morgan corp.

RCC Pavements Symposium | Fort Cavazos, TX, June 25, 2024

RCC Pavements Research and Case Studies

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CCT CEMENT COUNCIL OF TEXAS

RCC PAVEMENT COUNCIL

Presentation Outline

1. Introduction
2. Case Studies
   - ✓ Example Projects in the SE
   - ✓ Considerations to Maximize the Benefits of RCC Pavements
   - ✓ Mixture Design
   - ✓ Thickness Design
   - ✓ Site Civil Design
   - ✓ Construction Sequence and Coordination
3. Latest Research
   - ✓ Effects of percent void filled with paste on strength, compactability, stability, and finishability.
   - ✓ RCC thickness design for stacked containers

INTRODUCTION – RCC FOR PAVEMENT APPLICATIONS

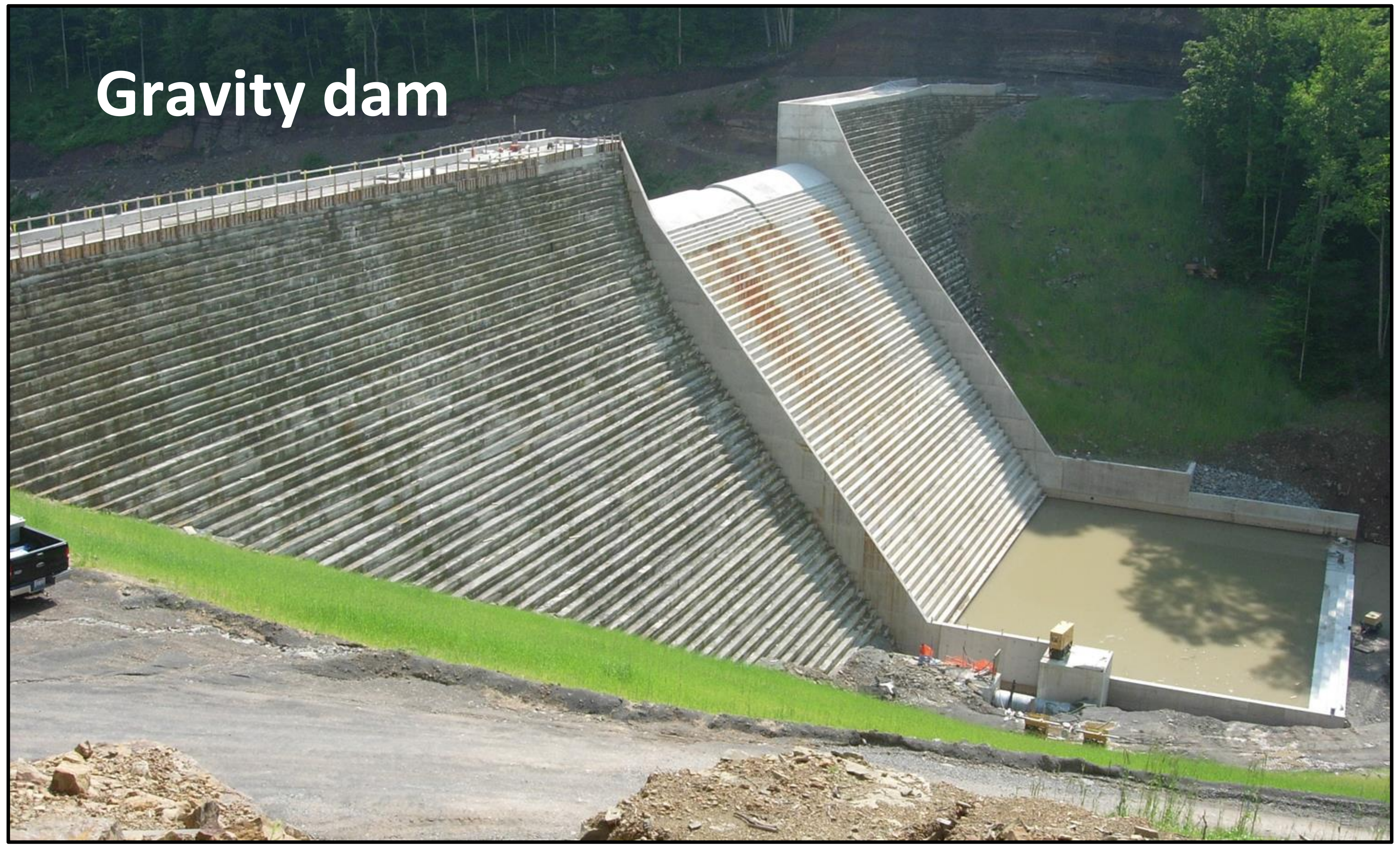

Haul road for an industrial manufacturing plant

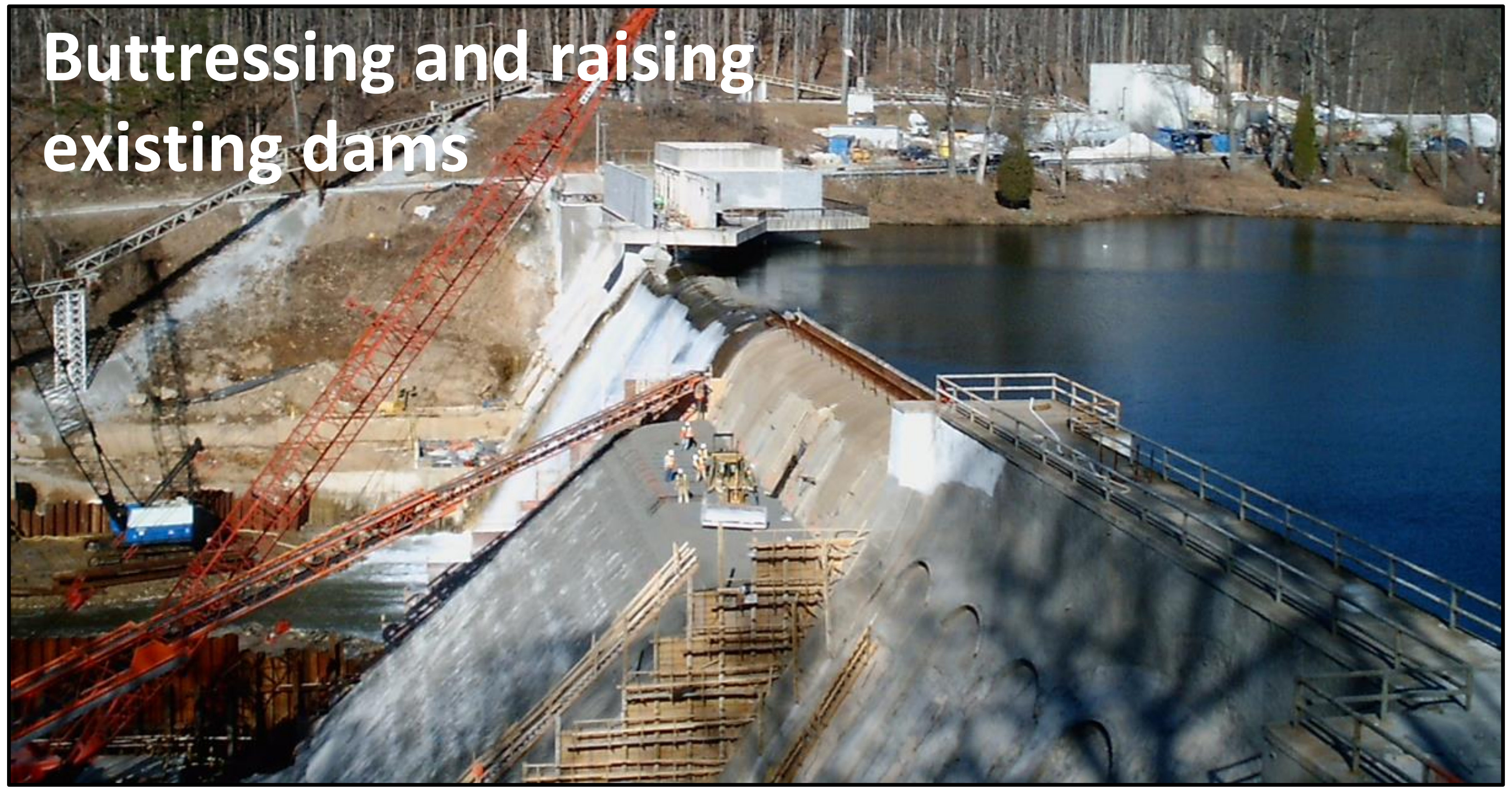

Container yard


Residential road


Distribution center

INTRODUCTION – RCC FOR WATER RESOURCES





RCC FOR WATER RESOURCES PLACED WITH PAVERS

Rattlesnake Hollow Ash Pond Dam Raise, Alabama

RCC FOR WATER RESOURCES PLACED WITH PAVERS

Potato Creek Embankment Overtopping Protection

WHAT IS COMMON IN RCC FOR PAVEMENTS AND FOR WATER RESOURCES?

- Materials
  - ✓ Aggregates, cementitious materials, water
    - ✓ But the two markets use very different mix proportions
  - ✓ Sometimes admixtures
- Equipment
  - ✓ Mixing plants
  - ✓ Compaction rollers
  - ✓ Paving machines (a few projects)
- Quality Control
  - ✓ Density and temperature testing during construction
  - ✓ Making and testing compressive strength specimens

HOW RCC FOR PAVEMENTS IS DIFFERENT FROM RCC FOR WATER RESOURCES?

- Mix engineering properties
- Blending aggregates
- Mixture design
- Structural design
- Transporting RCC
- Placing /spreading
- Compaction
- Jointing
- Finishing
- Curing

Engineers / specifiers should not mix specifications for the two markets

WHY CHOSE RCC FOR PAVEMENTS?

Benefits

- Cost savings
- Fast construction
- Early opening to traffic
- Low maintenance
- High load carrying capacity
- Sustainability attributes
  - ✓ Durability
  - ✓ About 10% reduction in cementitious content vs. PCC

https://www.youtube.com/watch?v=mfkprEuFg6o

Why not consider RCC for pavements?

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EXAMPLE PROJECTS-AUTOMOTIVE MANUFACTURING PLANTS

BMW Automotive Plant, Greer, SC

- Completed in 2009
- 230k SY
- 6” & 8” RCC on 6” soil-cement

Highway 78, Aiken, SC

- Completed in 2009
- 4 lanes, 2 miles
- 10" RCC on subgrade
- Diamond ground for high-speed smoothness

Plant Vogtle, Waynesboro, GA

- Completed in 2012
- 78 acres RCC
- 4”, 6”, 7”, 10” and 18” RCC on soil-cement

INDUSTRIAL HAUL ROADS

Duke Energy, Plant Mayo, Roxboro, NC

- Completed in 2014
- 3± miles haul road and maintenance building parking lot

INDUSTRIAL MANUFACTURING FACILITIES

Bridgestone Tire Plant, Trenton, SC

- Completed in 2014
- 40k SY, 7” and 10”

Ocean Terminal, Savannah, GA

- Constructed in 2012
- 79K SY RCC
- Saved 19% on initial cost as compared to HMA
- 33% higher structural capacity

SC Inland Port, Greer, SC

- Completed in 2014
- 182k SY of 9.5” and 13” RCC
- Access route is also 9.5” RCC

DISTRIBUTION CENTERS

Walmart DC, Mobile, AL

- Built in 2017-2018
- 372k SY of 10” RCC
- 9k SY 5” RCC

H.E.B. DC, San Antonio, TX

- 229,000 SY of 9” and 10” RCC
- 34,000 SY of 5.5” RCC

Walmart DC, Ridgeville, SC

- 420,000 SY of 10” RCC
- Completed in 2021

COMPREHENSIVE APPROACH | RCC PAVEMENTS DESIGN AND CONSTRUCTION

1. Geotechnical Exploration and Pavement Recommendations
2. Civil Design
3. Structural Design
4. Planning for Construction and Quality Control
5. Coordination with Other Trades and Sequence of Construction

Items 2–5: Understanding RCC Construction Means and Methods

GEOTECHNICAL EXPLORATION AND PAVEMENT RECOMMENDATIONS

- Identify in-situ materials that may be incorporated into the pavement structure
- Assign proper subgrade engineering properties for structural design
- Address potential for long-term subsidence
- Base layer alternates

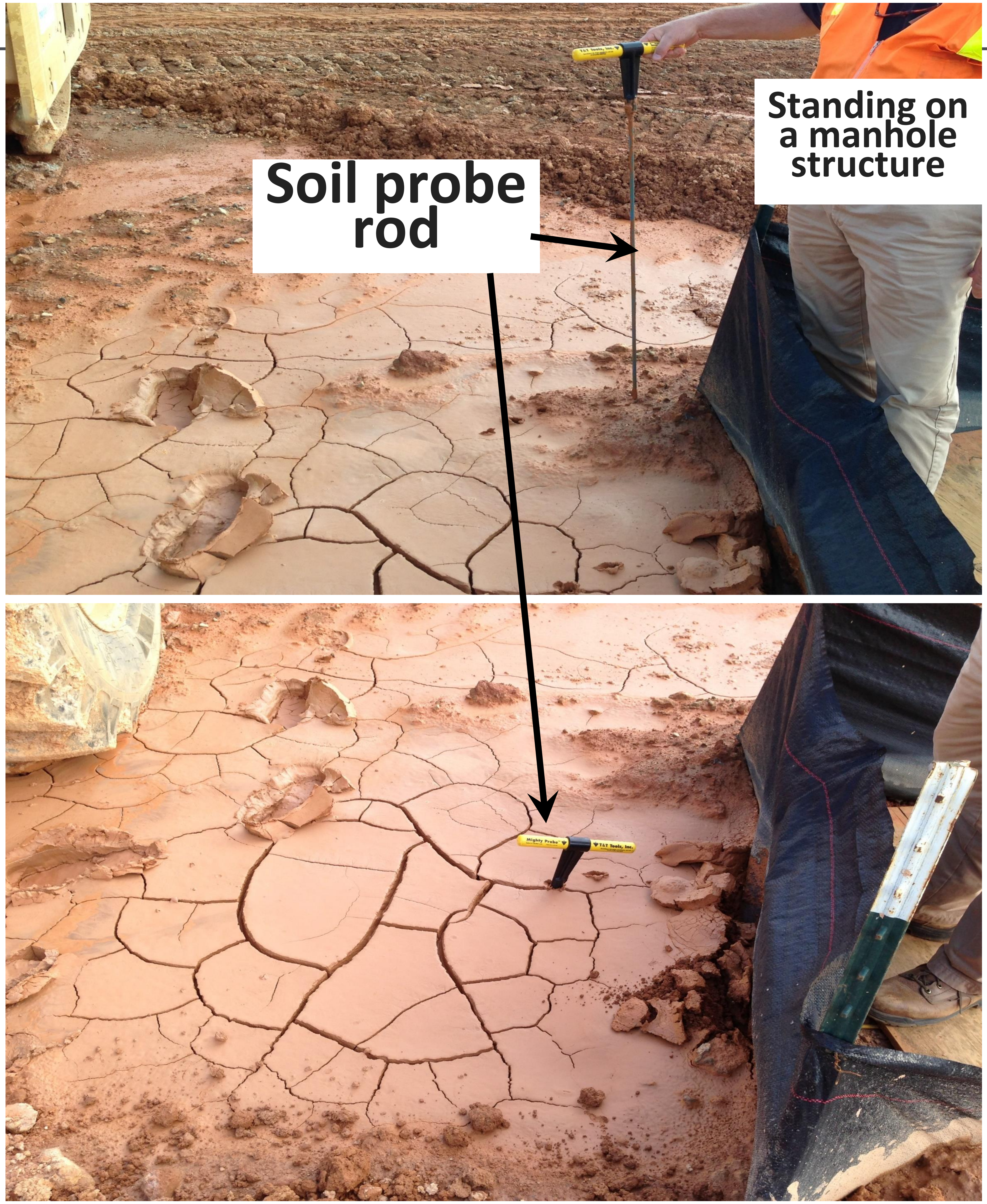
SITE CIVIL DESIGN

- Considerations
  - ✓ Initial construction
  - ✓ Long-term performance
  - ✓ Cost to build, own, and maintain

CIVIL DESIGN CONSIDERATIONS

- Geometry
- Grading Plan
- Drainage System
- Underground Utilities

LOCATIONS OF UNDERGROUND UTILITIES



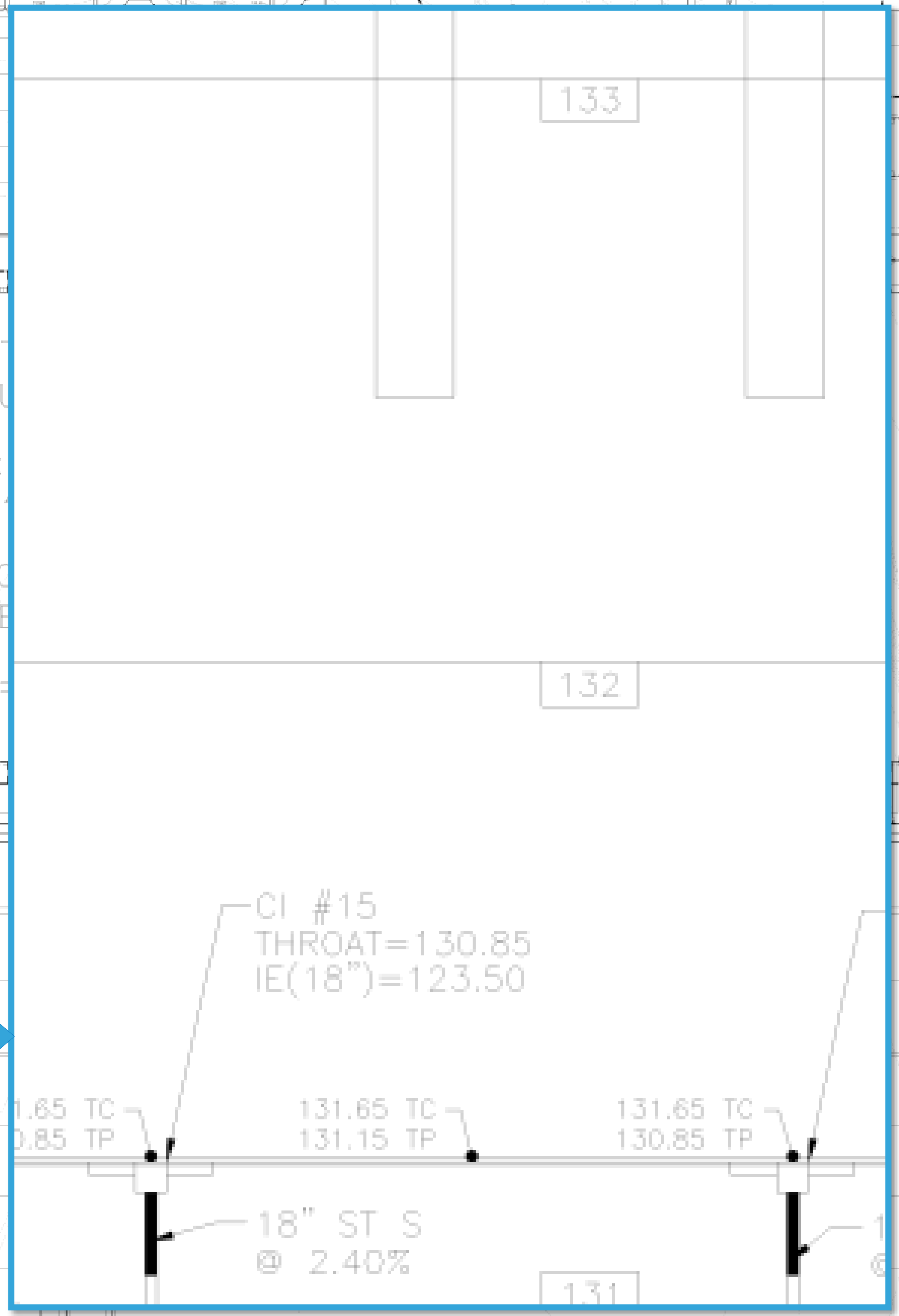
EXAMPLE 1

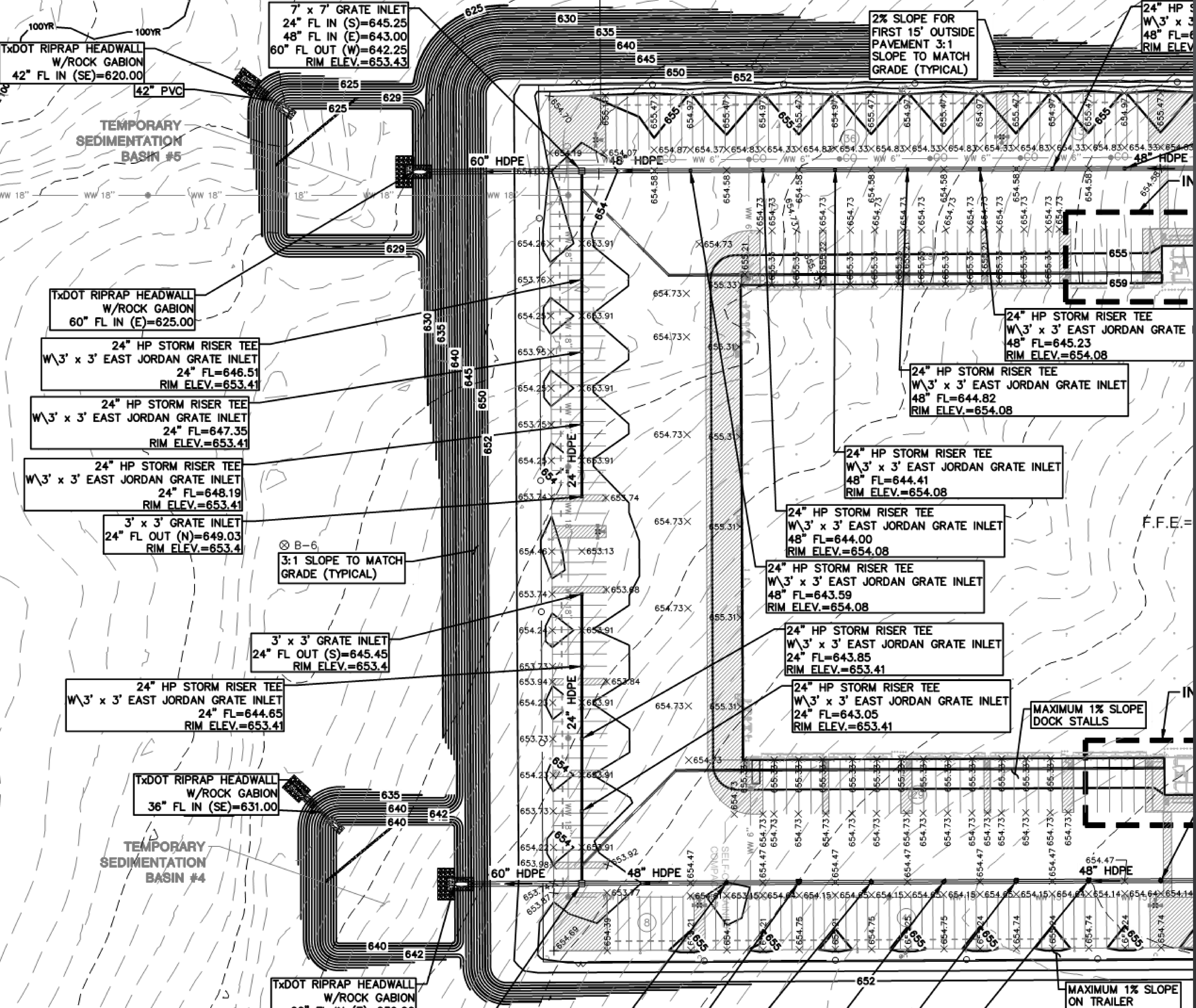
Design Features

- ❑ Storm drain inlets at edge of pavement
- ❑ 1% slope from building to edge of pavement
- ❑ All roof drains routed underground

Benefits

- ❑ Limited obstacles - easier to build high quality smooth pavement
- ❑ Increased speed of construction, i.e. reduced cost
- ❑ Reduced maintenance/repairs





EXAMPLE 2

Design Features

- Drainage structures within field of pavement
- Multi-directional slope

Disadvantages

- Slower grading work for subgrade, base layer, and RCC layer
- Slower speed of construction, i.e. increased cost
- Additional cost to pave around grate inlets
- In most cases proper compaction of backfill soil not achieved around under ground drainage structures
- Higher chance of failures/higher maintenance cost at underground drainage structures

Site Drainage

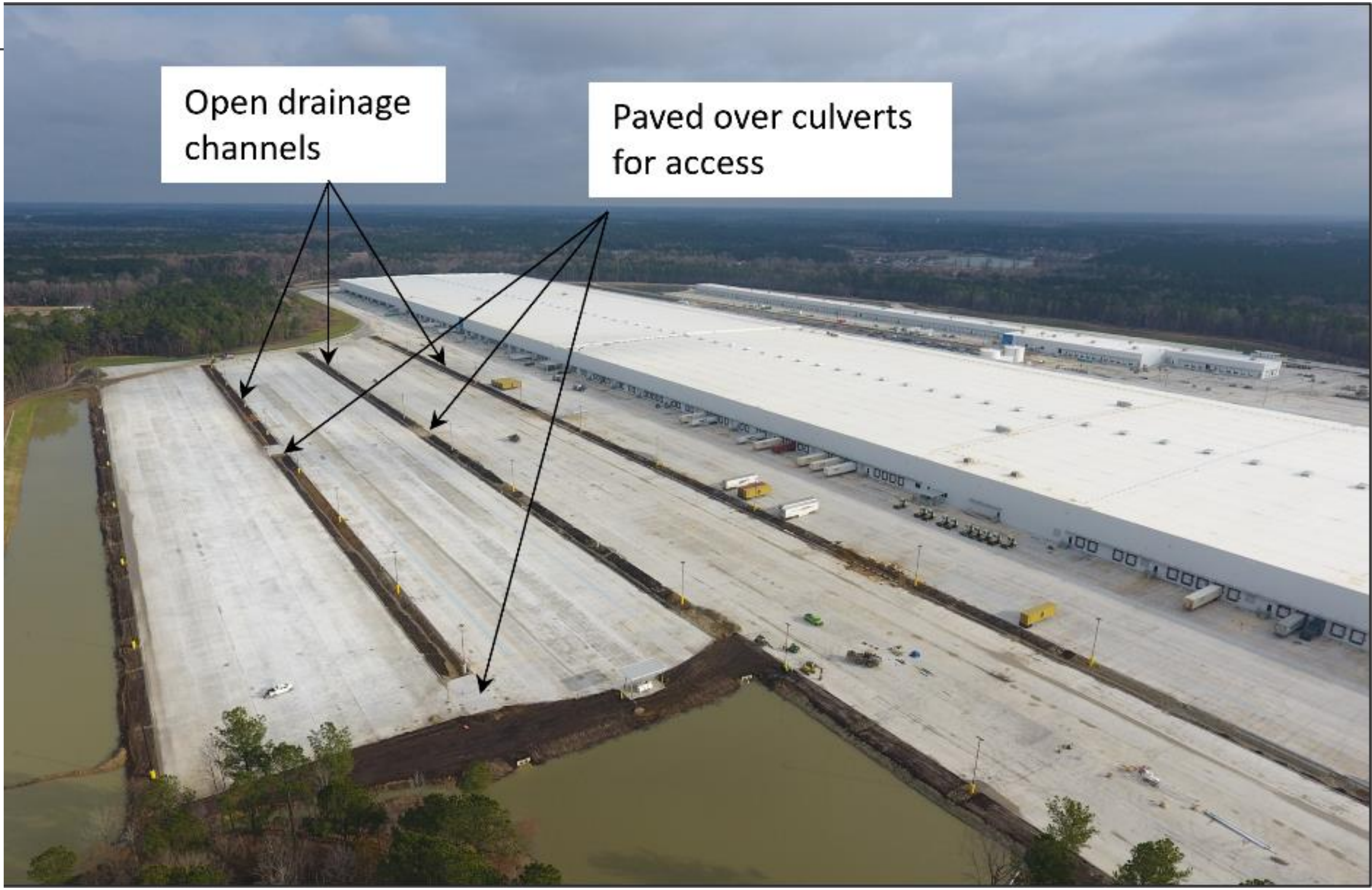
- 1% slope min. for positive drainage
- To the extent possible
  - ✓ Locate storm sewer inlets at the edge of pavement
  - ✓ Align obstacles in the field of pavement
- Joints in valleys should be sealed

Civil Design

What if edge drainage is not preferred due to:

- Excess soil or borrow soil constraints and cost implications
- Excessive drainage distance
- Additional length of storm sewer pipes adding significant cost

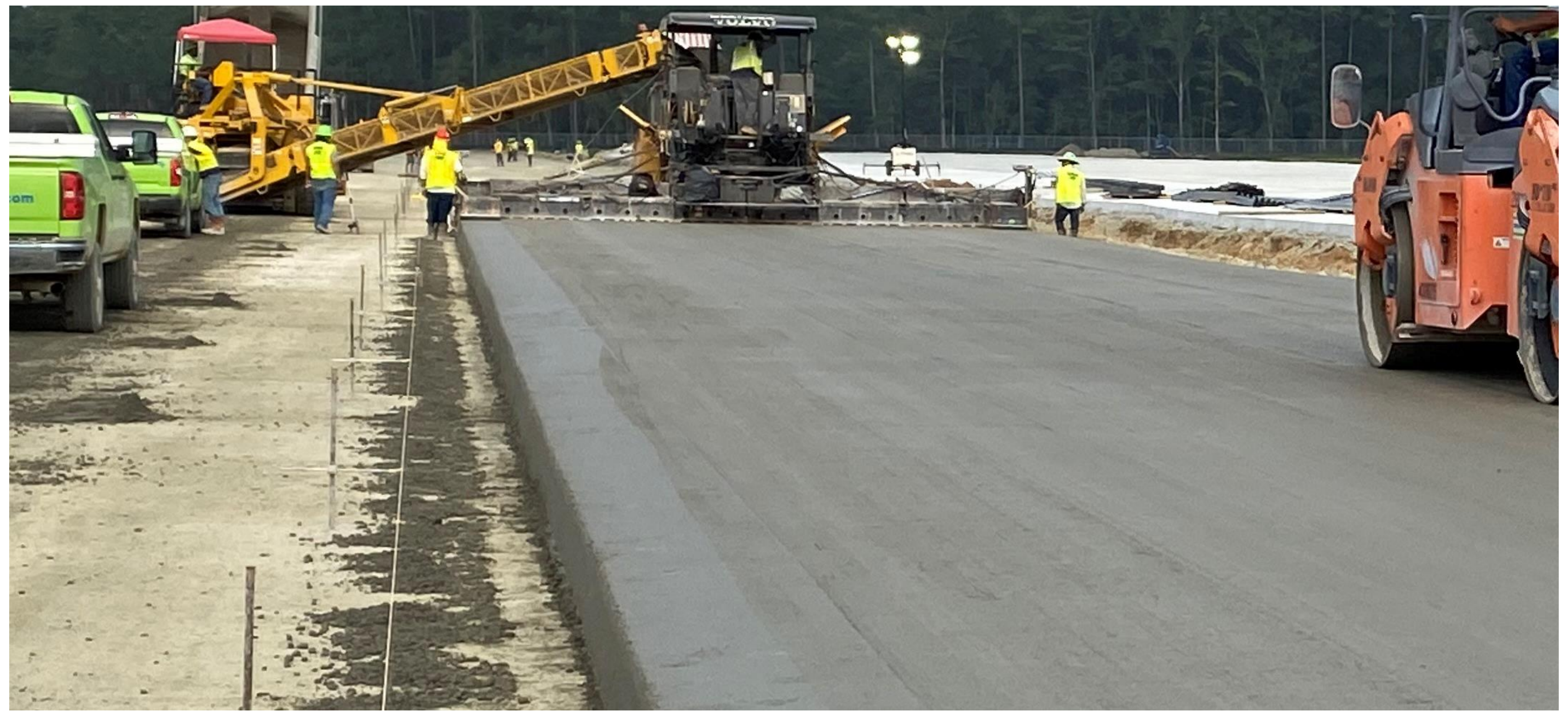
Consider open channel drainage



Walmart DC, Ridgeville, SC

CONSIDERATIONS FOR RCC STRUCTURAL PAVEMENT DESIGN

- Site conditions
  - ✓ Cut and fill: what would end up near the surface under the RCC layer?
  - ✓ Optimize the use of in-situ soils and borrow materials
- Materials for base layer
  - ✓ Virgin aggregates
  - ✓ In-situ soil stabilization
  - ✓ In-situ soil beneficiation and stabilization
  - ✓ Recycled materials
- What composite modulus of subgrade reaction (composite k-value) should be used?
  - ✓ Consider type of base, erodibility and long-term stability



CONSIDERATIONS FOR RCC STRUCTURAL PAVEMENT DESIGN

- Materials for RCC surface layer
  - ✓ Optimize using locally available aggregates approved for concrete paving
  - ✓ Consult with local suppliers and local designers prior to issuing specifications and thickness requirements

EXAMPLE BASED ON DATA FROM ACTUAL PROJECTS IN THE SOUTHEAST

CONSTITUENTS/PROPERTY	MIX FOR PROJECT A	MIX FOR PROJECT B
Coarse Aggregate	#67 granitic gneiss	#7 hard granite
Intermediate Aggregate	#89 granitic gneiss	#89 high calcium limestone
Fine Aggregate	Granitic gneiss washed screenings	Natural silica sand
Well Graded Combined Agg.	Yes	Yes
Type I/II Portland cement, pcy	500	450
Compaction, % of Mod. Proctor	100	100
Comp. strength at 28 days, psi	5,000	6,000
Flexural strength at 28 days, psi	640	700

PLANNING FOR OBSTACLES IN THE FIELD OF PAVEMENT

- Planning should start during project bid phase
- Critical coordination amongst grading, underground utilities, electrical, and paving subcontractors
- May have significant implications on the quality, speed of construction, and / or cost of construction

PCC Apron at building wall

Isolation Joints

CONSTRUCTION SEQUENCE AT IN-FIELD UNDERGROUND UTILITIES

PLANNING FOR UNDERGROUND UTILITIES


1

2


3

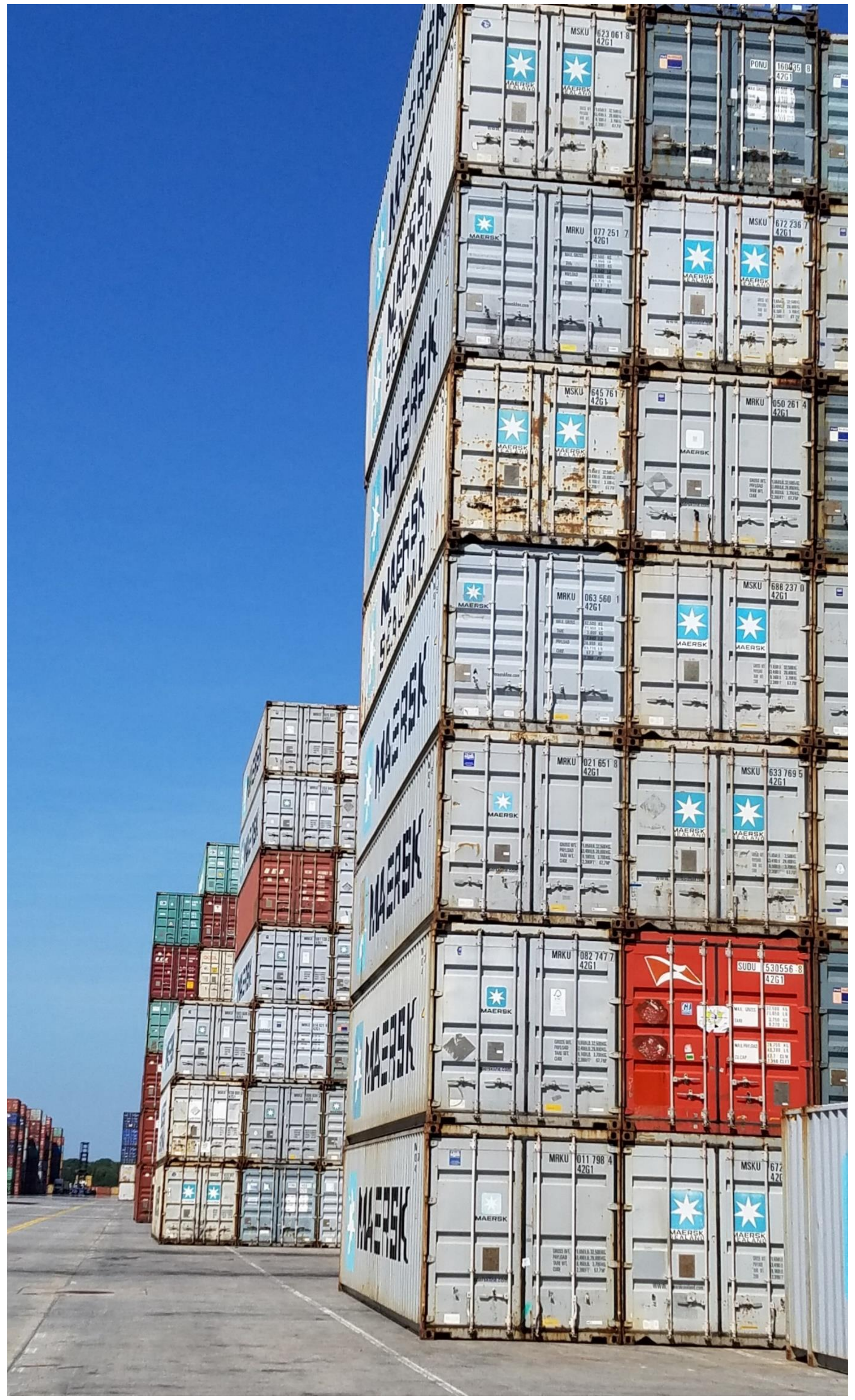

4

AVOID GETTING TRAPPED

- In field above surface of base layer vs. capped at base, paved over, then brought to grade
  - Significant cost impact

RCC THICKNESS DESIGN TOOLS

- Fundamentals: Thickness Design of RCC pavements is similar to plain un-doweled conventional concrete pavements
- Truck Traffic
  - ✓ PavementDesigner.org
  - ✓ ACI Tables
  - ✓ StreetPave; AirPave
  - ✓ PavementME; DOT's; PCASE
- Container Handlers / RTGs
  - ✓ PavementDesigner.org
  - ✓ AirPave
  - ✓ PCASE
- Stacked Containers
  - ✓ PCA Slab-on-Grade Design for Post Loads
  - ✓ PIANIC Report 165-2015
  - ✓ Guidance for load calculations
  - ✓ Prior Experience



RCC PAVEMENT DESIGN FOR UNUSUAL LOADING CONDITIONS

- Mix designs considerations for highly abrasive loads
  - ✓ Higher strength RCC
  - ✓ Maximum compaction
  - ✓ Proper curing is critical
- Wheel loads control for loaded roll trailers
  - ✓ Computer modeling for thickness design; Suggest Air Pave software or FEA

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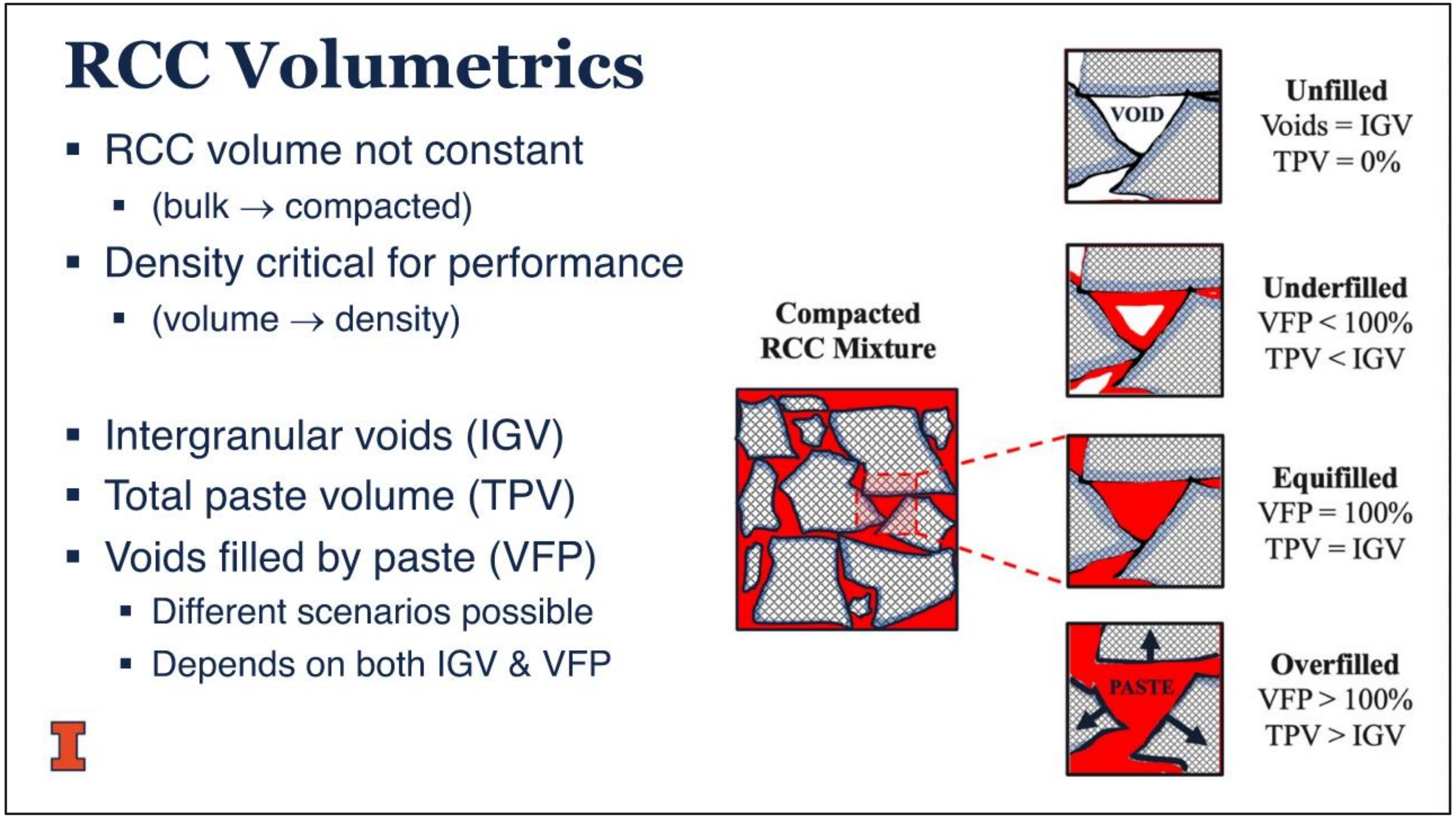
3. **Latest Research**
   - ✓ **Effects of percent void filled with paste on strength, compactability, stability, and finishability.**
   - ✓ RCC thickness design for stacked containers

LATEST MIX DESIGN RESEARCH – PARTIALLY FUNDED BY THE RCCPC

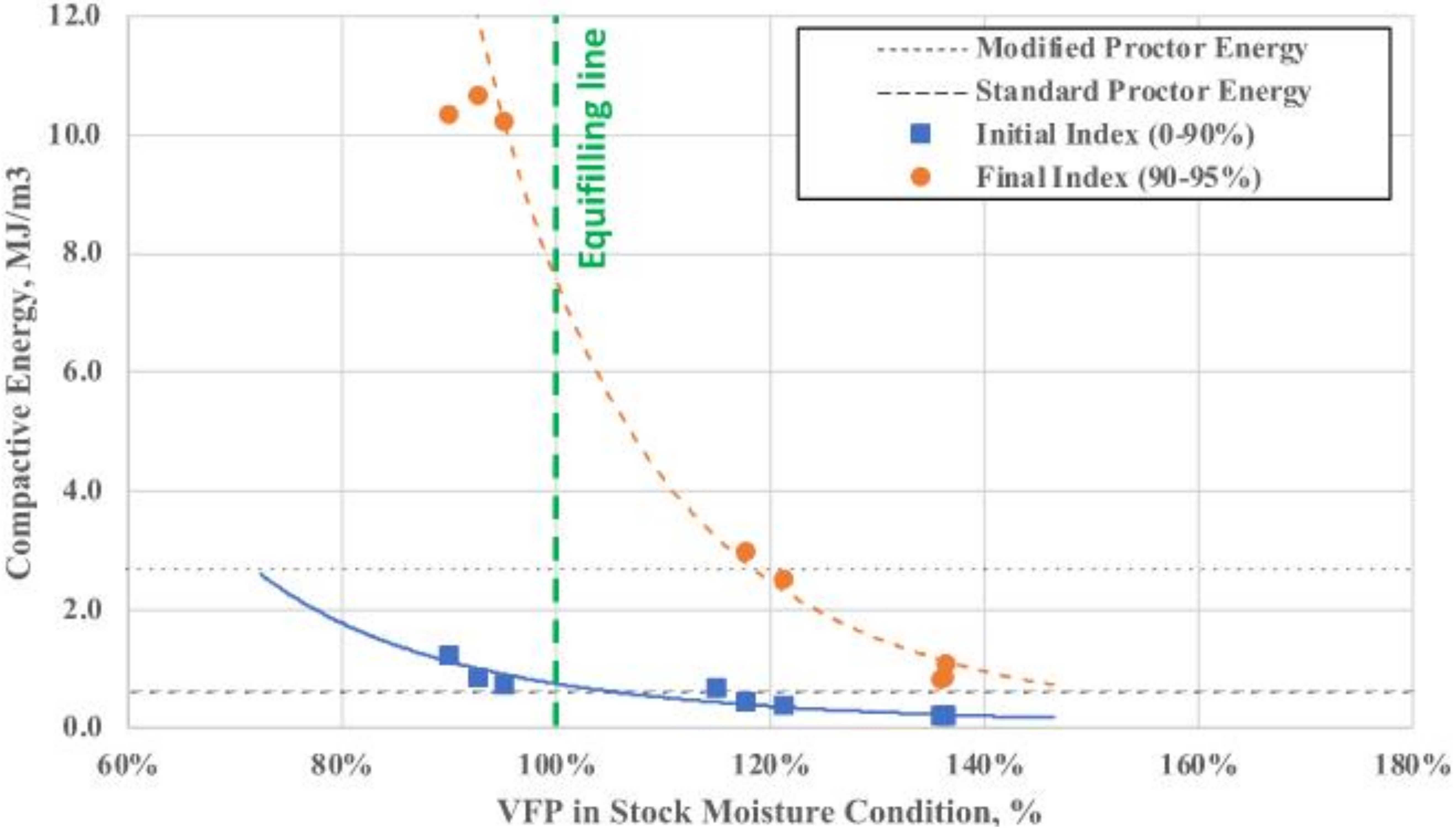
- UIUC Research Fellowship (Jeff Roesler, Ph.D. and Jordan Ouellet, M.A.SC.)
- Objectives:
  - ✓ Understanding RCC mixture volumetrics & green RCC properties
  - ✓ Develop better mix design methods
    - ❖ Properties of green and hardened RCC mixtures
    - ❖ Compaction energy (vibrating hammer and gyratory compactor methods)
    - ❖ Effects of percent of voids filled with paste



Courtesy of Jeff Roesler and Jordan Ouellet, UIUC

Paveability and Compactability

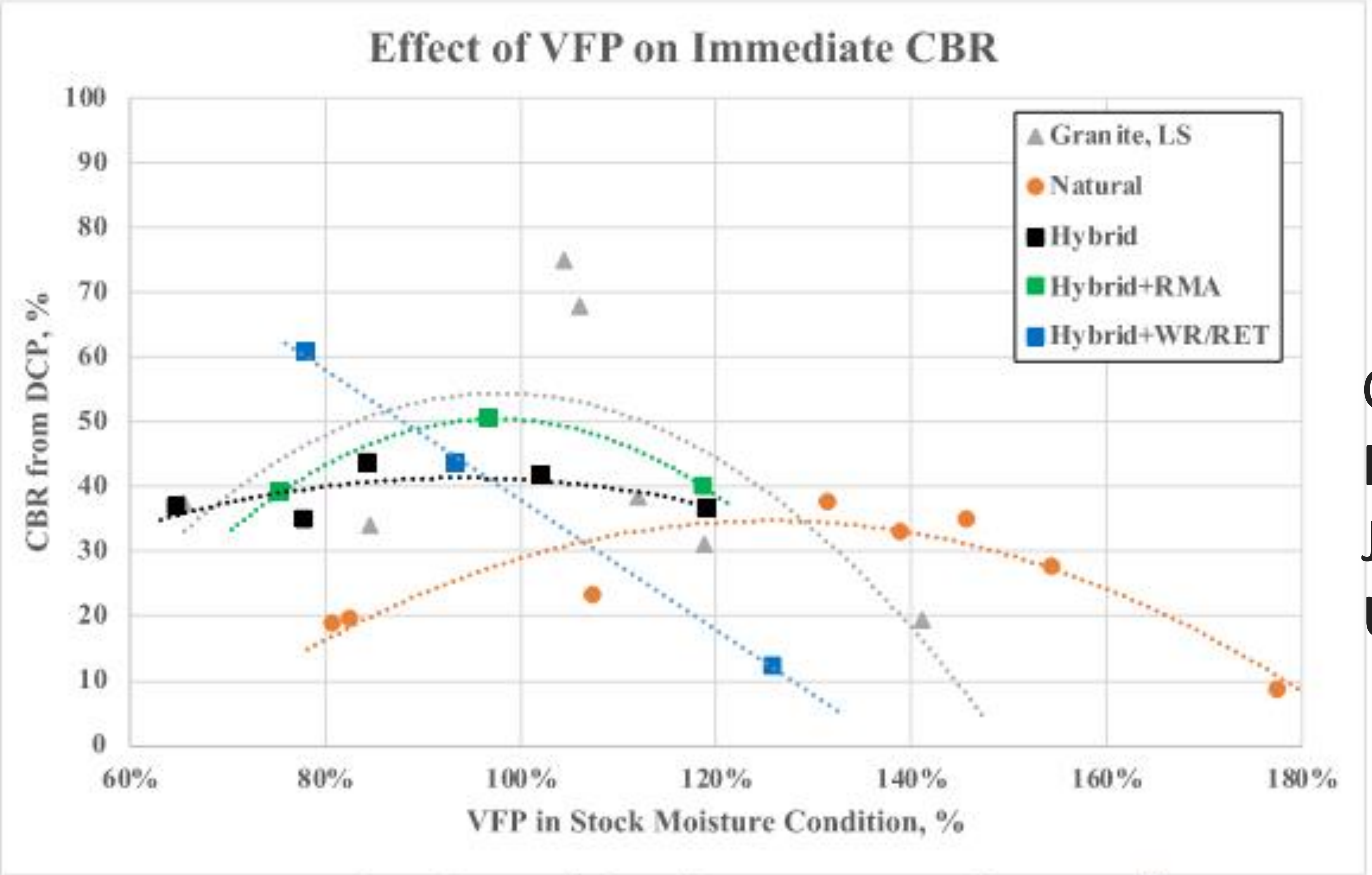
- Use of gyratory compactor to quantify volumetric energy
  - Volumetric energy transposable to field (0.5 MJ/m^3 = 1 pass)
  - Paveability (blue): energy to reach 90% voids
  - Compactability (orange) : energy to compact from 90% to 95%
  - Overfilling required to obtain adequate constructability



Courtesy of Jeff Roesler and Jordan Ouellet, UIUC

Stability

- Use of in-mold DCP to derive CBR values
  - Optimal behavior found for equifilled or slightly overfilled
  - Directly transposable to the field to prevent roll-down



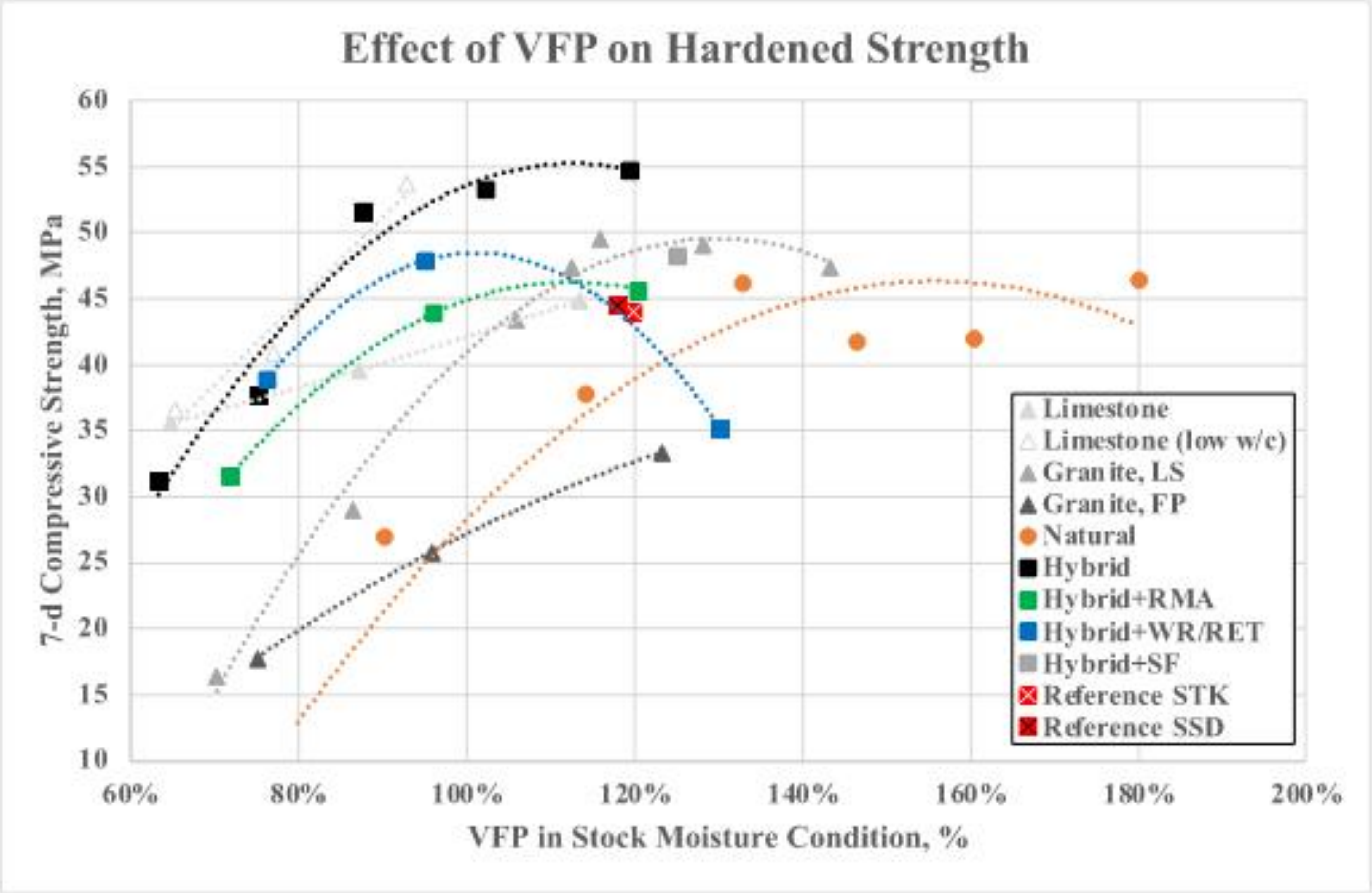
Courtesy of Jeff Roesler and Jordan Ouellet, UIUC

Min. CBR of 6.5 for construction traffic

Min. CBR of 9 to avoid traffic damage

Compressive Strength

- 7-d compressive strength
  - Adding more cement and paste beyond overfilling not beneficial
  - Aggregates must remain interlocked for optimal strength



Courtesy of Jeff Roesler and Jordan Ouellet, UIUC

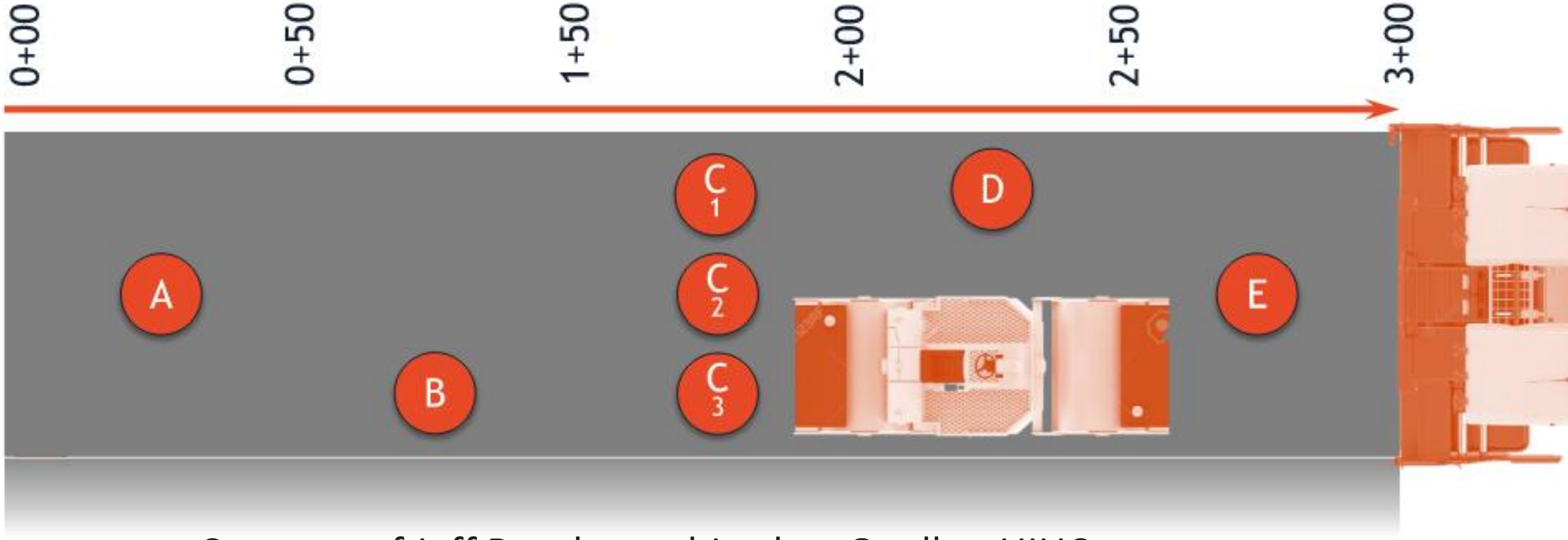
Summer 2023 Field Study

- Field study objectives:
  - connect field constructability with theoretical mix volumetrics
- 4 projects visited from experienced contractors:
  1. Sample materials at plant
  2. Sample RCC at the paver
  3. Test fresh pavement before compaction
  4. Test fresh pavement after compaction
  5. Reconstitute mixture in lab
  6. Test fresh RCC in the lab

Courtesy of Jeff Roesler and Jordan Ouellet, UIUC

Test Section & Lab Activities

Fresh RCC Sampled	RCC Pavement tested	Recreated in lab



Courtesy of Jeff Roesler and Jordan Ouellet, UIUC

UIUC RCC VOLUMETRICS RESEARCH FINDINGS

- For mixes containing well graded combined aggregates, generally mixes having enough paste to slightly overfill the voids work best
- Universal RCC mix design does not exist
- Contractors have very different mix proportions
  - ✓ Dictated by locally available materials and contractor’s equipment
  - ✓ All four projects delivered high-quality RCC
- Mix design volumetrics calibrated
  - ✓ Field metrics matched the lab metrics
- Research provided guidance how to adjust mix designs to improve strength, compactability, stability and finishability
- Paper is being peer reviewed and will be available later this year

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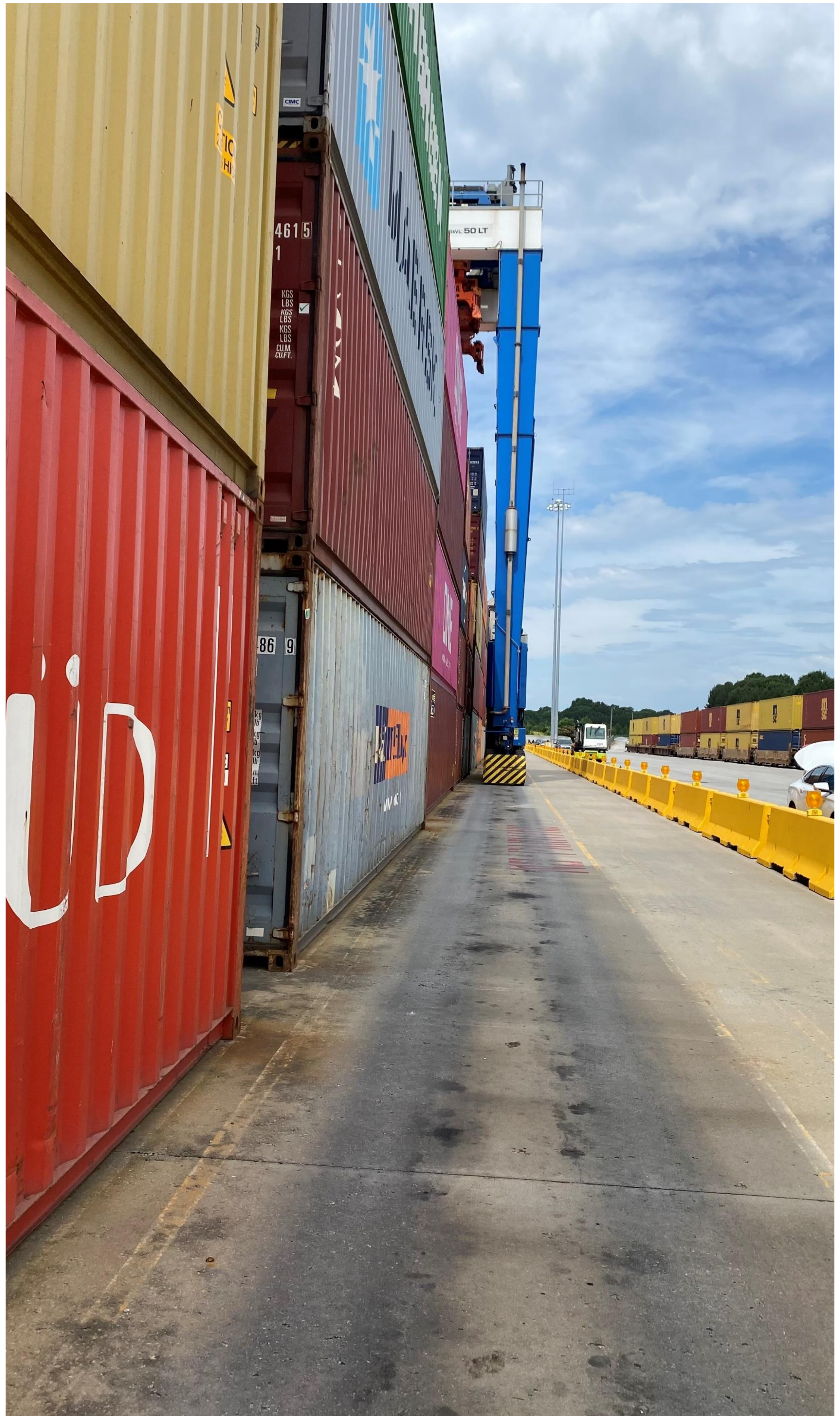
ONGOING THICKNESS DESIGN FOR STACKED CONTAINERS RESEARCH – PARTIALLY FUNDED BY THE RCCPC

ONGOING THICKNESS DESIGN RESEARCH – PARTIALLY FUNDED BY THE RCCPC

- ISU Research Fellowship (Halil Ceylan, Ph.D., Emin Sengun, Ph.D.)
  - Thickness design of RCC pavements for stacked containers
    - FEA using ISLAB software
      - Stacking 1 to 8 loaded containers
      - Various levels of load transfer efficiency
      - Various k values and Mr values
    - Developed draft design charts
    - Paper being peer reviewed
    - Next field validation and issuing a design manual
    - Objective is to incorporate a design model within industry accepted design tools



		Recommended Minimum RCC Pavement Thickness (in) for Stacked Containers-SF:1.0																							
Design Variables		**Stacking Height: 1 (Avg. Container Weight: 68552 lbs)**						**Stacking Height: 2 (Avg. Container Weight: 61670 lbs)**						**Stacking Height: 3 (Avg. Container Weight: 54820 lbs)**						**Stacking Height: 4 (Avg. Container Weight: 47965 lbs)**					
		Subgrade Reaction, k (pci)						**Subgrade Reaction, k (pci)**						**Subgrade Reaction, k (pci)**						**Subgrade Reaction, k (pci)**					
LTE %	**MoR, psi**	**50**	**100**	**200**	**300**	**400**	**500**	**50**	**100**	**200**	**300**	**400**	**500**	**50**	**100**	**200**	**300**	**400**	**500**	**50**	**100**	**200**	**300**	**400**	**500**
100	550	8.0	7.0	6.5	6.5	6.5	6.5	11.5	11.0	10.0	9.5	9.5	9.5	14.0	13.0	12.0	11.5	11.0	11.0	15.5	14.5	13.5	13.0	12.5	12.0
	600	7.5	7.0	6.5	6.5	6.5	6.5	11.0	10.5	9.5	9.0	9.0	9.0	13.5	12.5	11.5	11.0	10.5	10.5	15.0	14.0	13.0	12.5	12.0	11.5
	650	7.0	6.5	6.0	6.0	6.0	6.0	10.5	10.0	9.0	8.5	8.5	8.5	13.0	12.0	11.0	10.5	10.0	10.0	14.0	13.5	12.5	12.0	11.5	11.0
	700	7.0	6.0	6.0	6.0	6.0	6.0	10.5	9.5	8.5	8.0	8.0	8.0	12.5	11.5	10.5	10.0	9.5	9.5	13.5	13.0	12.0	11.0	11.0	10.5
	750	6.5	6.0	6.0	6.0	6.0	6.0	10.0	9.0	8.5	8.0	8.0	8.0	12.0	11.0	10.0	9.5	9.5	9.5	13.0	12.5	11.5	11.0	10.5	10.0
75	550	9.0	8.0	7.5	7.0	7.0	7.0	13.5	12.5	12.0	11.5	11.0	10.5	16.0	15.5	14.5	14.0	13.5	13.5	17.5	17.0	16.5	16.0	15.5	15.0
	600	8.5	8.0	7.0	7.0	6.5	6.5	13.0	12.0	11.5	11.0	10.5	10.5	15.5	15.0	14.0	13.5	13.0	13.0	17.0	16.5	15.5	15.0	14.5	14.5
	650	8.0	7.5	7.0	6.5	6.5	6.0	12.0	11.5	11.0	10.5	10.0	10.0	15.0	14.0	[illegible]	13.0	12.5	12.0	16.5	16.0	15.0	14.5	14.0	13.5
	700	7.5	7.0	6.5	6.0	6.0	6.0	11.5	11.0	10.5	10.0	9.5	9.5	14.0	13.5	[illegible]	12.0	12.0	11.5	15.5	15.0	14.5	13.5	13.5	13.0
	750	7.5	7.0	6.5	6.0	6.0	6.0	11.5	10.5	10.0	9.5	9.0	9.0	13.5	[illegible]	[illegible]	12.0	11.5	11.0	15.0	14.5	13.5	13.0	13.0	12.5
50	550	9.5	9.0	8.5	8.0	8.0	7.5	14.5	14.0	13.0	12.5	12.0	11.5	17.0	16.5	16.0	15.0	15.0	14.5	18.0	18.0	17.5	17.0	16.5	16.0
	600	9.0	8.5	8.0	7.5	7.5	7.5	14.0	13.0	12.5	12.0	11.5	11.0	16.5	[illegible]	15.0	14.5	14.0	14.0	18.0	17.5	17.0	16.5	16.0	15.5
	650	9.0	8.0	7.5	7.5	7.0	7.0	13.0	12.5	12.0	11.5	11.0	10.5	[illegible]	[illegible]	14.5	14.0	13.5	13.0	17.5	17.0	16.0	15.5	15.0	14.5
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	750	8.0	7.5	7.0	6.5	6.5	6.5	12.0	11.5	11.0	10.5	[illegible]	[illegible]	[illegible]	14.0	13.5	13.0	12.5	12.0	16.0	15.5	15.0	14.5	14.0	13.5
25	550	10.5	9.5	9.0	8.5	8.5	8.0	15.0	14.5	13.5	13.0	[illegible]	[illegible]	[illegible]	17.0	16.5	16.0	15.5	15.0	18.5	18.5	18.0	17.5	17.0	16.5
	600	10.0	9.5	8.5	8.5	8.0	8.0	14.5	14.0	13.0	[illegible]	[illegible]	12.0	17.0	16.5	15.5	15.0	15.0	14.5	18.0	18.0	17.0	16.5	16.5	16.0
	650	9.5	9.0	8.0	8.0	7.5	7.5	14.0	13.0	12.5	12.0	[illegible]	[illegible]	16.0	15.5	15.0	14.5	14.0	14.0	17.5	17.0	16.5	16.0	15.5	15.5
	700	9.0	8.5	8.0	7.5	7.5	7.0	13.0	12.5	12.0	[illegible]	[illegible]	11.0	15.5	15.0	14.5	14.0	13.5	13.0	17.0	16.5	16.0	15.5	15.0	14.5
	750	8.5	8.0	7.5	7.0	7.0	7.0	13.0	12.0	11.5	[illegible]	10.5	10.5	15.0	14.5	14.0	13.5	13.0	12.5	16.5	16.0	15.5	15.0	14.5	14.0
0	550	10.5	10.0	9.5	9.0	8.5	8.5	15.0	14.5	14.0	13.5	13.0	12.5	17.5	17.0	16.5	16.0	15.5	15.5	18.5	18.5	18.0	17.5	17.0	17.0
	600	10.5	10.0	9.0	8.5	8.5	8.0	14.0	14.0	13.5	13.0	12.5	12.0	17.0	16.0	16.0	15.5	15.0	14.5	18.0	18.0	17.0	17.0	16.5	16.0
	650	10.0	9.5	8.5	8.5	8.0	7.5	13.5	13.5	12.5	12.5	12.0	11.5	16.0	15.5	15.0	14.5	14.5	14.0	17.5	17.0	16.5	16.0	16.0	15.5
	700	9.5	9.0	8.5	8.0	7.5	7.5	13.0	13.0	12.0	12.0	11.5	11.0	15.5	15.0	14.5	14.0	13.5	13.5	17.0	16.5	16.0	15.5	15.0	15.0
	750	9.0	8.5	8.0	7.5	7.5	7.0	12.5	12.5	12.0	11.5	11.0	10.5	15.0	14.5	14.0	13.5	13.0	13.0	16.5	16.0	15.5	15.0	14.5	14.5

Design Variables		Stacking Height: 5 (Avg. Container Weight: 41113 lbs)						Stacking Height: 6 (Avg. Container Weight: 41113 lbs)						Stacking Height: 7 (Avg. Container Weight: 41113 lbs)						Stacking Height: 8 (Avg. Container Weight: 41113 lbs)					
		Subgrade Reaction, k (pci)						Subgrade Reaction, k (pci)						Subgrade Reaction, k (pci)						Subgrade Reaction, k (pci)					
LTE %	MoR, psi	50	100	200	300	400	500	50	100	200	300	400	500	50	100	200	300	400	500	50	100	200	300	400	500
100	550	16.0	15.5	14.5	13.5	13.0	12.5																		
	600	15.5	14.5	13.5	13.0	12.5	12.0	17.0	16.5	15.5	15.0	14.0	14.0												
	650	14.5	14.0	13.0	12.5	12.0	11.5	16.5	15.5	14.5	14.0	13.5	13.0	18.0	17.0	16.5	15.5	15.0	14.5						
	700	14.0	13.5	12.5	12.0	11.5	11.0	15.5	15.0	14.0	13.5	13.0	13.0	17.0	16.5	15.5	15.0	14.5	14.0	18.5	18.0	17.0	16.5	15.5	15.5
	750	13.5	13.0	12.0	11.5	11.0	11.0	15.0	14.5	13.5	13.0	13.0	13.0	16.5	16.0	15.0	14.5	14.0	14.0	17.5	17.0	16.5	15.5	15.0	15.0
75	550	18.5	18.0	17.0	16.5	16.0	16.0																		
	600	18.0	17.5	16.5	16.0	15.5	15.0	19.5	19.0	18.0	17.5	17.0	17.0												
	650	17.0	16.5	15.5	15.0	14.5	14.5	18.5	18.0	17.5	17.0	16.5	16.0	[illegible]	20.0	19.5	18.5	18.5	18.0						
	700	16.5	16.0	15.0	14.5	14.0	13.5	18.0	17.5	16.5	16.0	15.5	15.0	[illegible]	[illegible]	18.5	18.0	17.5	17.0	21.5	21.0	20.0	19.5	19.0	19.0
	750	16.0	15.0	14.5	14.0	13.5	13.0	17.0	16.5	16.0	15.5	15.0	[illegible]	19.0	[illegible]	18.0	17.0	17.0	16.5	20.5	20.0	19.5	19.0	18.5	18.0
50	550	19.5	19.0	18.5	18.0	17.5	17.0																		
	600	19.0	18.5	17.5	17.0	16.5	16.5	21.0	20.0	19.5	19.0	[illegible]	18.0												
	650	18.0	17.5	17.0	16.5	16.0	15.5	20.0	19.5	18.5	18.0	[illegible]	[illegible]	[illegible]	21.0	20.5	20.0	19.5	19.0						
	700	17.5	17.0	16.0	15.5	15.0	15.0	19.0	18.5	18.0	17.5	[illegible]	[illegible]	21.0	20.5	19.5	19.0	18.5	18.5	22.5	22.0	21.5	21.0	20.5	20.0
	750	17.0	16.0	15.5	15.0	14.5	14.0	18.5	18.0	17.0	[illegible]	[illegible]	16.0	20.0	19.5	19.0	18.5	18.0	17.5	21.5	21.5	20.5	20.0	19.5	19.5
25	550	19.5	19.0	18.5	18.0	18.0	17.5																		
	600	19.0	18.5	18.0	17.5	17.0	17.0	21.0	[illegible]	[illegible]	[illegible]	19.0	18.5												
	650	18.5	18.0	17.0	16.5	16.5	16.0	20.5	[illegible]	19.0	18.5	18.0	18.0	22.0	21.5	21.0	20.5	20.0	19.5						
	700	17.5	17.0	16.5	16.0	15.5	15.5	19.5	19.0	[illegible]	18.0	17.5	17.0	21.0	20.5	20.0	19.5	19.0	19.0	22.5	22.0	21.5	21.0	21.0	20.5
	750	17.0	16.5	16.0	15.5	15.0	14.5	19.0	18.5	[illegible]	17.0	17.0	16.5	20.5	20.0	19.5	19.0	18.5	18.0	22.0	21.5	21.0	20.5	20.0	20.0
0	550	19.5	19.0	18.5	18.5	18.0	17.5																		
	600	19.0	18.5	18.0	17.5	17.0	17.0	21.0	20.5	20.0	19.5	19.0	19.0												
	650	18.5	18.0	17.0	17.0	16.5	16.0	20.5	19.5	19.0	18.5	18.5	18.0	22.0	21.5	21.0	20.5	20.0	20.0						
	700	17.5	17.0	16.5	16.0	16.0	15.5	19.5	19.0	18.5	18.0	17.5	17.5	21.0	20.5	20.0	19.5	19.5	19.0	22.5	22.0	21.5	21.0	21.0	20.5
	750	17.0	16.5	16.0	15.5	15.0	15.0	19.0	18.5	17.5	17.5	17.0	16.5	20.5	20.0	19.5	19.0	18.5	18.5	22.0	21.5	21.0	20.5	20.0	20.0

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THANK YOU!
QUESTIONS?

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