ACI 330.2R-17

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ACI 330.2R-17, Guide for the Design and Construction of Concrete Site Paving for Industrial and Trucking Facilities

12 years in development…

Why did it take so long?
– No one else would take on the project
– Committee of volunteers
– Consensus document
– And its more complex that you might first imagine…
ACI 330.2R-17: GUIDE FOR THE DESIGN AND CONSTRUCTION OF CONCRETE SITE PAVING FOR INDUSTRIAL AND TRUCKING FACILITIES

72 Pages in 10 Chapters and Appendix A to D
WHAT’S INCLUDED IN “INDUSTRIAL & TRUCKING FACILITIES”

- Standard trucks
- Industrial lift trucks
- Front end loaders
- Tracked equipment
- Straddle carriers
- Cranes
- Military equipment
- Buses & coaches
- Agricultural equipment
WHO DESIGNS INDUSTRIAL PAVEMENTS

- Owner / Architect:
  - Loads (vehicle count & growth)
- Geotechnical Engineer:
  - Thickness recommendations based on subgrade support
- Civil Engineer:
  - Concrete strength
  - Joint spacing
  - Joint details & load transfer
  - Drainage details & layout
- Structural Engineer
  - Reinforcement???
- Contractor
  - Construction method
  - Joint layout
“6.5.3.1 Mechanical screeding—Numerous pieces of equipment and machines have been developed for screeding concrete flatwork.”

- Slip formed
- Truss-Screeded; or
- Laser-Screeded
- ‘Magic’-Screeded; or
- Hand-Screeded
“Laser-guided screeds are useful in the construction of large block pavement placements.”

“6.5.3.4 Laser-guided screeds—Laser-guided screeds can be used to consolidate and strike off concrete to the proper grade and slope with great efficiency.”
HOW JOINTING CAN BE DIFFERENT IN INDUSTRIAL FACILITIES

• Pavement thickness can vary significantly in the same project
• More structures and embedment's to consider
• Construction methods can vary
  • Laser-screeding® in large blocks (with truck dumping of concrete or pumping)
  • Slipforming or vibratory-screeding in lanes
  • “Magic” or hand-screeding in complicated / tight areas
• Each joint type can occur in either the transverse or longitudinal directions
  • Two directional doweling
• All joint types can require load transfer devices
  • Construction, Contraction & Isolation
JOINT DETAILS

Fig. 4.4.2.1a—Isolation joint.

Fig. 4.4.2.1b—Transition between new and existing pavements with different joint spacing.

Fig. 4.4.2.1c—Transition between new and existing pavements with different joint spacing and thickness.

Fig. 4.4.2.1g—Thickened edge isolation joint.

Fig. 4.4.2.3—Transition between sections of pavement different thicknesses.

Fig. 4.4.3a—Joint sealant with backer rod.

Fig. 4.4.3b—Joint filling.

NOTES:
- **DOWELS SHOULD HAVE SQUARE ENDS AND EDGES AND BE DEBONDED.**
- **TOTAL COMBINED INSTALLATION TOLERANCE INCLUDES THE TOLERANCE FOR INSTALLING THE DOWEL BASKET ASSEMBLY AND THE SAW CUT ABOVE IT.**
- **THE MINIMUM DOWEL EMBEDMENT LENGTH VARIES FOR DIFFERENT GEOMETRIES.**
STREETPAVE™…FOUNDATION OF THE 330.2R-17 DESIGN TABLES

Table 4.2.4b – Thickness and joint spacing table for over the road trucks: k = 200 pci

<table>
<thead>
<tr>
<th>No. of trucks per day in the design lane</th>
<th>Modulus of rupture, psi</th>
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<td>500</td>
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<tr>
<td>1000</td>
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Note: Recommended thicknesses are based on specific joint spacing and positive load transfer.

“B.1.1 ACPA StreetPave 12—Although tailored for jointed plain concrete pavement (JPCP) thickness design for streets and local roads, this software (ACPA 2012) can be used to design the areas of trucking and industrial facilities that service primarily truck loads. Based on both mechanistic and empirical formulas, the software considers thickness design concepts, such as design reliability, concrete material properties, subgrade/subbase support, structural features such as dowel bars and edge support, and traffic to calculate an optimized concrete surface course thickness.”
"B.1.2 AASHTOWare Pavement ME Design—This software represents a state-of-the-practice design and analysis tool for concrete, with and without internal reinforcement, and asphalt pavements, overlays, and selective rehabilitation techniques. It features advanced analysis tools to calculate pavement responses as a function of load, local environment, materials, and pavement structure, including details such as drainage. Performance predictions, such as pavement smoothness and faulting, relate these computed parameters (mechanistic elements) to observed performance (empirical elements) over time."
OPTIPAVE™ (“TCPAVEMENTS”)

- Founded in I-Slab
- Developed by Juan Pablo Covarrubias with Lev Khazanovich
- Tested by Jeff Roesler at U. of IL
- 5’ to 8’ joint spacing (Pavement ME 10’ +)

“B.1.3 TCPavements—This software is mechanistic-based and specifically developed to design concrete pavements for any set of climate, traffic, subgrade/subbase layers, and material inputs…This methodology designs the concrete pavement thickness by optimizing the slab size to suit a given geometry of truck wheel and axle spacing.”
Old Concrete Design:
- AASHTO 93 - 9 ¼” with 15’ joint spacing

Proposed Design for Cost Saving:
- Asphalt throughout

New Design:
- Heavy Duty – StreetPave™ 7” with 12’ joint spacing
- Medium Duty – OptiPave™ 5.5” with 6’ joint spacing
- Light Duty – OptiPave™ 4” with 6’ joint spacing

800,000 s.f under roof
1,200,000 s.f. exterior pavement
SUMMARY

- 12 years in development
- Industrial is complex
- Designed and constructed by different groups
- Already in use & successfully switching asphalt to concrete
- Promotion underway…

…Please don’t let the ACPA, NRMCA & PCA unified design conflict with or contradict this document!
Thank you

Please don’t let the unified design conflict with ACI330.2R-17

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