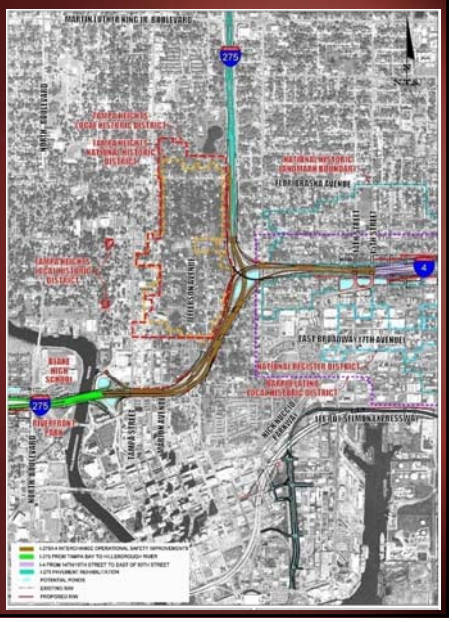
- **Downtown Traffic will be Separated from Through Trips**
- **The I-275 to I-4 Flyover Ramp will be Relocated as a Right Entry to Reduce Weaving on I-4**
- **Ashley Street Entrance will be extended on I-275 to I-4**
- **Includes Landscaping and Aesthetic Treatments**



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Project Scope:

- Existing pavement was rehabilitated
- Extensive widening to create additional lanes
- Variable widening to soften curves
- Profile grade changes

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- An extremely challenging project
- Mixture of new widened concrete pavements and rehabilitation of the existing pavements
- Extremely heavy volumes of traffic
- In the heart of Downtown Tampa's business districts and residential neighborhoods
- Little "New" right of way

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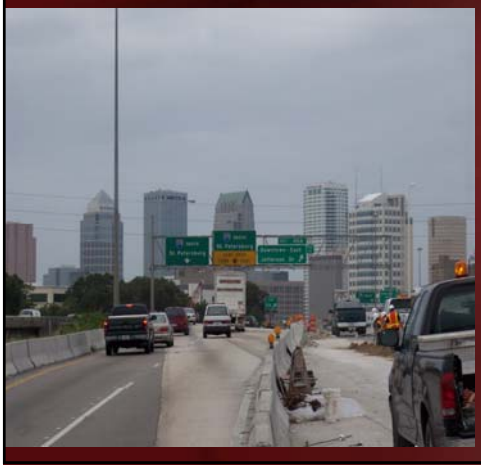
Challenges

- **Difficult excess to work areas**



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Challenges

- **Profile Changes**

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Challenges

- **Profile changes**

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Challenges

- **Tight Spaces**

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- **Tight work areas and maintenance of traffic limited delivery of materials to "off-peak" periods**
- **Contract duration must be considered when planning and designing projects with these types of constriants**
- **Profile changes must be considered from a maintenance of traffic stand point**
- **Survey the existing conditions, especially bridges**

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Challenges

- **Mixture of new pavements and existing pavements**

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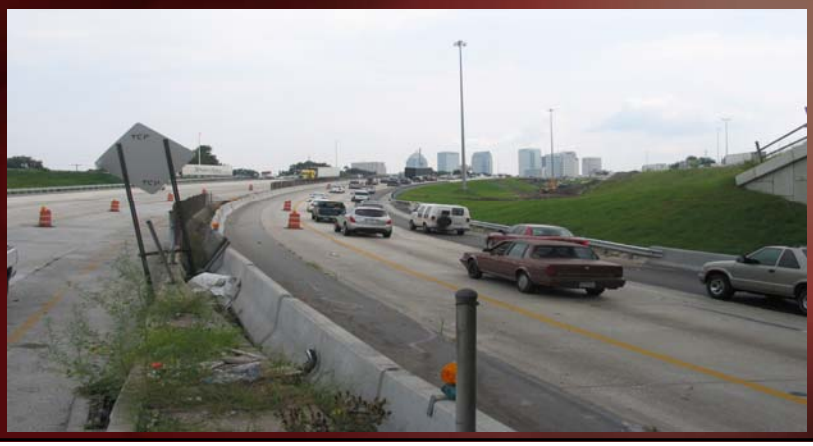
Challenges

- **Maintenance of traffic complicating rehab operations**



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Challenges

- A piece at-a-time! Existing, new and temporary asphalt

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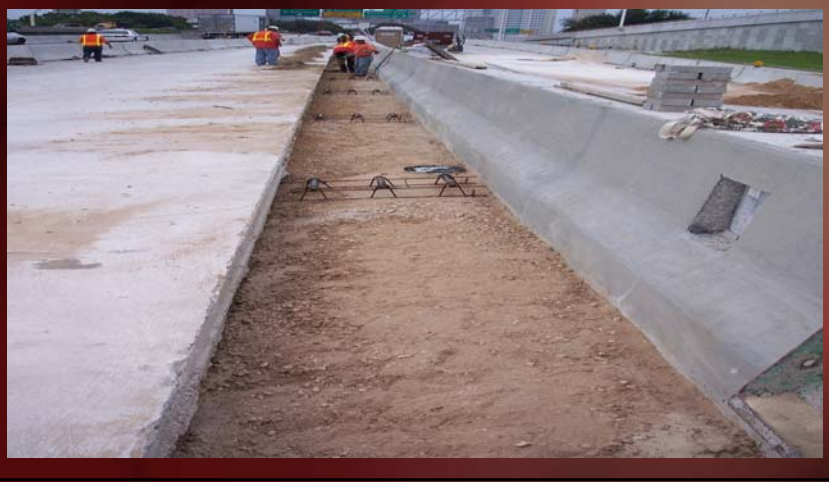
Challenges

- Small areas



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Challenges

- **Variable widening**

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Challenges

- **Variable widening**

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- Success!

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- Success!

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Other Unique features

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Architectural Treatments

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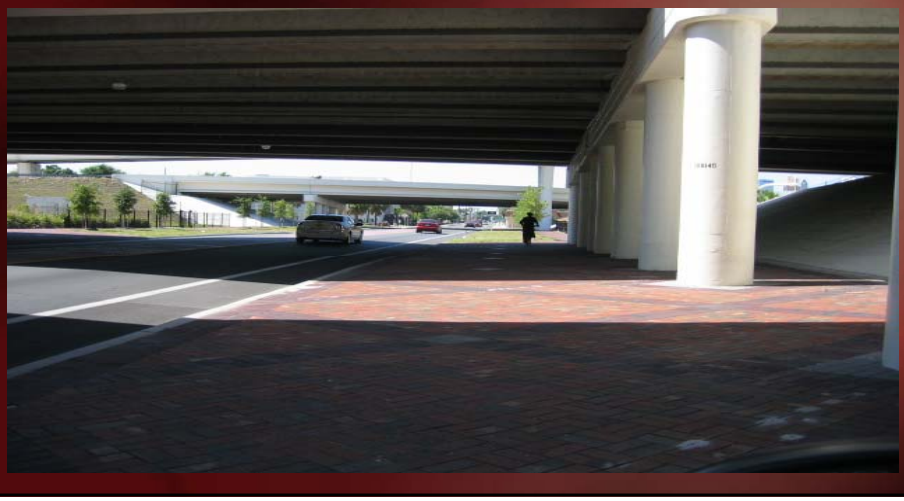
Hardscape Features



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