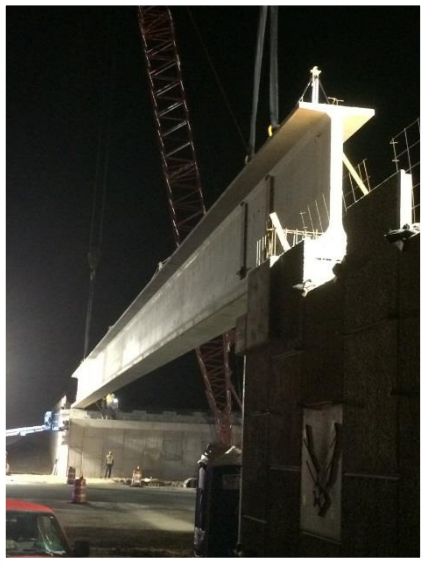
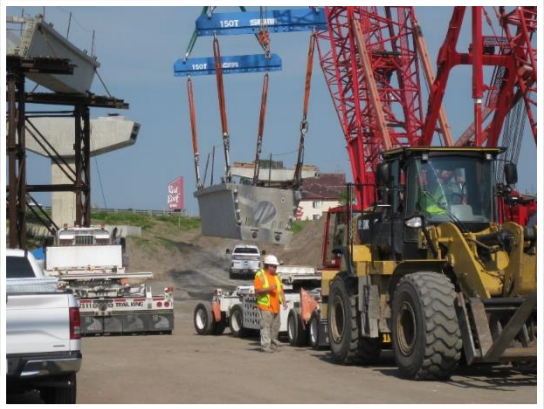
2021 Construction Academy Structures Session





READ THE SPECS AND CPAM!

Purpose

- Educate about structures construction
- Review Specifications and CPAM
- Much to know, remember, and keep track of so:

CPAM Sections

- 8.4 – Shop and Erection Drawing Process
- 8.11 – Contractor Initiated Submittals
- 10.2 – Prestressed/Precast Concrete Components
- 10.3– Concrete Construction
- 10.4 – Coatings & Asbestos Removal, Handling and Disposal and Structural Steel Coating Issues
- 10.6 – Underwater Bridge Construction Inspection
- 10.7 – Post-tensioned Bridges
- 10.9 – Structural Steel & Miscellaneous Metal Components
- 10.10 – Bridge Construction Issues that Must Involve State Construction Office Staff
- 10.11 – General Structures Construction Issues

CPAM 8.4 Shop and Erection Drawings Process

- Nine (9) Item Shop Drawing Tracking Log (number, status, status of EOR review, etc.)
- Schedule of submittals required within 60 days of the start of contract
- At weekly progress meetings Contractor reports latest shop drawing priorities, updates

CPAM 8.4 Shop and Erection Drawings Process

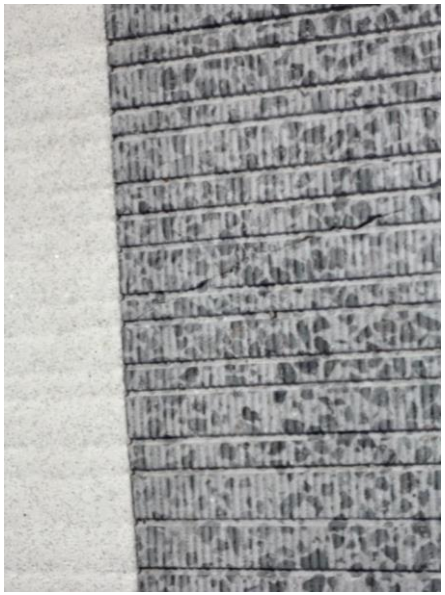
11. Shop Drawings: A shop drawing is a drawing or set of drawings produced by the contractor, supplier, manufacturer, subcontractor, or fabricator for prefabricated components. Shop drawings also include all working drawings, erection plans, associated trade literature, material cut-sheets, calculations, schedules, erection manuals, geometry control manuals and other manuals and similar documents submitted by the Contractor to define some portion of the project work. The type of work includes both permanent and temporary works as appropriate to the project.

CPAM 8.11 Contractor Initiated Submittals

- 3 Categories of Submittal:
  - Request for information (RFI)
  - Request for Correction (RFC)
  - Request for Modification (RFM)
- Process/procedure covered in CPAM
- 17-item tracking log for each submittal

CPAM 10.3 Concrete Construction

- Spec. 400-21, Disposition of Cracked Concrete: the number of cracks, average crack width, length of cracks taken into account
- CPAM Section 10.3.5, Mass Concrete Control Plan (MCCP)
- CPAM Section 10.7, Crack and Joint Inspection of Post-Tensioned Bridges



CPAM 10.3 Concrete Construction

CPAM 10.3 Concrete Construction

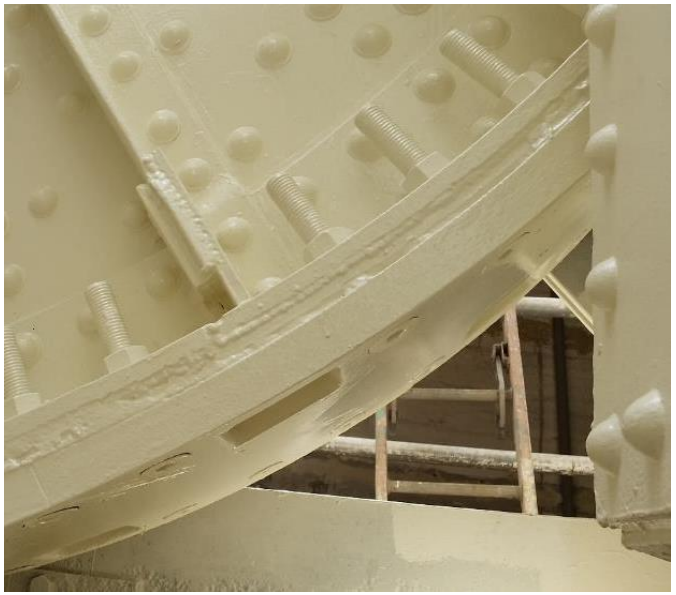
- Crack inspection 3X: 1) after casting, 2) all dead loads, 3) all live loads
- Early discovery allows crack monitoring and correction of other components to prevent more cracks
- Crack Maps denoting length, width, depth, location
- Disposition of Cracks:
  - Structural or
  - Non-structural—Engineer makes the determination!

CPAM 10.4 Paint & Asbestos Removal, Handling & Disposal and Structural Steel Coating Issues

- Hazardous but also potentially hazardous waste:
  - Asbestos Containing Material (ACM)
  - Lead
- Coating Concerns:
  - Surface preparation
  - Bolts, caulking gaps and seams—stripe coating
  - Faying surfaces
  - Testing for chloride, sulfate and nitrate concentrations
  - Containment
- Discuss concerns at pre-operations meetings

CPAM 10.4 Paint & Asbestos Removal, Handling & Disposal and Structural Steel Coating Issues

- Blast media for paint removal/surface prep
- Ferrous (top)
- Steel grit (below)



CPAM 10.4 Paint & Asbestos Removal, Handling & Disposal and Structural Steel Coating Issues

Stripe coating of irregular surfaces

CPAM 10.4 Paint & Asbestos Removal, Handling & Disposal and Structural Steel Coating Issues

Containment and Coating/Metallizing

CPAM 10.6 Underwater Bridge Construction Inspection

- Initial inspection of voided concrete/cylinder piles
- Other pile types, Engineer makes decision
- Final underwater inspections for all projects by:
  - FDOT prequalified Consulting Firm (Maintenance)
  - FDOT Structures Maintenance

CPAM 10.9 Structural Steel and Miscellaneous Metal Components

- Records must be kept of:
  - Job Inspection Snug Tight Torque Test for Bolts
  - Rotational Capacity Test for Bolts (ROCAP)
  - Steel Girder Shear Connector Bend Test
- Fabrication schedule
- Consultant Inspection of fabrication
- Non-compliances of fabricated components

CPAM 10.9 Structural Steel and Miscellaneous Metal Components

CPAM 10.9 Structural Steel and Miscellaneous Metal Components

Florida Department of Transportation

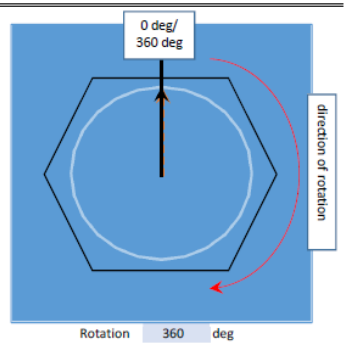
675-010-16a
CONSTRUCTION
06/17

ROCAP Testing Tabulation Sheet
Long Bolts

Bolt Type	A325		*bolt grade, choose from drop-down*
Bolt dia. (in)	3/4	in	*bolt diameter, choose from drop-down*
Stick out (in)	0.25	in	*measured from nut to the end of the threads (non-bearing side)*
Bolt length (in)	4	in	*measured from the bottom of the head to the end of the bolts*
Initial tension (kips)	3	kips	*tension tolerance: -0 kips to +2 kips*
Minimum tension (kips)	28	kips	*tighten the bolt to this tension value*
Required rotation	1		*further tighten the bolt to achieve this rotation from the match mark*
Minimum final tension (kips)	32	kips	*final tension value fastener must achieve with full rotation*

BOLT ASSEMBLY #1	
Recorded final tension (kips)	35
Check tension	OK
Recorded torque (lb*ft)	500
Maximum torque (lb*ft)	438
Check torque	No good

BOLT ASSEMBLY #2	
Recorded final tension (kips)	38
Check tension	OK
Recorded torque (lb*ft)	400
Maximum torque (lb*ft)	438
Check torque	OK



Rotation 360 deg

CPAM 10.9
Structural Steel and Miscellaneous Metal Components

CPAM 10.10 Bridge Construction Issues that Must Involve State Construction Office Staff

- Complex or Category II Bridge issues:
  - Steel
  - Segmental
  - Movable
  - Post-tensioned
- Changes to As-Built condition
- Modification of Plans
- Non-compliances of Steel/Prestressed items

CPAM 10.11 General Structures Construction Issues

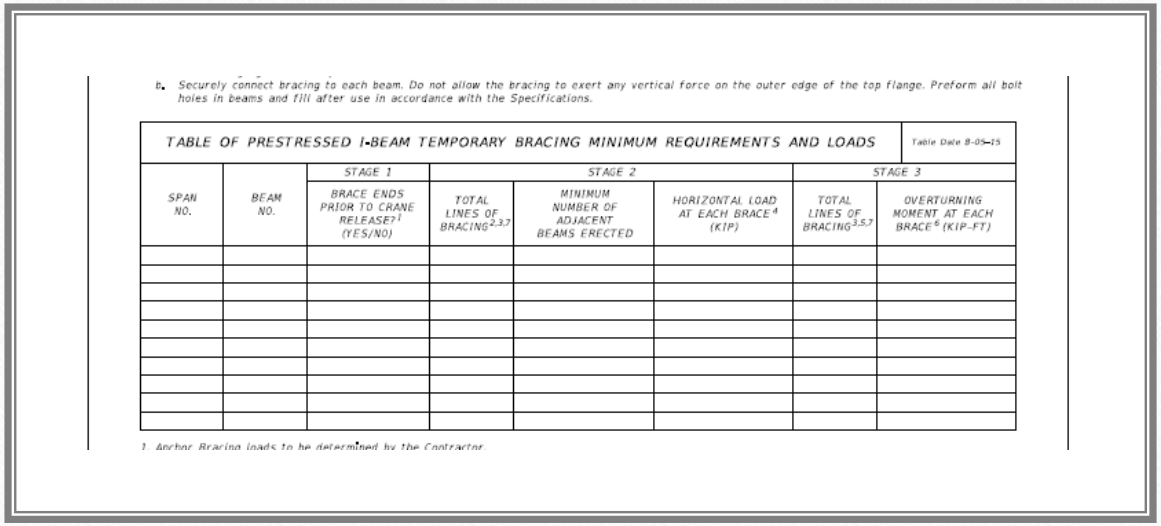
- Notifying District Structures Maintenance Engineer of in-service dates and acceptance inspections
- As-Bid vs. As-Built Load Ratings—changes?
- Department-owned temporary bridging

Specification Sections

- 5 – Control of the Work
- 346 – Portland Cement Concrete
- 400 – Concrete Structures
- 450 – Precast Prestressed Concrete Construction
- 460 – Structural Steel and Miscellaneous Metals
- **Not all Structures Specs specifically addressed here**

Spec 5—Construction Affecting Public Safety

- Construction Affecting Public Safety
  - Signed and sealed erection plan prior to erection
  - Daily inspections of structure
  - Specialty Engineer certification prior to opening facility below
- Signed and sealed stability calculations
- Table of Temporary Bracing Details



b. Securely connect bracing to each beam. Do not allow the bracing to exert any vertical force on the outer edge of the top flange. Preform all bolt holes in beams and fill after use in accordance with the Specifications.

TABLE OF PRESTRESSED I-BEAM TEMPORARY BRACING MINIMUM REQUIREMENTS AND LOADS — Table Date 8-05-15

SPAN NO.	BEAM NO.	STAGE 1	STAGE 2			STAGE 3	
		BRACE ENDS PRIOR TO CRANE RELEASE?[1] (YES/NO)	TOTAL LINES OF BRACING[2,3,7]	MINIMUM NUMBER OF ADJACENT BEAMS ERECTED	HORIZONTAL LOAD AT EACH BRACE[4] (KIP)	TOTAL LINES OF BRACING[3,5,7]	OVERTURNING MOMENT AT EACH BRACE[6] (KIP-FT)

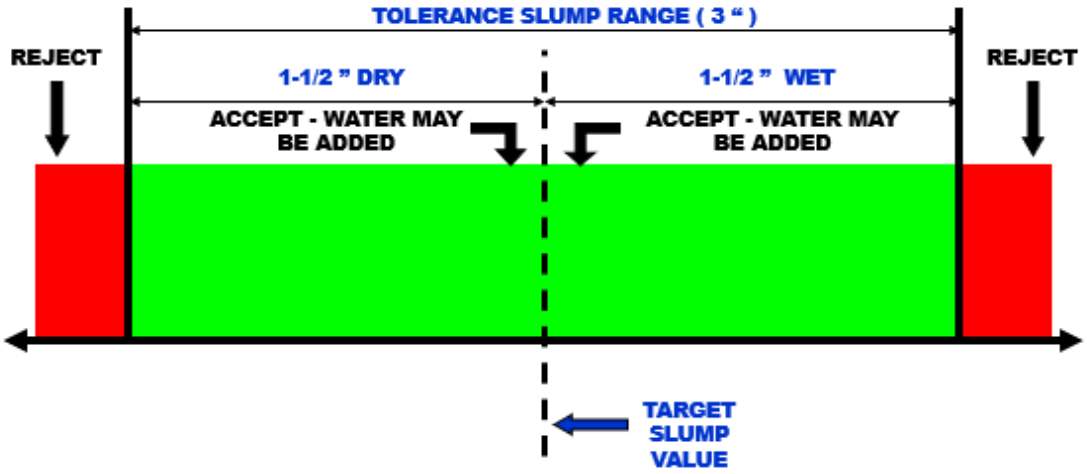
1. Anchor Bracing loads to be determined by the Contractor.

Spec 5—Construction Affecting Public Safety

Spec 5— Construction Affecting Public Safety

Spec 346—Plastic Properties

- Every load requires water cement ratio (w/c) calculation
- Slump test when there is question of water content–consistency must be observed for each truck
- When water is added at the site, truck must be retested
- Test trucks after rejected truck for slump—including the first adjusted truck and begin a new LOT
- Also included are temperature, air entrainment
- VT/CEI/Engineer verifies roughly once per four LOTs

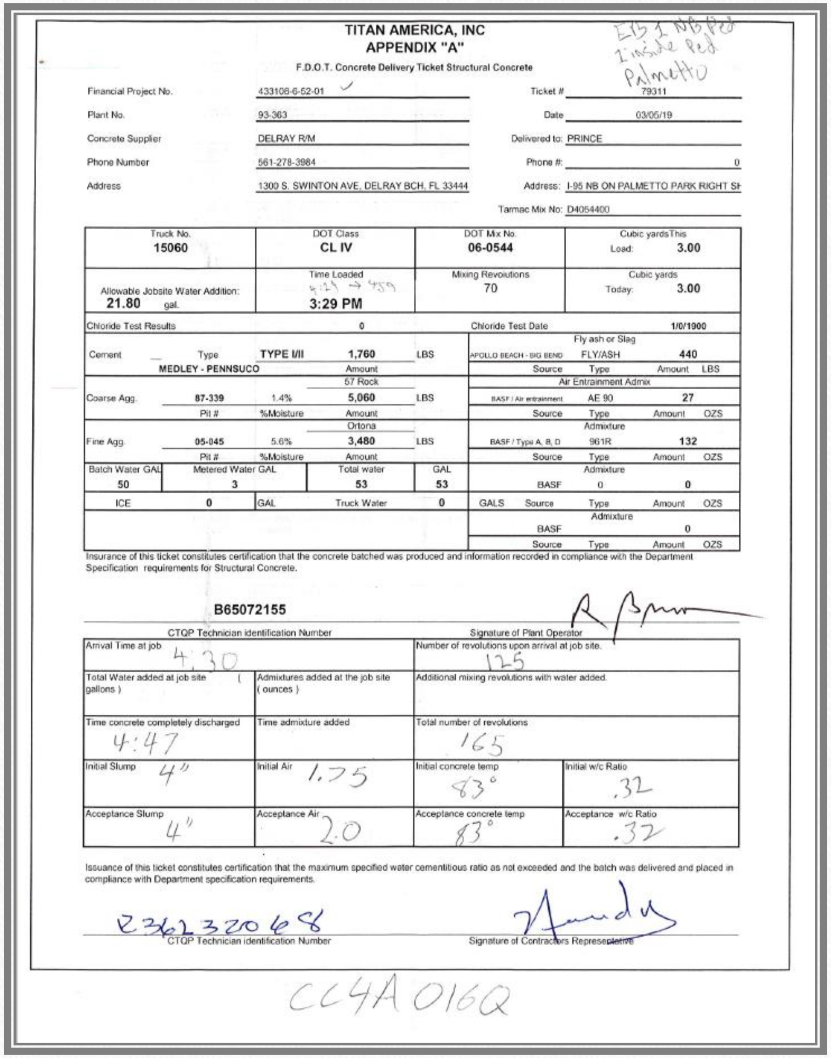


Spec 346—Plastic Properties

Spec 346—Concrete Class, Sampling, Transit Time

- Department-approval of reduced sampling frequency
- Higher class concrete can be used for lower strength
- Transit Time is the time for all concrete to be discharged from the truck taken from when water is first introduced
- Placement Time of 15 minutes after Transit Time to get concrete to its final position; time extension may be requested

Spec 346—Delivery Ticket



TITAN AMERICA, INC
APPENDIX "A"
F.D.O.T. Concrete Delivery Ticket Structural Concrete

E5 1 NB Ped
1 inside Ped
Palmetto

Financial Project No.	433108-6-52-01 ✓	Ticket #	79311
Plant No.	93-363	Date	03/05/19
Concrete Supplier	DELRAY R/M	Delivered to:	PRINCE
Phone Number	561-278-3984	Phone #:	0
Address	1300 S. SWINTON AVE, DELRAY BCH, FL 33444	Address:	I-95 NB ON PALMETTO PARK RIGHT SH
		Tarmac Mix No:	D4054400

Truck No. 15060	DOT Class CL IV	DOT Mix No. 06-0544	Cubic yards This Load: 3.00
Allowable Jobsite Water Addition: 21.80 gal.	Time Loaded 4:29 → 4:59 3:29 PM	Mixing Revolutions 70	Cubic yards Today: 3.00
Chloride Test Results 0		Chloride Test Date 1/0/1900	

Cement	Type	TYPE I/II	1,760	LBS	Fly ash or Slag: APOLLO BEACH - BIG BEND	FLY/ASH	440	
	MEDLEY - PENNSUCO		Amount		Source	Type	Amount	LBS
			57 Rock		Air Entrainment Admix			
Coarse Agg.	87-339	1.4%	5,060	LBS	BASF / Air entrainment	AE 90	27	
	Pit #	%Moisture	Amount		Source	Type	Amount	OZS
			Ortona		Admixture			
Fine Agg.	05-045	5.6%	3,480	LBS	BASF / Type A, B, D	961R	132	
	Pit #	%Moisture	Amount		Source	Type	Amount	OZS
Batch Water GAL 50	Metered Water GAL 3	Total water 53	GAL 53		Admixture: BASF	0	0	
ICE 0	GAL	Truck Water	0	GALS	Source	Type	Amount	OZS
					Admixture: BASF		0	
					Source	Type	Amount	OZS

Insurance of this ticket constitutes certification that the concrete batched was produced and information recorded in compliance with the Department Specification requirements for Structural Concrete.

B65072155
CTQP Technician identification Number

Signature of Plant Operator

Arrival Time at job 4:30		Number of revolutions upon arrival at job site. 125	
Total Water added at job site (gallons)	Admixtures added at the job site (ounces)	Additional mixing revolutions with water added.	
Time concrete completely discharged 4:47	Time admixture added	Total number of revolutions 165	
Initial Slump 4"	Initial Air 1.75	Initial concrete temp 83°	Initial w/c Ratio .32
Acceptance Slump 4"	Acceptance Air 2.0	Acceptance concrete temp 83°	Acceptance w/c Ratio .32

Issuance of this ticket constitutes certification that the maximum specified water cementitious ratio as not exceeded and the batch was delivered and placed in compliance with Department specification requirements.

2362320658
CTQP Technician identification Number

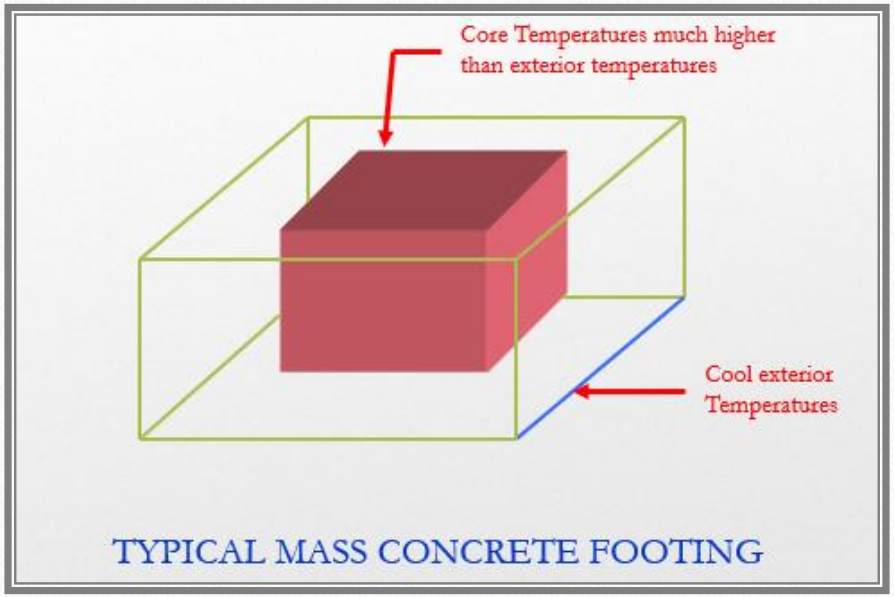
Signature of Contractors Representative

CC4A 016Q

Spec 346—Mass Concrete

- Mass Concrete Control Plan
- Temperature readings every 6 hours until:
  - Max temperature differential (35°F max) and
  - Max temperature (180°F max) and diminishes
- Controls remain until core temperature within 50°F of ambient
- Specialty Engineer must be engaged to advise if issues arise

Spec 346—Mass Concrete



Spec 346—Mass Concrete

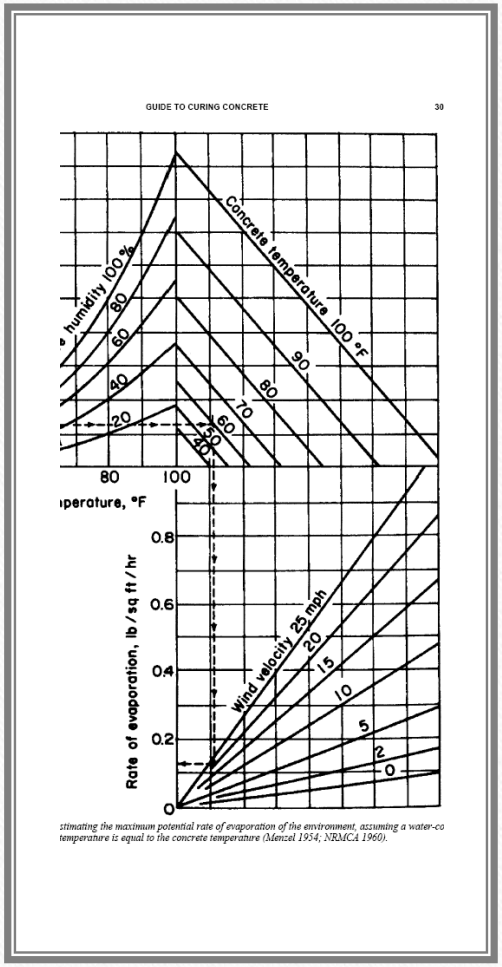
Spec 400—Footing Placement

- Cofferdam preparation—seal concrete or precast "bathtub"
  - Water seepage
  - Standing water prior to concrete placement
  - Primary pump capacity plus backup pump
- 20 inch or less lift thickness when placing concrete
- Mass concrete monitoring devices protected during concrete placement

Spec 400—Deck Placement

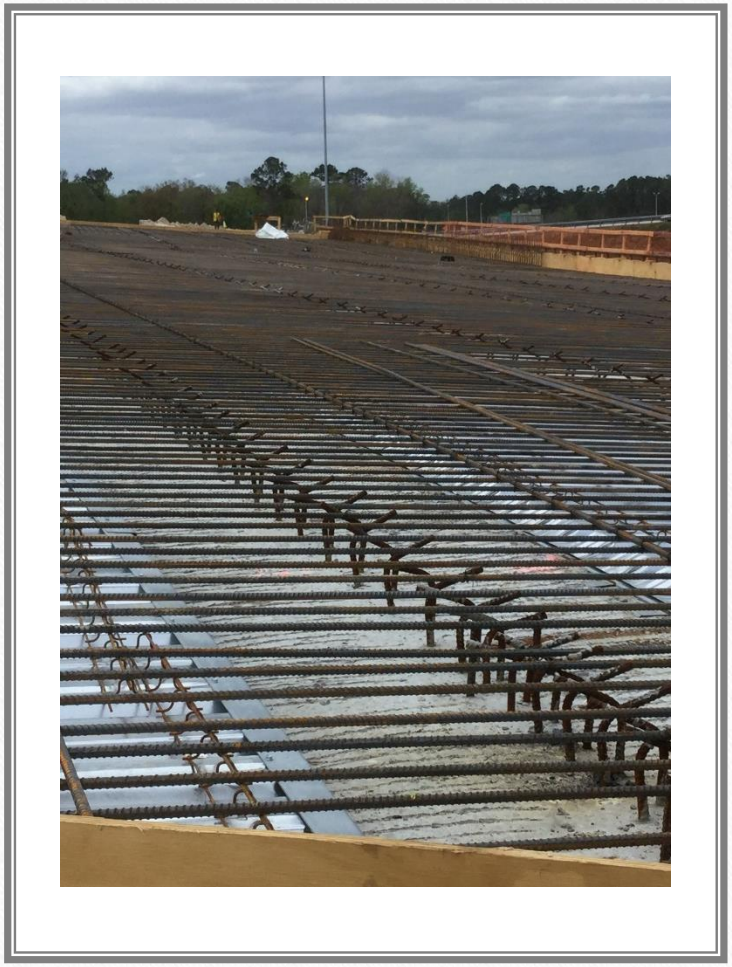
- Placement sequence/ direction
- Screed demonstration
- Curing compound applied within 120 minutes of initial placement
- Compound spread rate/quantity reported to the Engineer
- Placement and maintenance of curing blankets (over barrier)

Spec 400—Deck Placement



Spec 400—Deck Placement

- Evaporation rate determined by:
  - Air temperature, relative humidity
  - Concrete temperature
  - Wind Velocity (15 mph max)
- If evaporation rate exceeds 0.1 lbs/ft^2/hr including:
  - Evaporation retarder
  - Water fogging
  - Chilled mix water
  - Wind screens

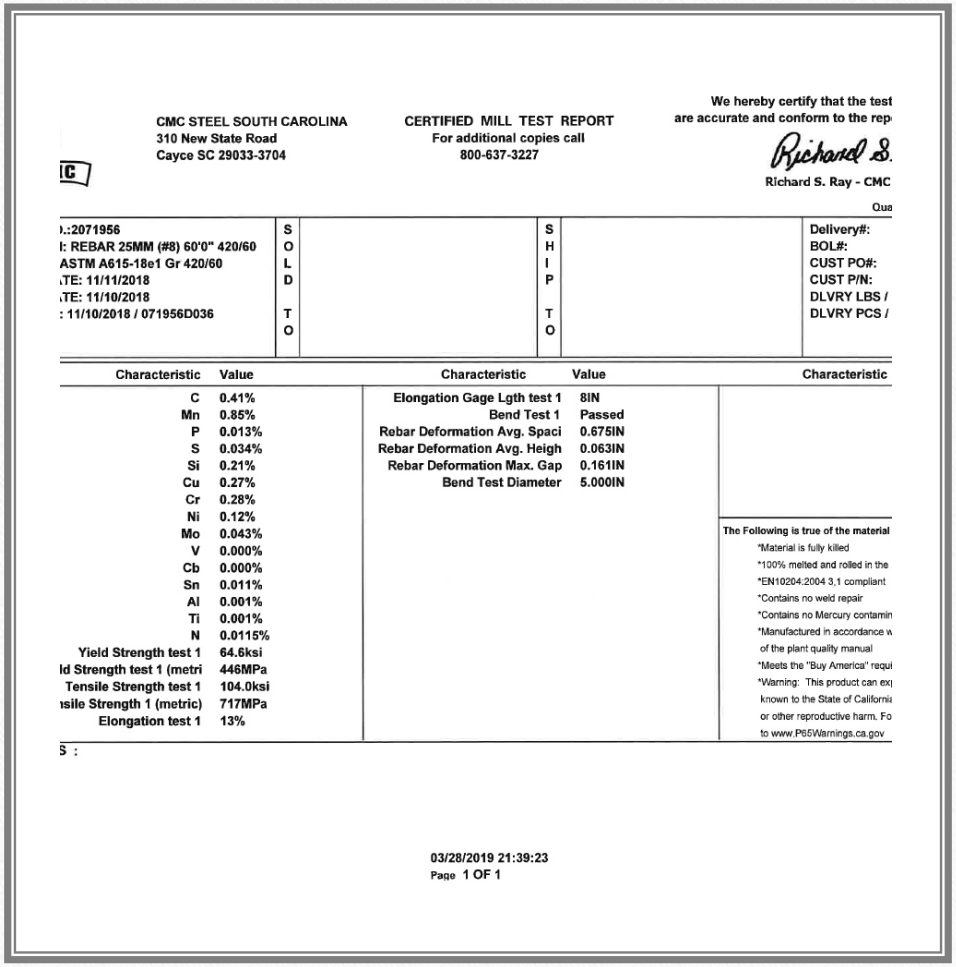


Specs 400/450—Camber

- Monthly camber estimates in the precast yard
- Camber tolerance of 1 inch from design camber in Plans
- Contractor takes appropriate actions (400-7.13.1) to get girder stirrups to “fit” with the deck

Specs 400/415/460/502—Rebar, SIP Forms, Shear Connectors

- Field welding permitted per Spec 460 if on the Plans
- No welding of SIP forms to flanges
- Bending of reinforcement with Engineer's permission
- Store rebar above ground
- Shear stud installation in the field with bend testing



CMC STEEL SOUTH CAROLINA
310 New State Road
Cayce SC 29033-3704

CERTIFIED MILL TEST REPORT
For additional copies call
800-637-3227

We hereby certify that the test
are accurate and conform to the rep

Richard S. Ray - CMC

Qua

.:2071956
: REBAR 25MM (#8) 60'0" 420/60
ASTM A615-18e1 Gr 420/60
TE: 11/11/2018
TE: 11/10/2018
: 11/10/2018 / 071956D036

SOLD TO

SHIP TO

Delivery#:
BOL#:
CUST PO#:
CUST P/N:
DLVRY LBS /
DLVRY PCS /

Characteristic	Value	Characteristic	Value	Characteristic
C	0.41%	Elongation Gage Lgth test 1	8IN	
Mn	0.85%	Bend Test 1	Passed	
P	0.013%	Rebar Deformation Avg. Spaci	0.675IN	
S	0.034%	Rebar Deformation Avg. Heigh	0.063IN	
Si	0.21%	Rebar Deformation Max. Gap	0.161IN	
Cu	0.27%	Bend Test Diameter	5.000IN	
Cr	0.28%			
Ni	0.12%			
Mo	0.043%			
V	0.000%			
Cb	0.000%			
Sn	0.011%			
Al	0.001%			
Ti	0.001%			
N	0.0115%			
Yield Strength test 1	64.6ksi			
ld Strength test 1 (metri	446MPa			
Tensile Strength test 1	104.0ksi			
nsile Strength 1 (metric)	717MPa			
Elongation test 1	13%			

The Following is true of the material
*Material is fully killed
*100% melted and rolled in the
*EN10204:2004 3,1 compliant
*Contains no weld repair
*Contains no Mercury contamin
*Manufactured in accordance w
of the plant quality manual
*Meets the "Buy America" requi
*Warning: This product can ex
known to the State of Californi
or other reproductive harm. Fo
to www.P65Warnings.ca.gov

S :

03/28/2019 21:39:23
Page 1 OF 1

Spec 6—Buy America

- Buy America applicable to steel incorporated in the finished work, not the temporary condition
- Not just for Projects with FHWA funding during Construction
- Included if the corridor had FHWA funding through PD&E
- Mill certs need state "Made in USA"

Specs 400/460/461—Bearings, Anchor Bolts

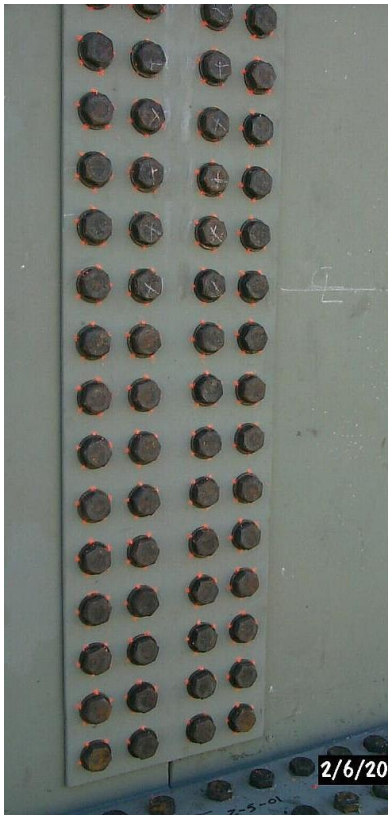
- Inspection of bearings for deformation and general condition
- Anchor bolt hole misalignment
- Expansion and contraction from temperature

Spec 460—Material

- The Department requires structural steel superstructures to be fabricated with weathering steel if 4 miles from the coast or greater
- Painting not required, reduction in maintenance costs over the life of the bridge
- Exceptions permitted but must be approved by the Chief Engineer, requiring justification by the District

Spec 460—Structural Steel and Miscellaneous Metals

Weathering steel girders

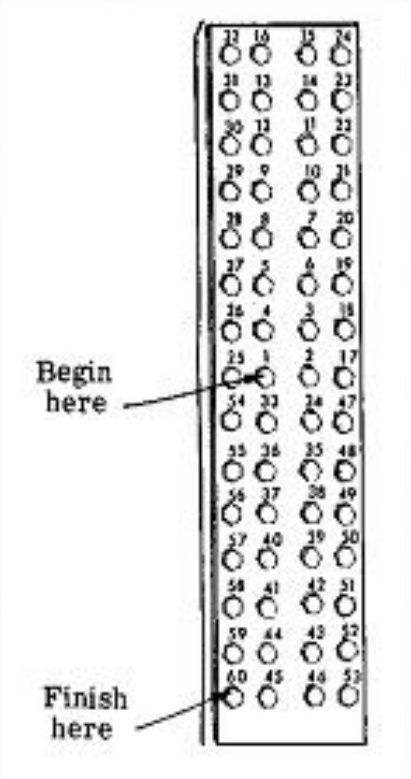


Spec 460—Bolting

- Turn-Of-Nut method
- ROCAP/Job-Inspection Snug Tight Torque performed in the field
- Bolt tightening sequence
- Erection Plan
- DTI's – Direct Tension Indicators

Spec 460—Bolting

Bolt Tightening Sequence



The Sequence of Tightening is
CRITICAL
→Most rigid, to least rigid

Spec 460 Skidmore-Wilhelm Tension Calibrator

Spec 460—Turn of Nut Bolting

Spec 460—Bolting

- Checking Snug Tight Tension with a Calibrated Torque Wrench

Contractor's Engineer of Record

Florida Department of TRANSPORTATION

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Construction

Office of Construction / Engineering Area / Specialty Engineer

Contractor's Engineer

This table provides brief clarifications to the works that are allowed to be performed by Contractor's Engineer of Record, Department Approved Specialty Engineer and Specialty Engineer as defined in Specification Section 1. For definitions, additional information and further clarifications refer to Specification Section 1.

Work Type	Contractor's Engineer of Record	Department Approved Specialty Engineer	Specialty Engineer
Re-design	Yes	No	No
Cost Savings Initiative Proposal	Yes	No	No
Details of the permanent work not fully detailed in the plans	Yes	Yes	Yes
Design and details of the permanent work declared to be minor or non-structural including minor repairs	Yes	Yes	Yes
Design and details of the permanent work declared to be major or structural including major repairs	Yes	Yes*	No
Design and drawings of temporary works, such as falsework, formwork, etc.	Yes	Yes	Yes

*The work must also be checked by another Department Approved Specialty Engineer

Qualifications and Certifications

CTQP Concrete Field Technician - Level I

CTQP Concrete Field Inspector - Level II

CTQP Grouting Technician - Level I & 2

CTQP Post-Tensioning Technician - Level I & 2

ACI, PTI, and ASBI issue certifications for successful completion

ASBI Certification in Flexible Filler Injection

Technicians certified by these agencies

Not considered qualified for FDOT work until qualification by CTQP

Training and Reference Tools

- Office of Construction and CTQP Websites contain most structures construction training materials including piles and drilled shafts as downloads
  - https://www.ctqpflorida.com/
- Structures Related Websites:
- State Construction Office, Structures Webpage
  - (http://www.fdot.gov/construction/)
- State Structures Design Office Website
  - (http://www.fdot.gov/structures/)

Contacts

- State Construction Structures Engineer
  - david.wagner@dot.state.fl.us
  - (850) 414-5246
- Construction Structures Engineer
  - Vacant
  - (850) 414-4141

Construction Structures Website:

- https://www.fdot.gov/construction/structures/Structures.shtm