2022 Construction Academy

May 2022

Concrete and Structural Materials

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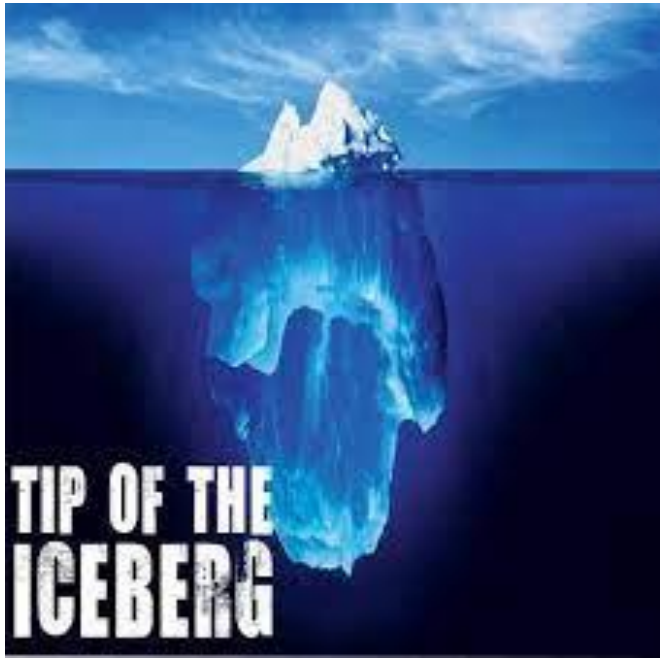
This conference has been prepared for you, construction project engineers, to facilitate better understanding of your role when dealing with ***concrete and structural materials*** in your projects.

If you want to know the specifics of each material beyond the scope of this presentation, please contact the presenters.



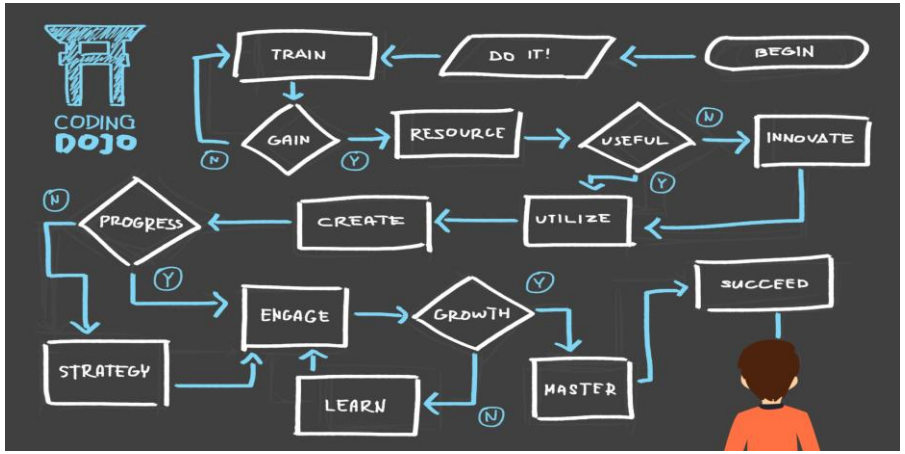
Scope of the Presentation

Concrete Fundamentals

Structural Materials

Precast / Prestressed Concrete

MAC basics related to Concrete



Part 1

Concrete Fundamentals

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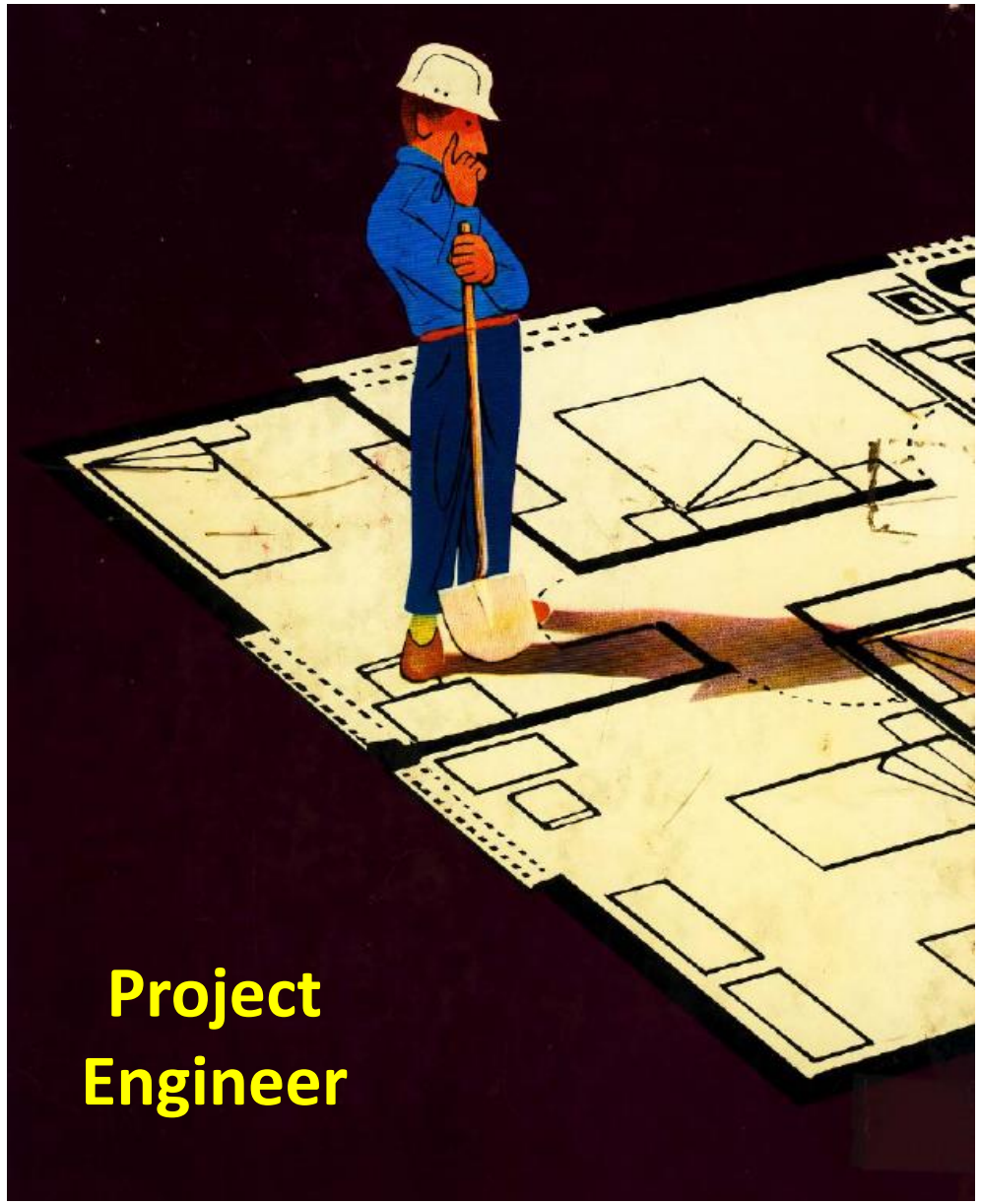
Concrete Fundamentals

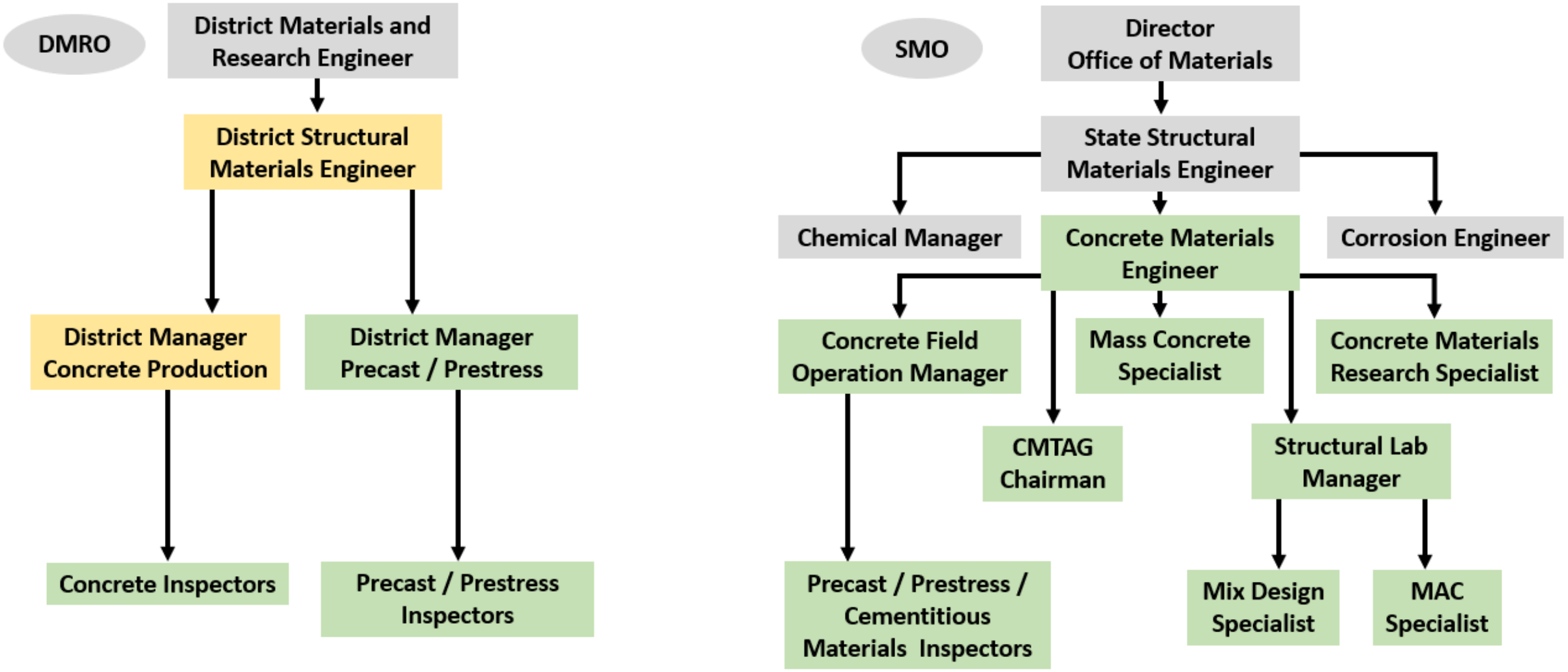
- Concrete Raw Materials
- Concrete Classification
- Concrete System Components
- Sampling and Testing
- Special Types of Concrete
- Concrete Acceptance based on Compressive Strength
- Low Compressive Strength
- Concrete Personnel Qualification Requirements



Who do I call if I have questions related to concrete or structural materials?

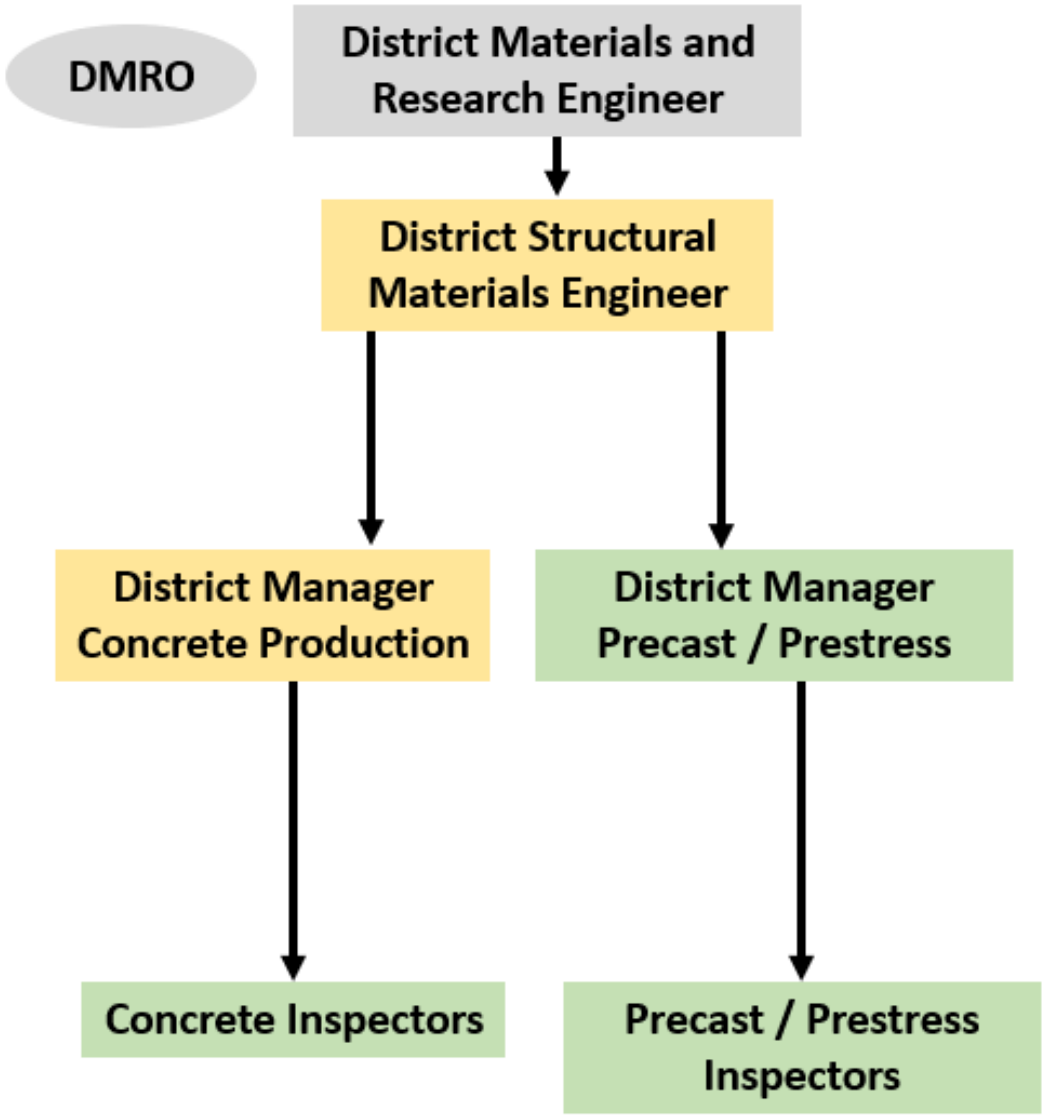
CHAIN OF COMMAND

FDOT Concrete Materials Structure



Contact your DMRO ***first*** and they may contact the SMO if needed.

Who do I call if I have questions related to concrete or structural materials?



Districts 1 & 7

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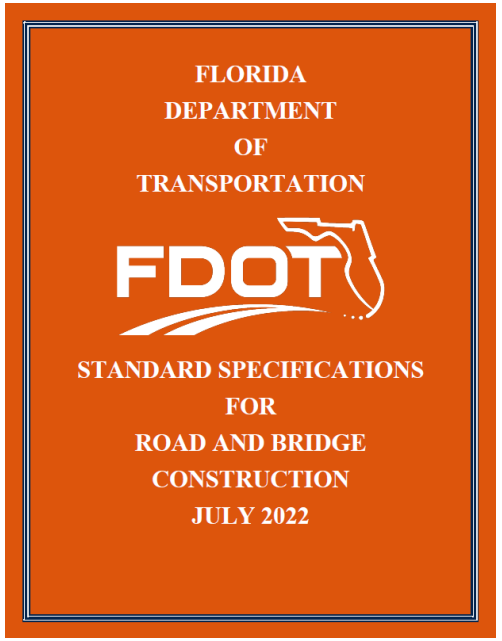
Concrete – Essential Documents



Standard Specification (SS)

https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/programmanagement/implemented/specbooks/july-2022/july2022ebook.pdf?sfvrsn=804e3f6_2

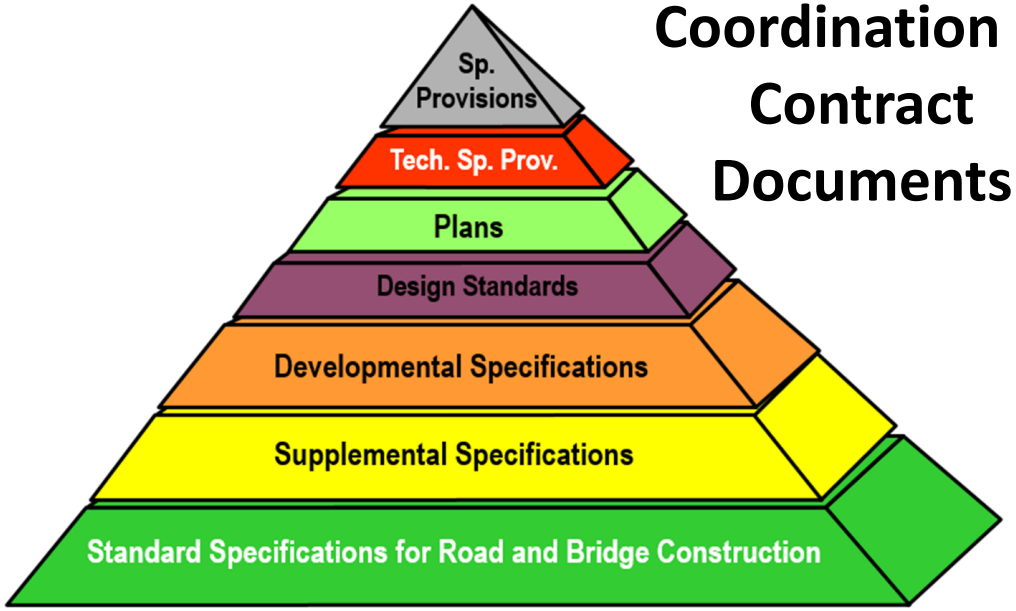
Materials Manual 8.4, 8.6, 9.2 and 9.3 (Vol I & II) (MM)

https://infonet.dot.state.fl.us/materials/administration/resources/library/publications/materialsmanual/index.htm

CPAM (Chapter 10 Structures)

Construction Project Administration Manual (fdot.gov)

Coordination of Contract Documents



Concrete Raw Materials

- **Cementitious Materials (SS 921 & 929)**
  - Portland Cement (SS 921)
  - Supplementary Cementitious Materials (SCMs) (SS 929)
    - (1) Fly Ash (coal-fired power stations) 
    - (2) Slag (iron manufacturing process)
    - (3) Highly Reactive Pozzolans $$
      - Silica Fume (Ferrosilicon Industry)
      - Metakaolin
      - Ultra Fine Fly Ash
    - (4) Other: Calcined Clay, Ground Glass, etc.
- **Coarse Aggregate (SS 901)**
- **Fine Aggregate (SS 902)**
- **Chemical Admixtures (SS 924)**
- **Water (SS 923)**

Binary Mix = Portland Cement + 1 SCM

Ternary Mix = Portland Cement + 2 SCMs

Use of Supplementary Cementitious Materials (SCMs) is mandatory. Few exceptions apply (SS 346-2.3)

$$\frac{Water}{Cem}\ Ratio = \frac{Total\ Water\ (lb)}{Total\ Cementitious\ Materials\ (lb)}$$

Concrete Classification according to FDOT Specifications

Conventional Concrete (SS 346 - 350) →

→ **Target Slump** → **3 in (general)**
→ **Target Slump** → **1.5 in (slip-formed pavement)**
→ **Tolerance ± 1.5 in**

Increased Slump Concrete (SS 346) →

→ **Target Slump** → **7 in (maximum)** → **Tolerance ± 1.5 in**

Flowing Concrete (MM 8.6) →

→ **Target Slump** → **9 in (general)** → **Tolerance ± 1.5 in**

Self-Consolidating Concrete (MM 8.4) →

→ **Target Spread** → **27.0 in (general)**
→ **Target Spread** → **22.5 in (Jan-2022)**
→ **Tolerance ± 2.5 in**

Buy America Concrete – Cars Dealerships

What is your favorite car ?

Ultra-High-Performance Concrete (UHPC)
(Ford Formula 1 Team)

Self-Consolidating Concrete (SCC)
(Ford GT-40)

Flowing Concrete
(Chevrolet Corvette)

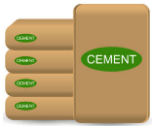
Increased Slump Concrete
(Cadillac CT6)

Conventional Concrete
(Ford Fusion)

Cementitious Content

Cost

Issues



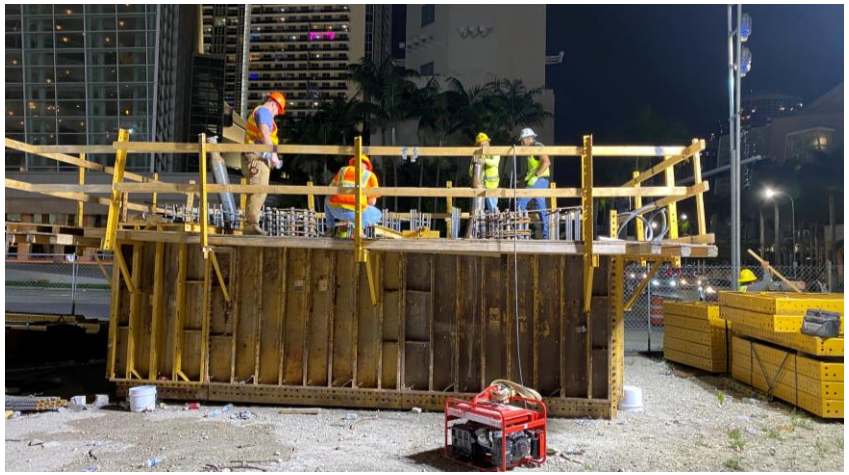
Conventional Concrete Class I (Pavement)
f'c = 3,000 psi (SS 350 – MM 9.3)

⇐ **Excessive Slump Issues**

(Target 1.5 in ± 1.0 tolerance [0.5 in to 2.5 in])

Ex. Use of Flowing Concrete
I-395 Signature Bridge Central Footing (District 6)

Flowing Concrete (MM 8.6), SCC (MM 8.4) and UHPC (DevSpec 349/927) require a Mock-Up Production and Evaluation



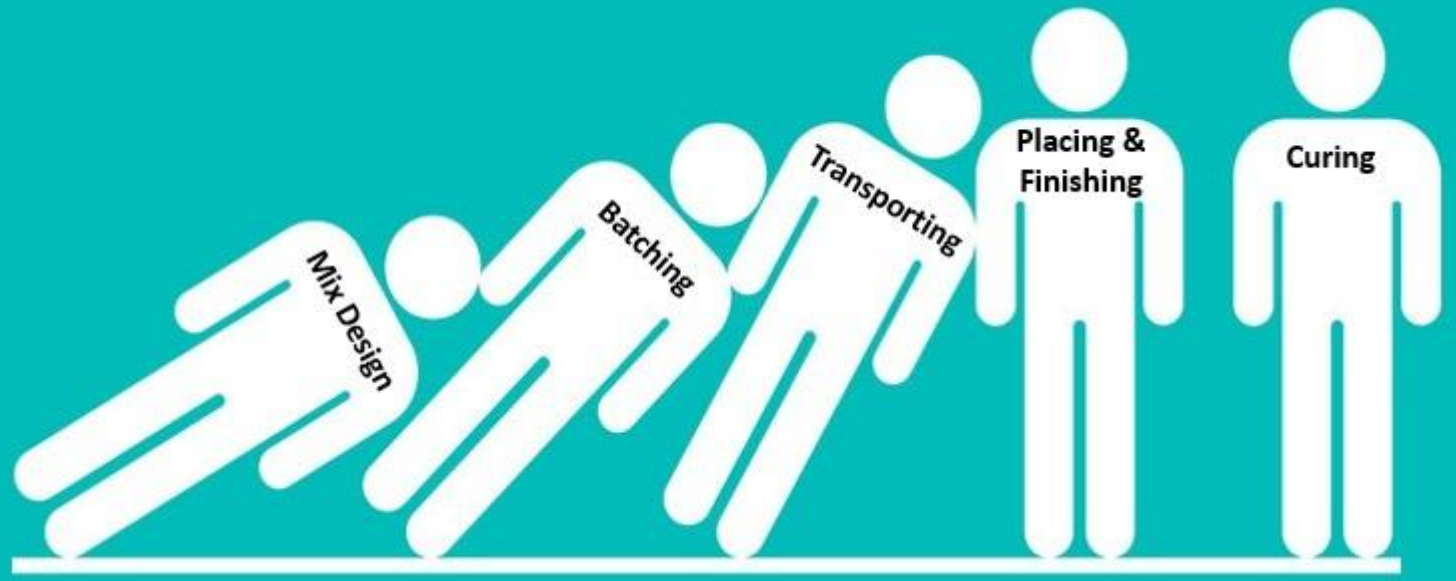
UHPC (DevSpec 349/927)

Standard Concrete Products (Tampa) Field Demonstration

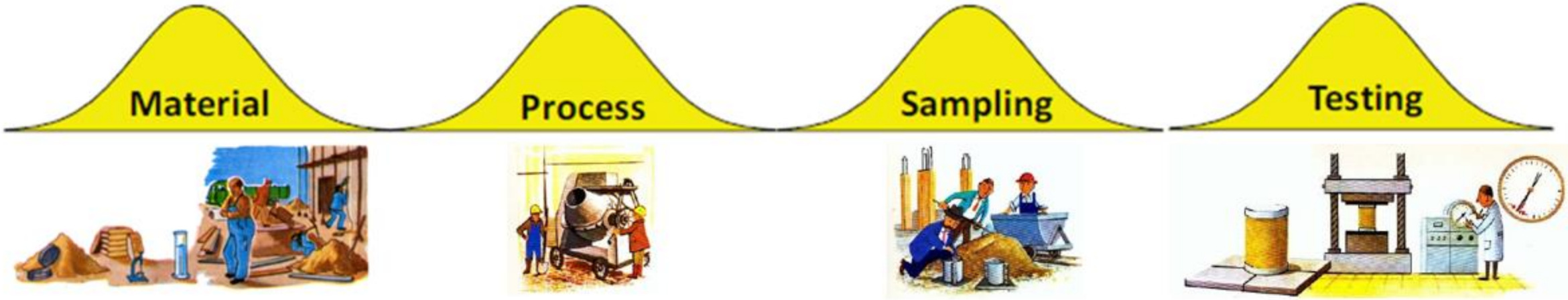
UHPC – Mockup Demonstration in District 3 – SR 8 Approach Slab Replacement

Concrete System

- Mix Design (Proportioning)
- Batching
- Transporting
- Placing & Finishing
- Curing

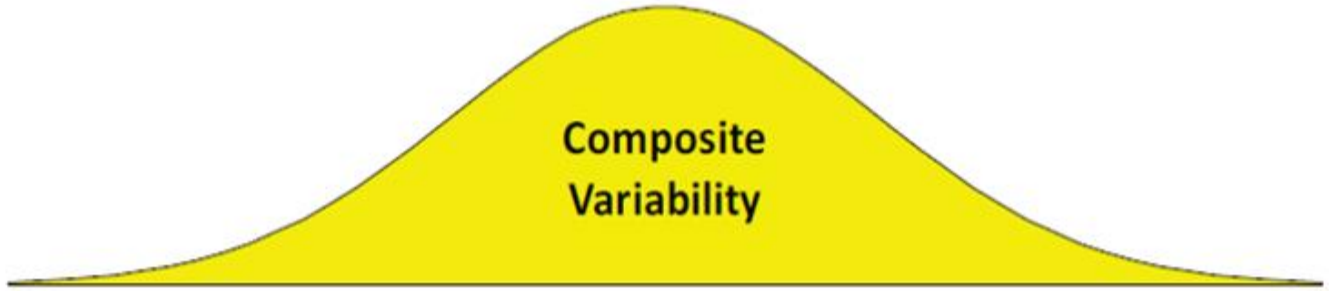


Sources of variability in concrete



SS 901, 902, 921, 923, 924 & 929

SS 346, 350, 400, 450, MM 8.4, 8.6, 9.2 & 9.3



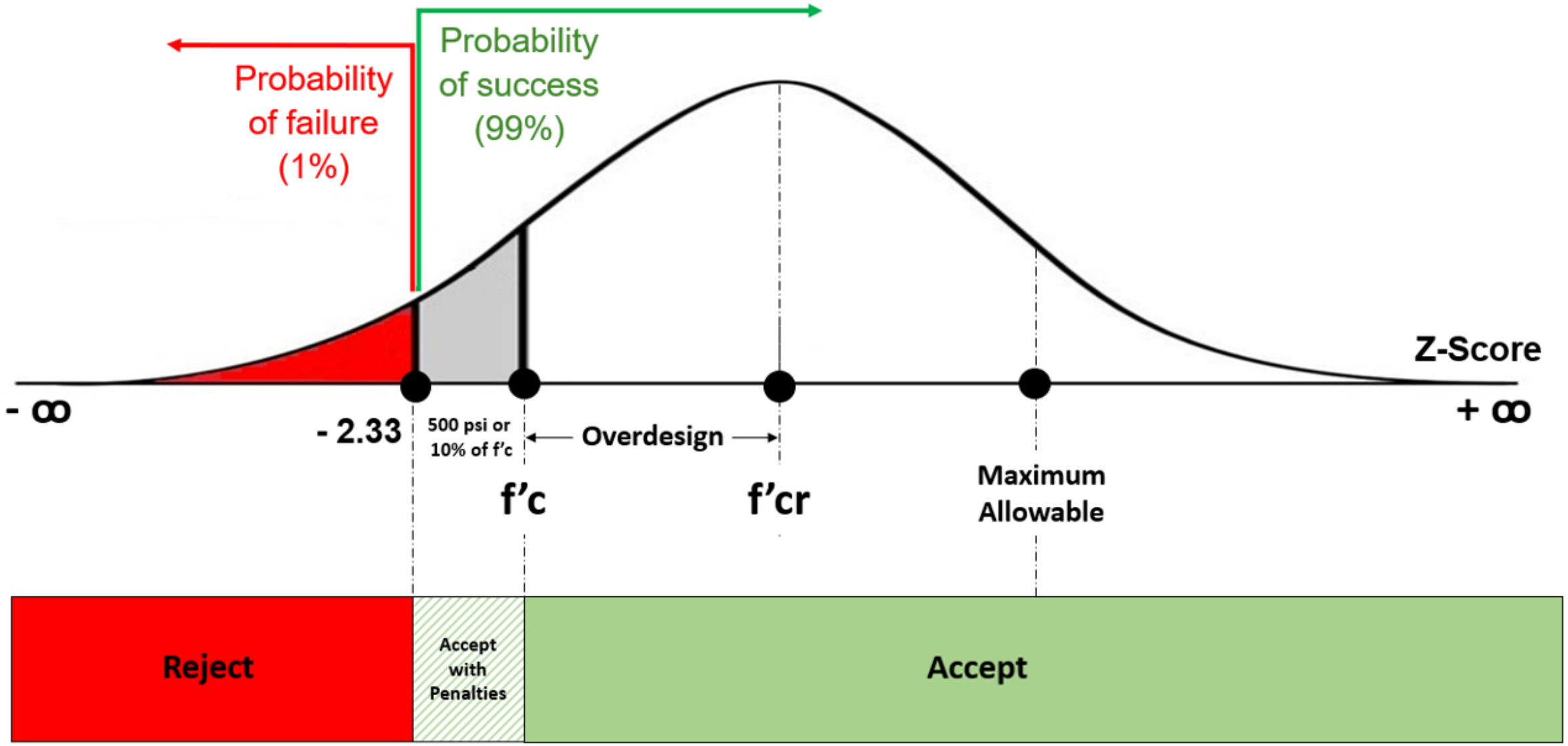
We overdesign the concrete **MM 9.2**

$$f'cr = f'c + Overdesign$$

TABLE 1 – Overdesign requirements for establishing ***f'cr*** when data is not available at 28-day or 56-day whichever is applicable

Class of Concrete	***f'c*** (psi)	Overdesign (psi)	***f'cr*** (psi)	Maximum Allowable Compressive Strength (psi)
I Seal	3,000	1,200	4,200	5,200
I Pavement	3,000	1,200	4,200	5,200
II	3,400	1,200	4,600	5,700
II Bridge Deck	4,500	1,200	5,700	6,750
III	5,000	1,200	6,200	6,750
IV	5,500	1,250	6,750	7,850
IV Drilled Shaft	4,000	1,200	5,200	6,200
V	6,500	1,350	7,850	10,050
VI	8,500	1,550	10,050	11,700
VII	10,000	1,700	11,700	13,000

Basis of Concrete Mix Design ⇛ SS 346 & MM 9.2



Mix Design (Proportioning)

A Concrete Mix Design is unique and proprietary (MAC – ID).

Concrete supplier proposes a mix design for approval. ***DMRO reviews*** the mix. ***SMO approves*** the mix.

Each mix design approved meets the specified compressive strength plus an overdesign for the specified class of concrete **(MM 9.2)**

Raw materials substitutions may be considered (at the discretion of the SMO) to prevent concrete placement delays on ongoing construction projects **(MM 9.2)**

The Engineer may allow the substitution of a higher-class concrete in lieu of the specified class concrete. Acceptance is based on the requirements in Table 346-3 for the specified class concrete. **(SS 346-3.2)**

Batching

Concrete Batch Plants follow the mixer manufacturer's design or recommendations.

Wet Mixers: Batch Plants equipped with a central mixer.

Dry Mixers: Batch Plants without a central mixer.
Plants weigh the materials, and ready-mix trucks are utilized to mix and transport the concrete.

⇛

Batching

Movable Mixers: Proportion, mix and deliver the concrete.

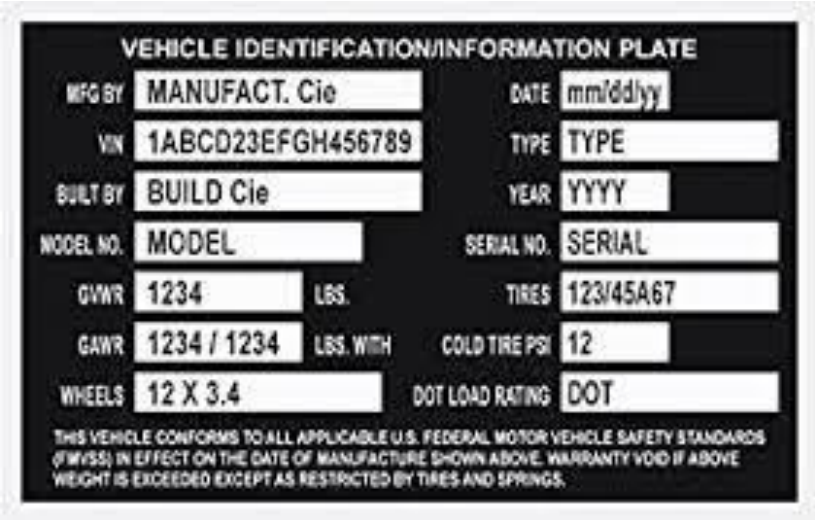
Developmental Specification 346 (Volumetric Mixers)

https://www.fdot.gov/programmanagement/otherfdotlinks/developmental/default.shtm

VOLUMETRIC MIXERS Use only with Structural Concrete Class I and II. NOTE: Must be used with Dev346VM and Dev105VM	Jose Armenteros	**DevMM9.2VM**
VOLUMETRIC MIXERS Use only with Structural Concrete Class I and II. NOTE: Must be used with Dev346VM and DevMM9.2VM	Jose Armenteros	**Dev105VM**
VOLUMETRIC MIXERS Use only with Structural Concrete Class I and II. NOTE: Must be used with Dev105VM and DevMM9.2VM	Jose Armenteros	**Dev346VM**

Batch Plant Requirements are detailed in the Plant QC Plan.
Ensure that each truck has a rating plate and a valid mixer identification card issued by the Department.
Ensure that the revolution counter on the mixer is working properly, and calibration of the water dispenser has been performed within the last twelve months. **(SS 346-8 & MM 9.2)**

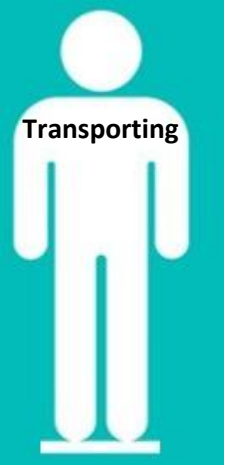
Operate all concrete mixers at speeds and volumes per the manufacturer's design or recommendation as stipulated on the mixer rating plate. **(SS 346-7.1)**


VEHICLE IDENTIFICATION/INFORMATION PLATE

MFG BY	MANUFACT. Cie	DATE	mm/dd/yy
VIN	1ABCD23EFGH456789	TYPE	TYPE
BUILT BY	BUILD Cie	YEAR	YYYY
MODEL NO.	MODEL	SERIAL NO.	SERIAL
GVWR	1234 LBS.	TIRES	123/45A67
GAWR	1234 / 1234 LBS. WITH	COLD TIRE PSI	12
WHEELS	12 X 3.4	DOT LOAD RATING	DOT

THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY STANDARDS (FMVSS) IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE. WARRANTY VOID IF ABOVE WEIGHT IS EXCEEDED EXCEPT AS RESTRICTED BY TIRES AND SPRINGS.

DMRO performs quarterly Batch Plant inspections



Transporting (SS 346, 400, MM 9.2)

346-7.2.1 Transit Time: Ensure compliance with Table 346-8 between the initial introduction of water into the mix and completely discharging all the concrete from the truck. Reject concrete exceeding the maximum transit time. The Engineer may approve an extension of the transit time which will be identified on the approved mix design.

Table 346-8	
Maximum Allowable Transit Time	
Non-Agitator Trucks	Agitator Trucks
45 minutes	60 minutes
75 minutes (1)	90 minutes (1)

Note:
(1) When a water-reducing and retarding admixture (Type D, Type G, or Type II) is used.

346-7.2.2 Placement Time: All the concrete in a load must be in its final placement position a maximum of 15 minutes after the transit time has expired unless a time extension is approved by the Engineer.

For Class IV (Drilled Shaft) mixes, placement time may be extended provided the slump loss time of the first concrete placed is not exceeded throughout the elapsed time.

Fresh concrete loses its workability with time. This phenomenon is called “slump loss’”.

Placing and Finishing (SS 400)

When concrete arrives to the job site and before placing it, check the delivery ticket information. **(MM 9.2)**

- The Contractor is responsible for ensuring that the truck has an FDOT issued mixer identification card.
- If the mixer card is not present, the Contractor must reject the load.

Reject concrete exceeding 100°F at the time of placement. **(SS 346-7.5)**

Do not mix or place concrete when the air temperature is below 40°F. **(SS 346-7.5)**
Protect the fresh concrete from freezing in accordance with Section 400.

Where conveyor belts, pumps, or chutes are used to transport concrete directly to the point of final placement, samples will be obtained at the point of discharge.

Avoid segregation of concrete during placement. **(SS 400-7.5)**

Placing and Finishing

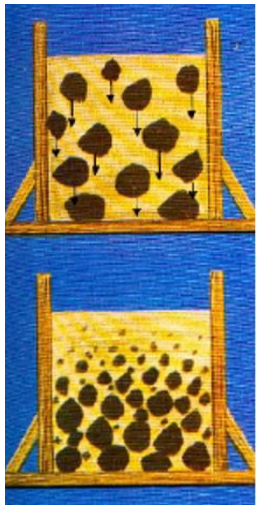
Concrete Segregation (SS 400-7.5)

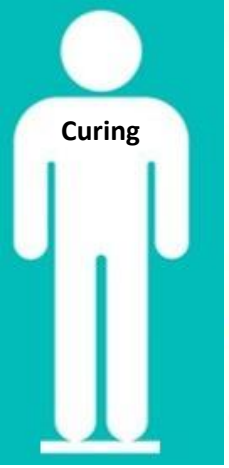
Segregation is the tendency for the coarse aggregate to separate from the mortar and is a measure of how cohesive the concrete mix is. Segregation can lead to non-uniform zones in the concrete, such as rock pockets or honeycombs.

Use a method and manner of placing concrete that avoids the possibility of segregation or separation of aggregates.

Concrete Segregation - Causes

Excessively wet mix.
Over vibration.
Excessive drop in placing (+5 ft).
Gap graded aggregate.
Low mix viscosity.





(SS 400-16)

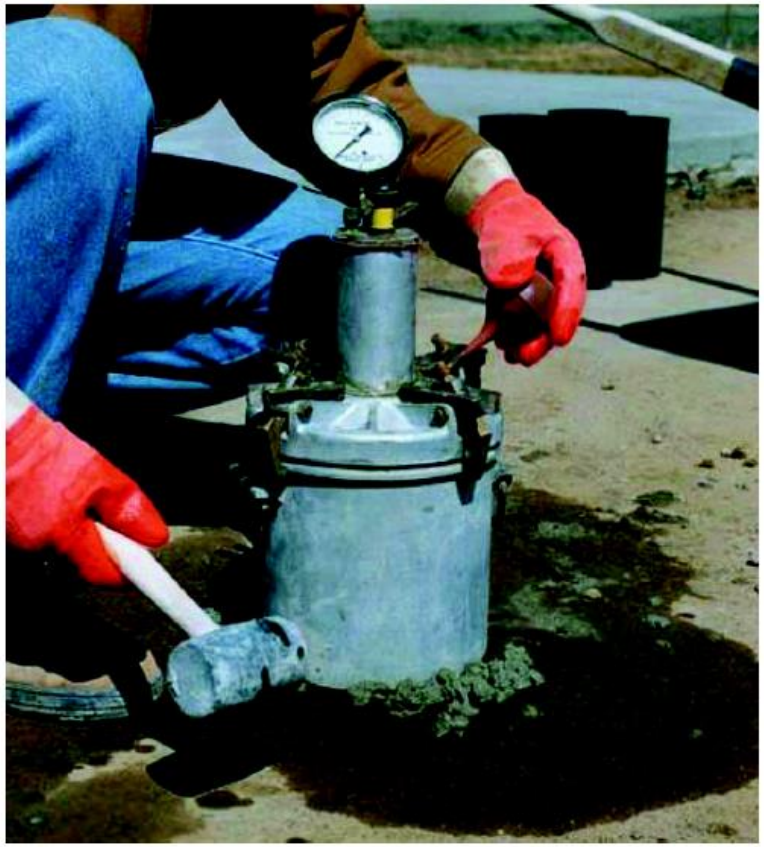
Early covering with mats, kept water-soaked, protect concrete while it cures in hot weather **(SS 400-16.2)**

Curing compound application on Concrete Class I (Pavement) **(SS 400-16.2)**

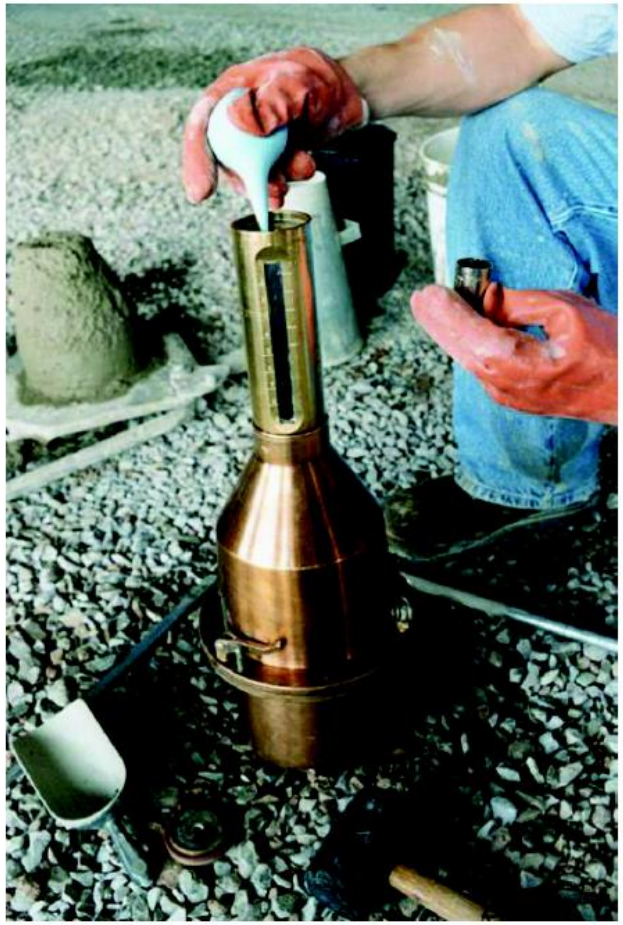
Sampling and Testing

Plastic Properties

Slump



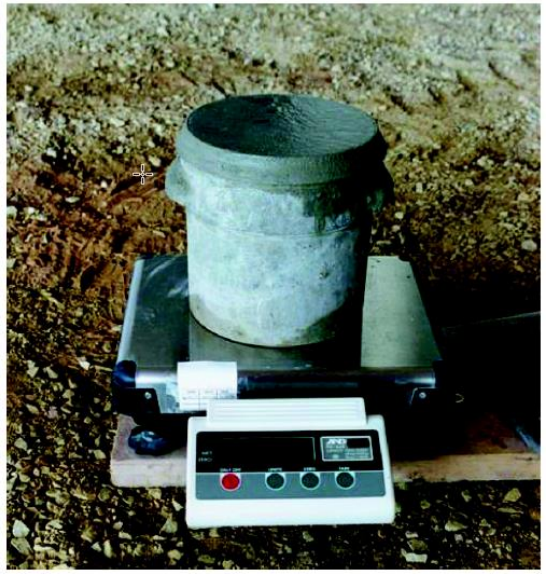
Air Content
(Pressure Meter)



Air Content
(Roller Meter)

Plastic Properties

Temperature



Unit Weight (Density)

Casting Cylinders

Do we reject concrete with slump out of the tolerance? (Y / N)

YES, we do.

There are opportunities to correct a low slump.

346-6.4 Plastic Property Tolerances: Reject concrete with slump or air content that does not fall within the specified tolerances, except as noted below, and immediately notify the concrete production facility that an adjustment of the concrete mixture is required. If a load does not fall within the tolerances, test each subsequent load and the first adjusted load. If failing concrete is not rejected or adjustments are not implemented, the Engineer may reject the concrete and terminate further production until the corrections are implemented.

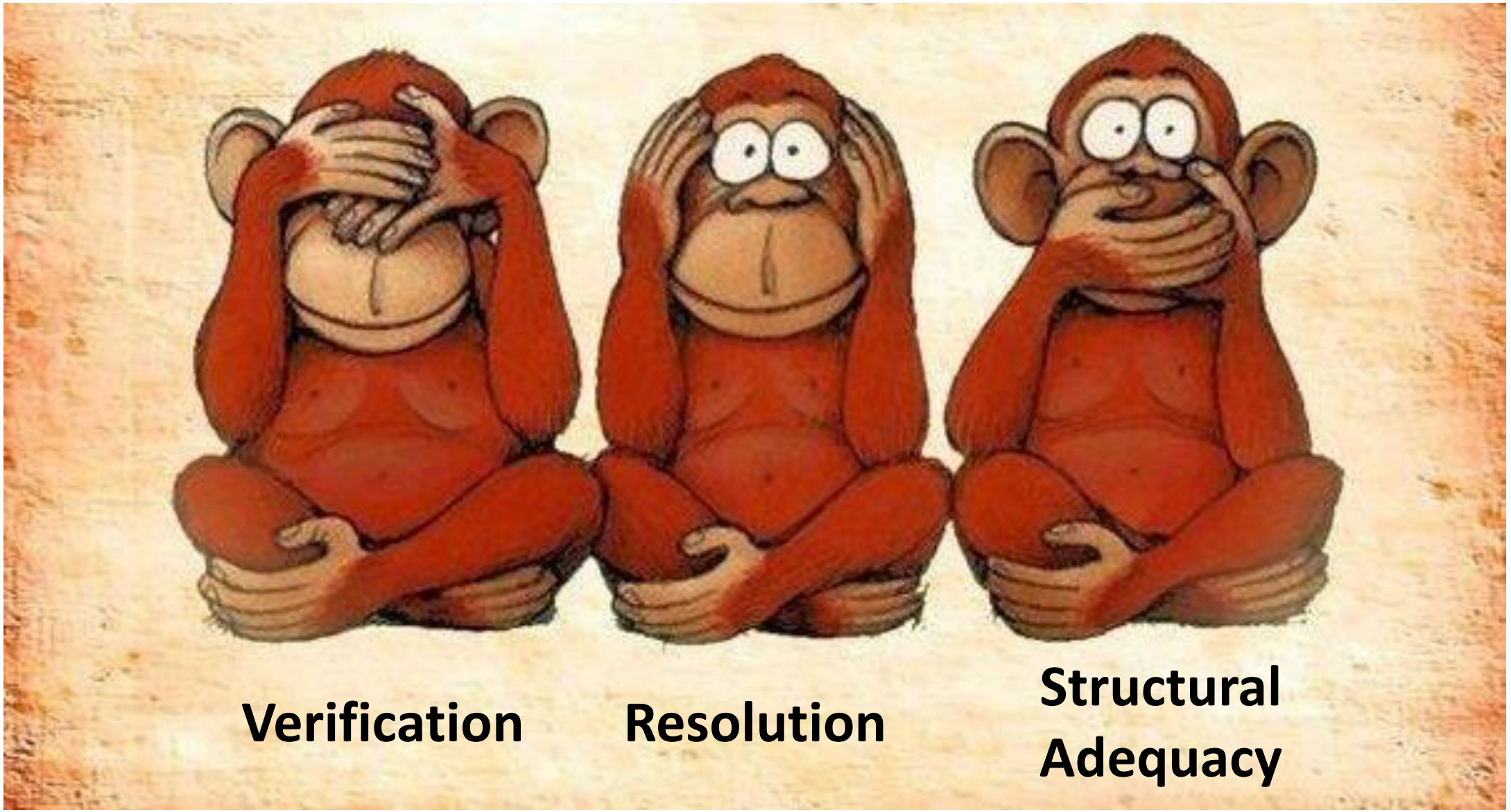
At the Contractor's risk, water may be added at the placement site immediately after completion of the initial slump test, either to correct a low slump or to increase the concrete workability, provided the addition of water does not exceed the water to cementitious materials ratio as defined by the mix design.

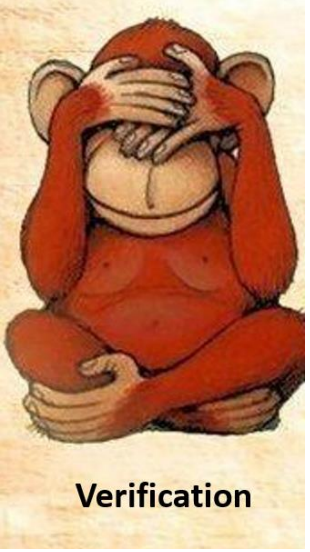
After adding water, perform an additional slump test to confirm the concrete is within the slump tolerance range. If the slump is outside the tolerance range, reject the load. If an adjustment is made at the concrete production facility, perform a slump test on the next load to ensure the concrete is within the slump tolerance range. Do not place concrete represented by slump test results outside of the tolerance range. Include water missing from the water storage tanks upon arrival at the project site in the jobsite water added.

Do not allow concrete to remain in a transporting vehicle to reduce slump.

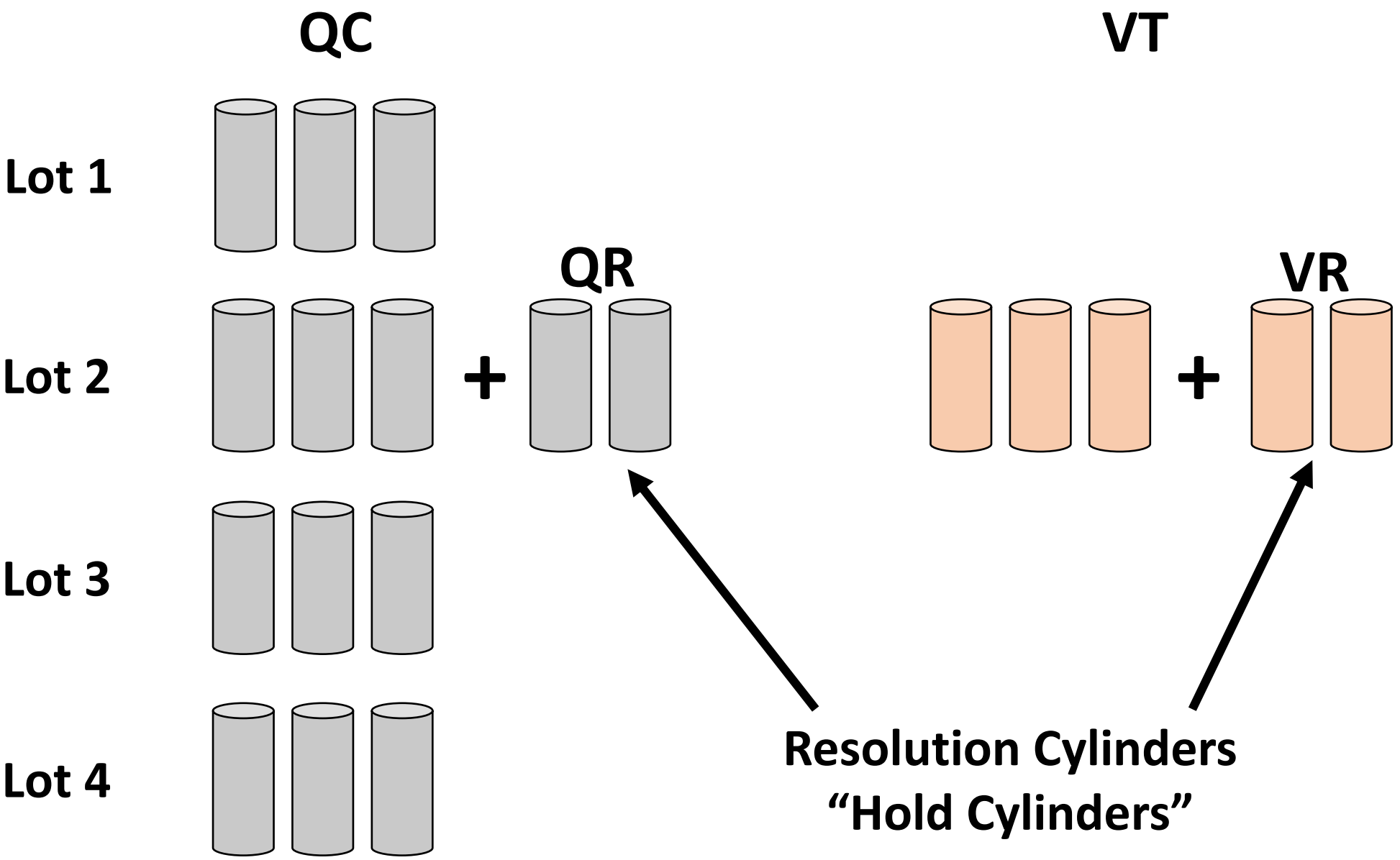
There is an exception for Self-Consolidating Concrete (SCC) based on additional plastic property tests (Precast/Prestressed). **(MM 8.4)**

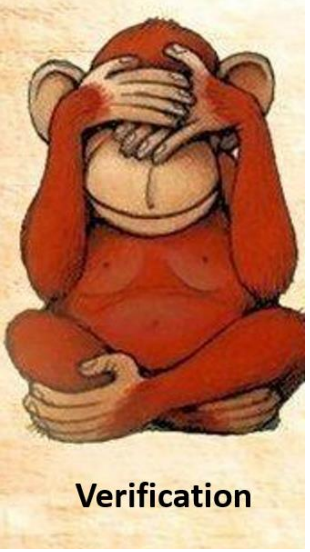
Concrete Acceptance based on Compressive Strength at 28 days

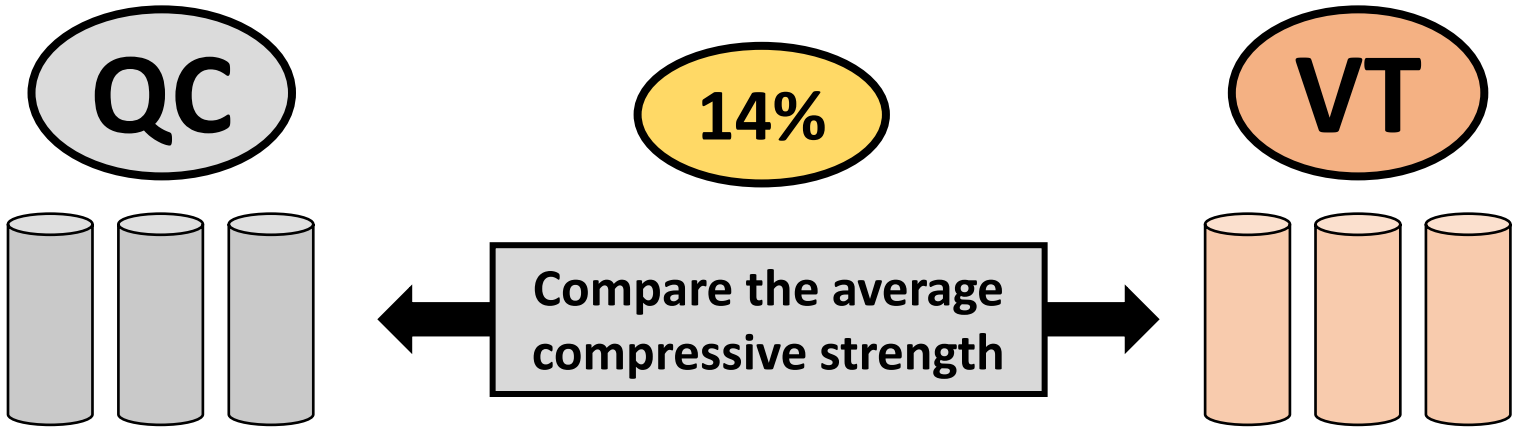




Verification of compressive strength by comparing *QC* and *VT* results.







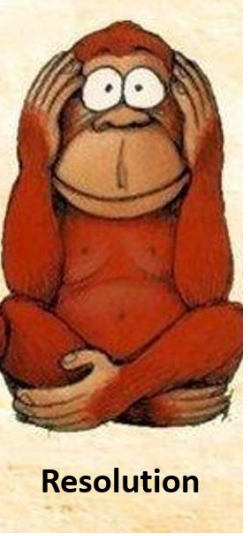
$$\textbf{Difference}\ (\%) = \textbf{ABS}\left(\frac{\textbf{QC} - \textbf{VT}}{\textbf{QC}}\right)\textbf{100}$$

IF Difference (%) ≤ 14%

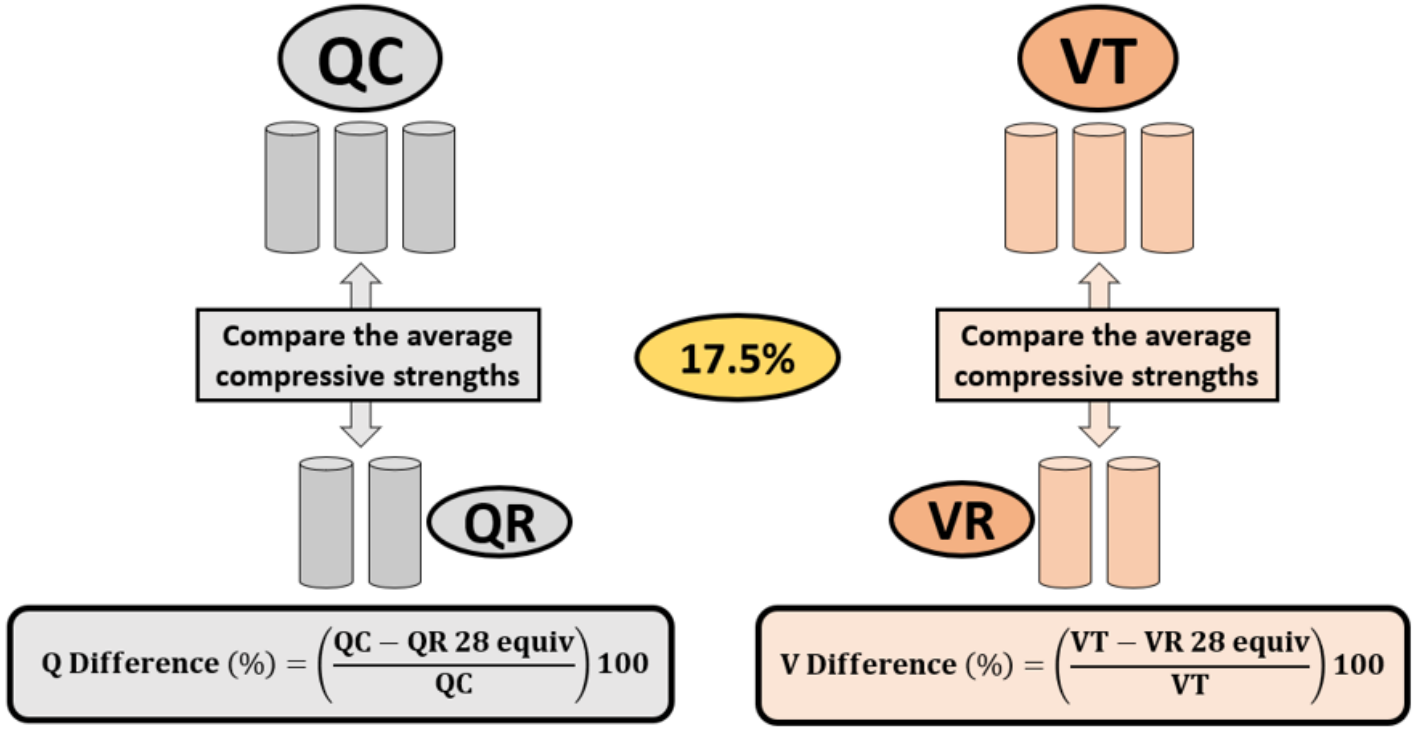
QC test results are verified, the Engineer will accept the concrete based on QC test results.

IF Difference (%) > 14%

The QC data is not verified, and the Engineer will initiate the **Resolution procedure.**



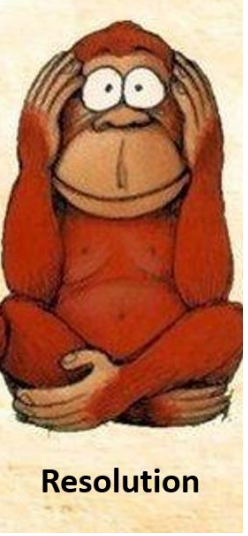
Comparing (***QC*** with ***QR***) and (***VT*** with ***VR***) results.



Differences must not be greater than 17.5%

Based on the **Resolution** process, the Engineer will determine the most accurate strength test result (***QC or VT***) to represent the four or fewer consecutive LOT(s).

When the Engineer cannot determine which strength test results are the most accurate, the concrete represented by the four consecutive LOTs will be evaluated based on the ***QC*** data.



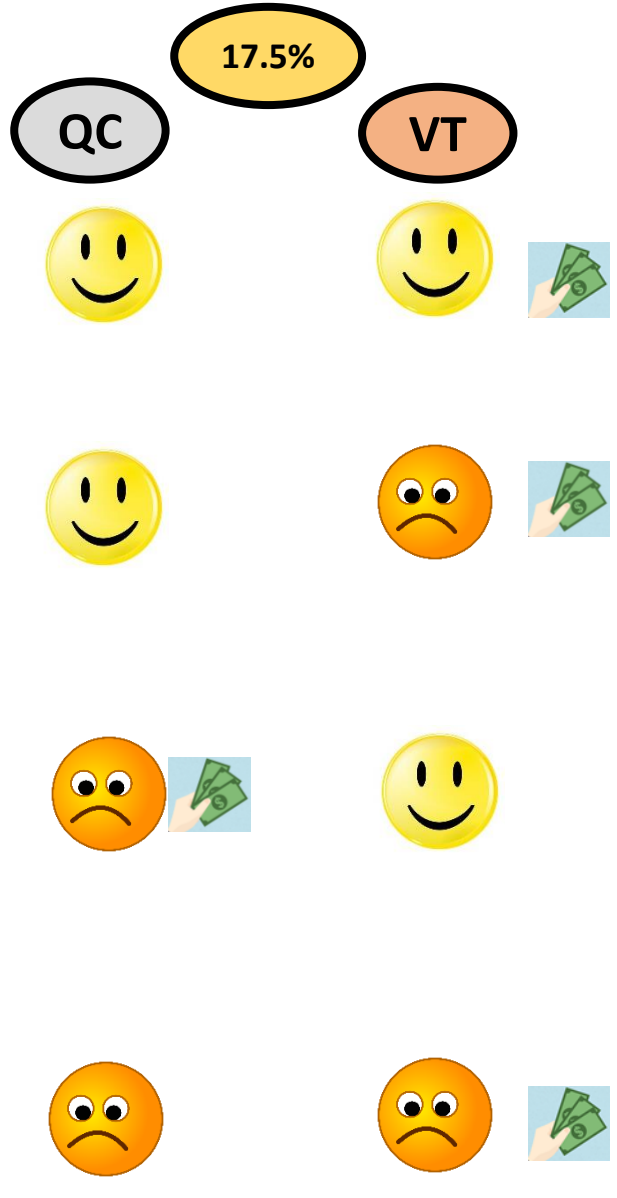
The Engineer will determine the most accurate strength test result to represent the LOTs as follows:

When both results meet the established comparison criteria, both are deemed accurate, and the QC strength will represent the LOTs. The Department will pay for cost of the resolution testing.

When only the QC result is within the established comparison criteria, the QC strength is deemed as most accurate and will represent the LOTs. The Department will pay for the cost of the resolution testing.

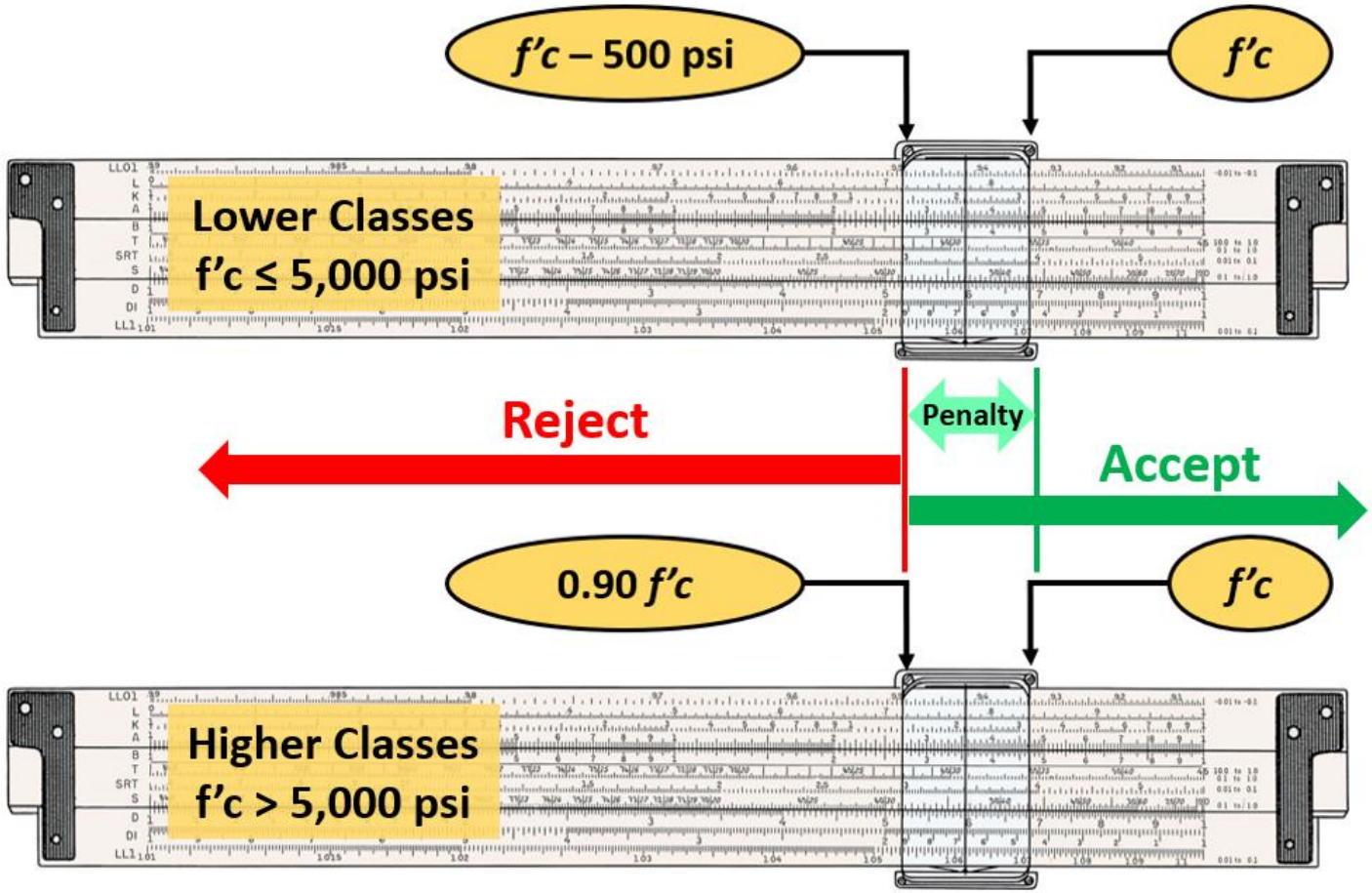
When only the VT result is within the established comparison criteria, the VT strength is deemed as most accurate and will represent the LOTs. The Department will assess a $1,000 pay reduction for the cost of the Resolution Investigation.

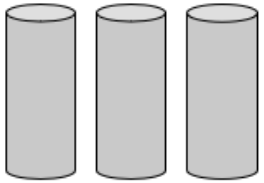
When both results are outside the established comparison criteria, the Engineer, with input from the District Materials Office, will determine if any Department IA evaluations are required and which test results are most accurate. The Department will pay for the cost of the resolution testing.



Structural Adequacy

The Engineer will accept the concrete of a given LOT when it meets the minimum specified compressive strength requirement (***f'c***) (SS 346-9.4)



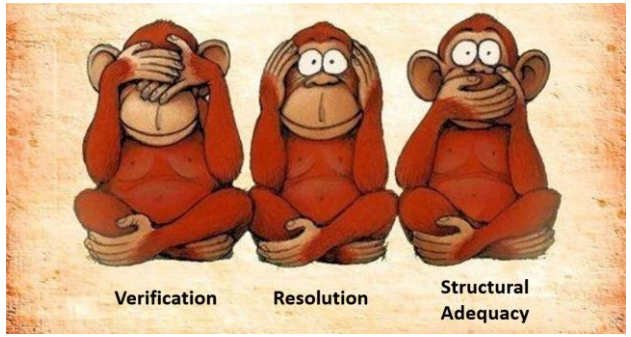


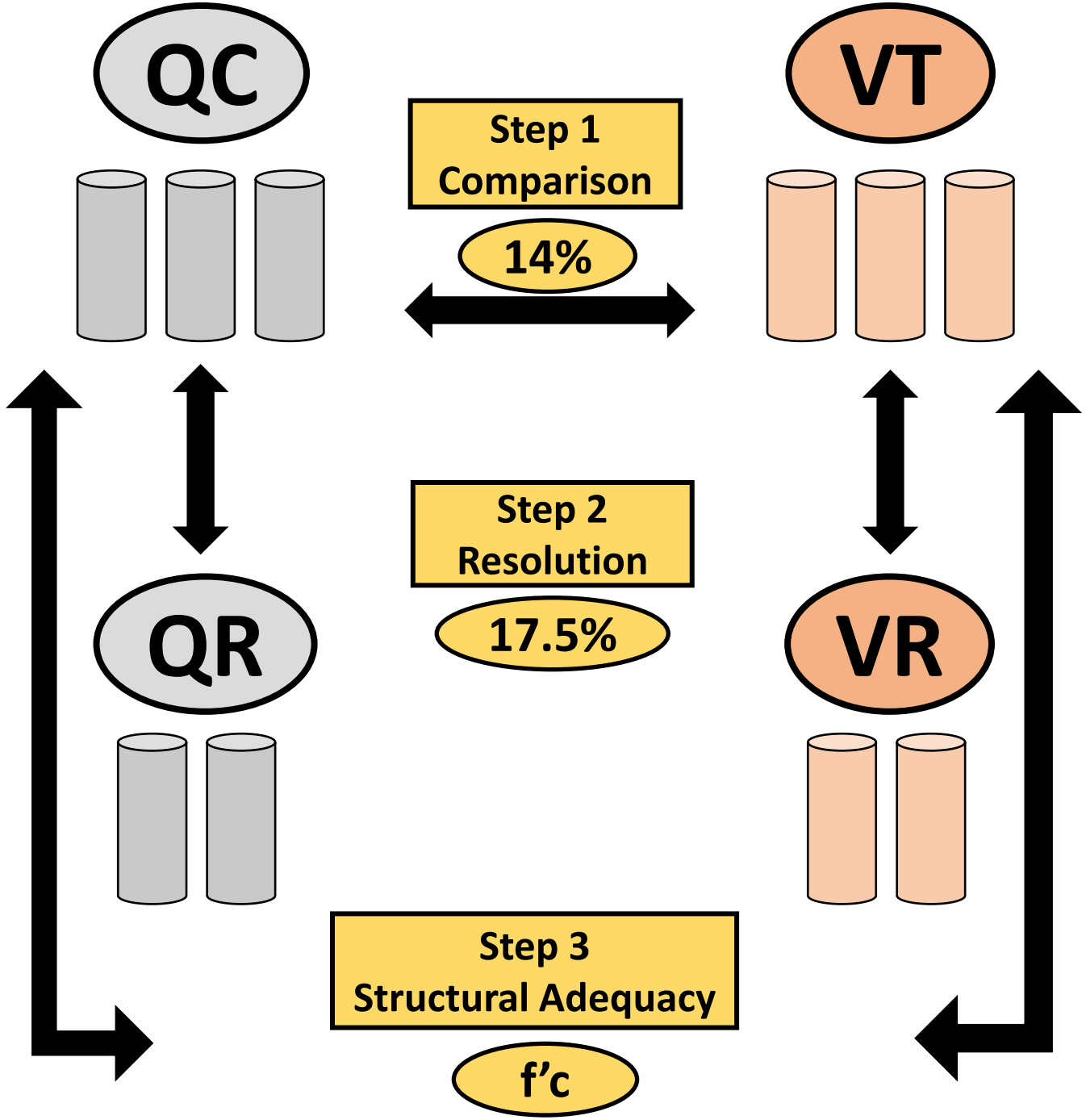
28-Day Average

Reduction in Pay is equal to the reduction in percentage of concrete compressive strength below the specified minimum strength:

$$\text{Reduction in Pay (\%)} = \left(\frac{f'c - \text{28 day Strength}}{f'c}\right) 100$$

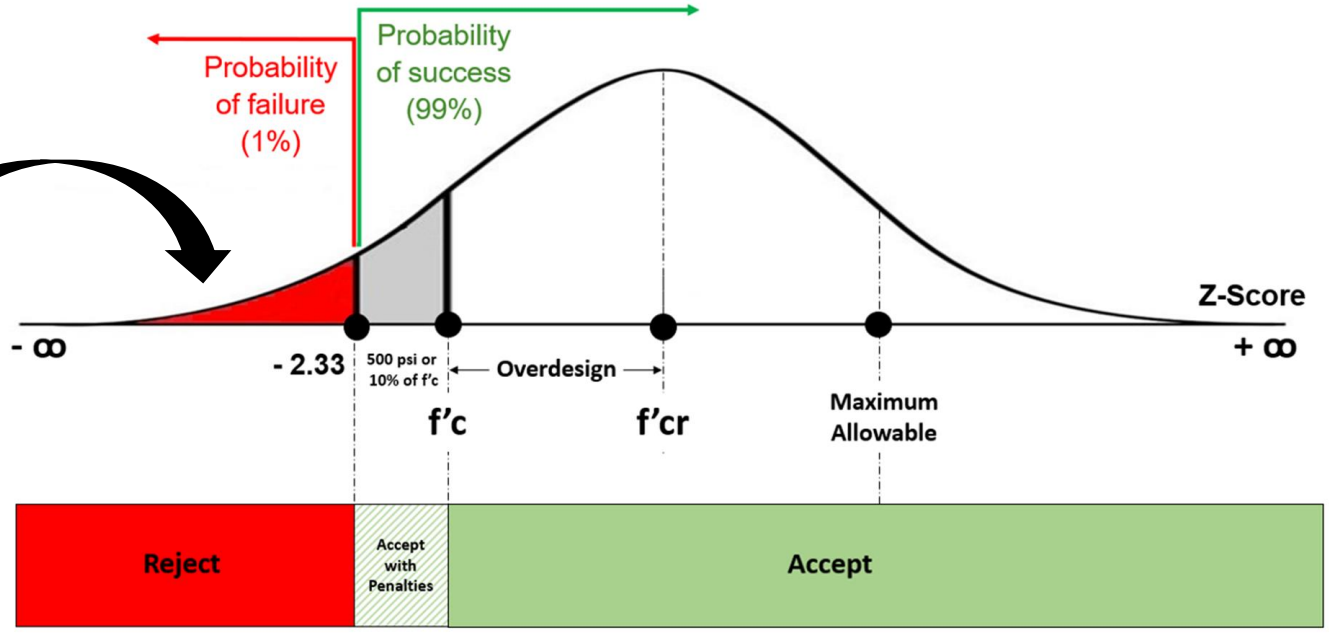
Summary


Verification
Resolution
Structural Adequacy


QC
VT
Step 1
Comparison
14%
Step 2
Resolution
17.5%
QR
VR
Step 3
Structural Adequacy
f'c

Low Compressive Strength

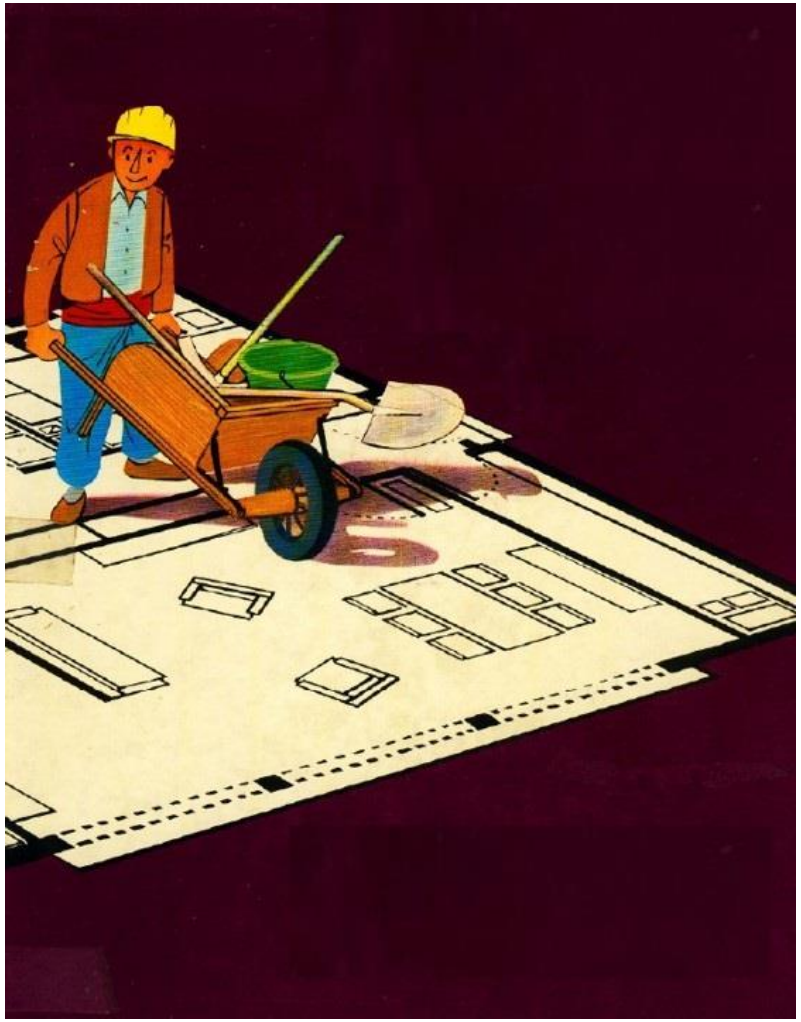
When the compressive strength of concrete does not meet the structural adequacy **(SS 346-10)**



1. Submit an Engineering Analysis Scope to establish structural and durability adequacy. If the results of the structural analysis indicate adequate strength to serve its intended purpose with adequate durability, and is approved by the Engineer, the Contractor may leave the concrete in place, otherwise, remove and replace the LOT of concrete in question at no additional expense to the Department.

2. At the Engineer's discretion, obtain drilled core samples to determine the in-place strength of the LOT of concrete in question, at no additional expense to the Department.

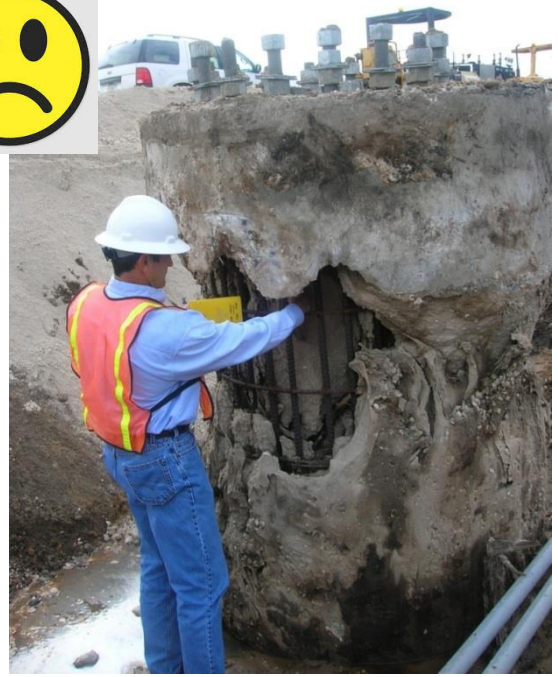
Special Types of Concrete



- Drilled Shaft
- Mass Concrete
- Fiber Reinforced Concrete (FRC)
- Ultra-High-Performance Concrete (UHPC)

Drilled Shaft
SS 346-4.1

Obtain ***slump loss*** tests results demonstrating that the drilled shaft concrete maintains a slump of at least 5 inches throughout the concrete ***elapsed time*** before drilled shaft concrete operations begin.



If the ***elapsed time*** during placement exceeds the ***slump loss*** test data, submit an Engineering Analysis Scope in accordance with 6-4

Drilled Shaft (Example)

Mixing

Transit Time
90 min

Transit Time
90 min

Transit Time
90 min

Transit Time
90 min

Transit Time
90 min

Concrete Placement

Installation

Elapsed Time (Slump loss time of the concrete mix design)

T= 0

Maintain a minimum slump of 5 inches throughout the elapsed time SS 455-17.2

T= 7.5 hrs

Drilled Shaft (Elapsed Time) SS 355-17.2

455-17.2 Placement Time Requirements: The elapsed time for placing drilled shaft concrete includes the concrete mixing and transit time, the concrete placement time, the time required to remove any temporary casing that causes or could cause the concrete to flow into the space previously occupied by the casing, and the time to insert any required column steel, bolts, weldments, etc. The elapsed time begins at the time the first truck load placed in the shaft is batched. Maintain a minimum slump of 5 inches throughout the elapsed time. Use materials to produce and maintain the required slump through the elapsed time that meets the class of concrete specified. Provide slump loss tests that demonstrate to the Engineer that the concrete will maintain a 5 inch or greater slump for the anticipated elapsed time before beginning drilled shaft construction.

T= 0

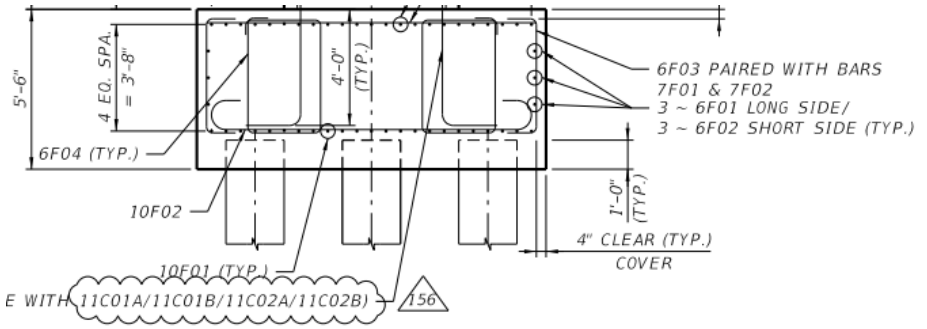
Elapsed Time (Slump loss time of the concrete mix design)

T = 7.5 hrs

Mass Concrete SS 346-4.2

Mass Concrete Designation

The designer includes the designation in plan sheets. (SDG)



SECTION A-A

ABBREVIATION:

E.C. : EACH CORNER

NOTES:

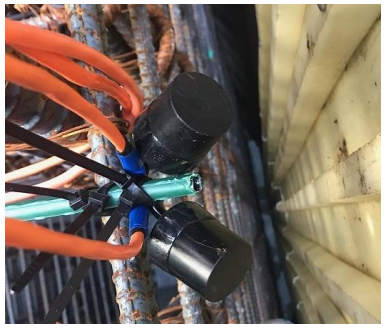
1. TOP REINFORCING STEEL MAY BE PLACED ± 2" FROM PLAN LOCATION TO CLEAR COLUMN DOWELS REINFORCING BARS.
2. ALL PILES ARE 24" SQUARE PRESTRESSED CONCRETE PILES.
3. FOR LOCATION OF COLUMN DOWELS, SEE COLUMN REINFORCEMENT ON PIER DETAILS SHEETS.
4. FOR REQUIRED CONCRETE COVERS AND OTHER REQUIREMENTS SEE GENERAL NOTES SHEETS.
5. PILE CAP SHALL PROVIDE FOR MASS CONCRETE.
6. FOR WORKING POINT LOCATION, SEE FOUNDATION LAYOUT SHEET.

Mass Concrete Control Plan (MCCP)

The Contractor uses a Specialty Engineer. (SS 346)

Mass Concrete. Placement and Surface Inspection

Temperature Sensors
(SS 346-4.2 and MCCP)



Locations
- **Center**
- **Surface**

Insulation
(SS 346-4.2 and MCCP)

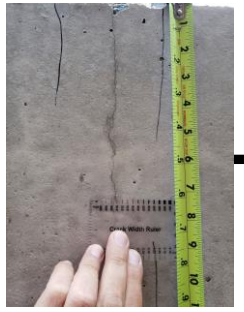
Locations
- **Formed surfaces**
- **Top and bottom**

→ **R-value ≥ 2.5**

Pour and monitoring
(SS 346-4.2 and MCCP)

Allowed Temperatures
- **Concrete at placement** → **Per MCCP**
- **Core** → **$T \leq 180°F$**
- **Differential** → **$T \leq 35°F$**
- **Insulation removal** → **$T_{core} - T_{air} \leq 50°F$**

Surface Inspection
(SS 346-4.2, 400, and MCCP)



Significance
- **≤ 0.005%** → **Slightly Aggressive, Width ≤ 0.012 in**
- **≤ 0.005%** → **Moderately Aggressive, Width ≤ 0.004 in**
- **0.000%** → **Extremely Aggressive**

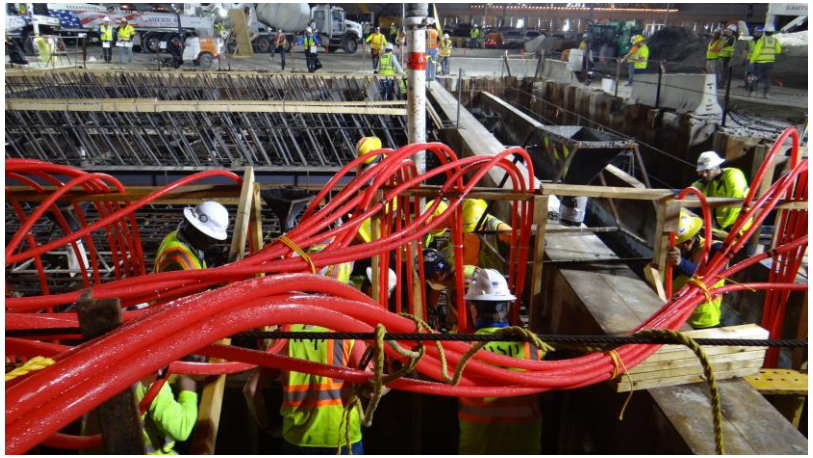
Mass Concrete

SS 346-4.2

Cooling Pipes (active cooling)

Installation

Pumps, Pipes, Fittings, Meters



Operation

Pumps, Pipes

Monitoring

Temperature, Pressure (P), Flow Rate (F)

Grouting

f'_c grout ≈ f'_c concrete

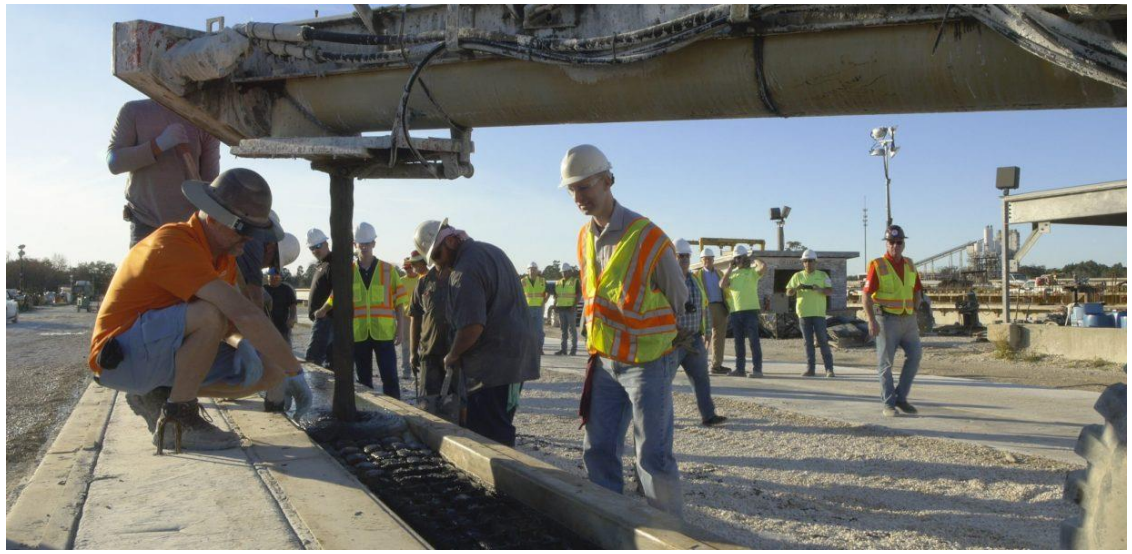
Fiber Reinforced Concrete (FPC)

Developmental Specification 346 (FRC)

https://www.fdot.gov/programmanagement/otherfdotlinks/developmental/default.shtm

Fiber Reinforced Concrete Calls for the use of Fiber Reinforced Concrete using either polymeric fibers or steel fibers in concrete bridge decks on prestressed concrete slab units.	Jose Armenteros	**Dev346FRC** **Project List**

Ultra-High Performance Concrete (UHPC)



Developmental Specification 346 (UHPC)

https://www.fdot.gov/programmanagement/otherfdotlinks/developmental/default.shtm

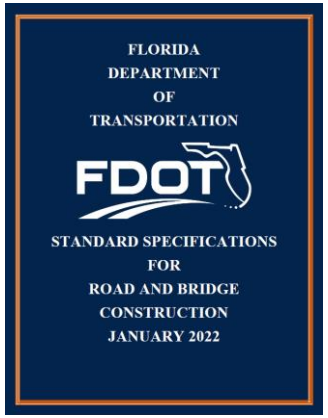
Ultra-High-Performance Concrete -	Jose Armenteros	**Dev349UHPC** **Project List**
Prepackaged Ultra-High-Performance Concrete Provide the material requirements for ultra-high-performance concrete. NOTE: Use with Dev 349UHPC	Jose Armenteros	**Dev927UHPC** **Project List**

Concrete Personnel Qualification Requirements

Contractor

Standard Specification Section 105

[january2022-ebook.pdf (windows.net)]



CTQP Manual Chapter 4

[Construction Training Qualification Manual (fdot.gov)]

Department

Materials Manual Volume I (Training Articles)

[SMO: Materials Manual (state.fl.us)]

Section 6.2 Precast Concrete Pipe
Section 6.3 Precast Concrete Drainage Structures and Box Culverts
Section 8.1 Precast Prestressed Concrete Products
Section 8.2 Incidental Precast Concrete Products
Section 9.2 Concrete Production
Section 9.3 Concrete Pavement Production Facility Guide

Part 2

Precast / Prestressed Concrete

Thomas Frank
Concrete Field Operations Manager
Thomas.Frank@dot.state.fl.us
(352) 955-6683

FDOT Precast Concrete

Precast concrete Producers are required to have a Quality Control (QC) manager, and a QC Plan/Program.

District Materials personnel have Quality Control (QC) Plan acceptance authority over four categories of precast concrete Producers.

Materials personnel perform periodic verification inspections at the plants.

The QC stamp must be applied to the products by the Producer's QC staff after final inspection and prior to shipment to the project.

The QC stamp includes the Plant's Department-assigned Facility ID (e.g., PI-18 for Precast Concrete Pipe) and may contain a company logo.

Precast Concrete Pipe (PI)
MM 6.2

Precast Concrete Drainage Structures and Box Culverts (PC)

MM 6.3

Incidental Precast Concrete Products (IPC)

MM 8.2

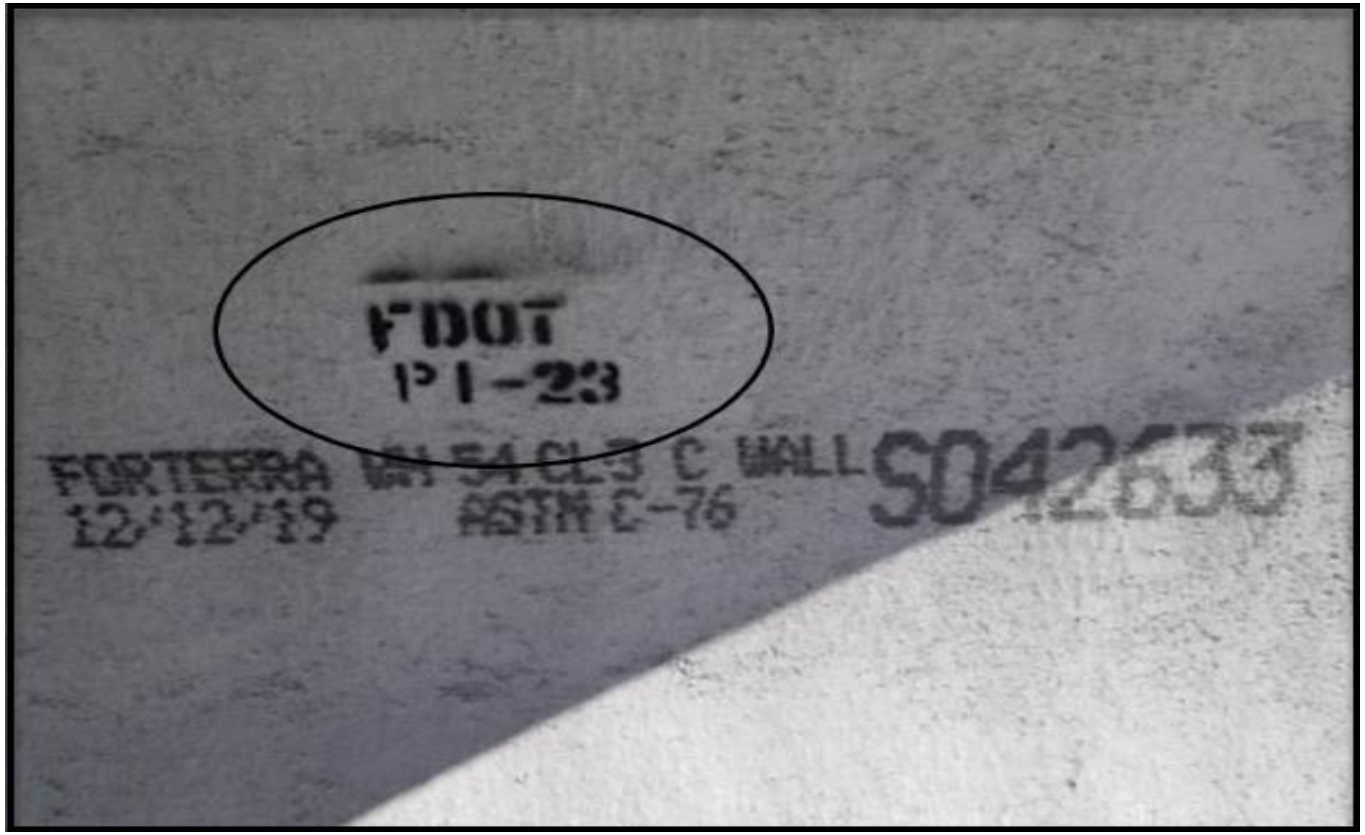
Precast Prestressed Concrete Products (PCP)

MM 8.1

Production Facility QC Stamp

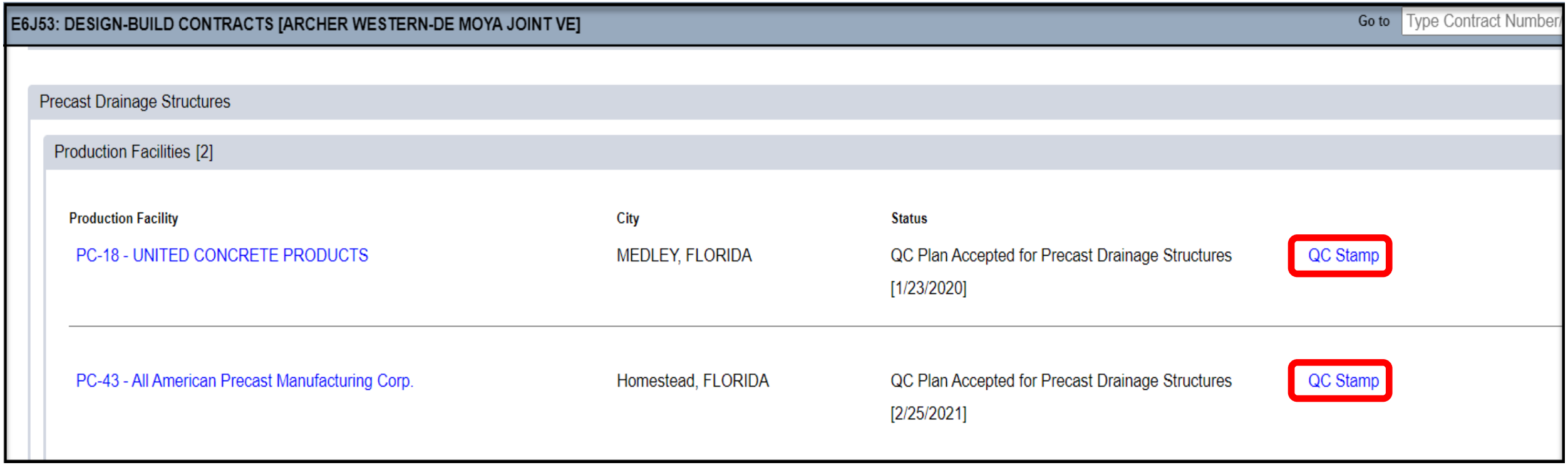
At a minimum, the QC Stamp must contain the Department-issued Facility Identifier.

Example of QC Stamp on wall of concrete pipe.



Verifying Precast Producer's QC Stamp

Can be viewed from the Precast Concrete Production Facility on the Contractor QC Plan in MAC.

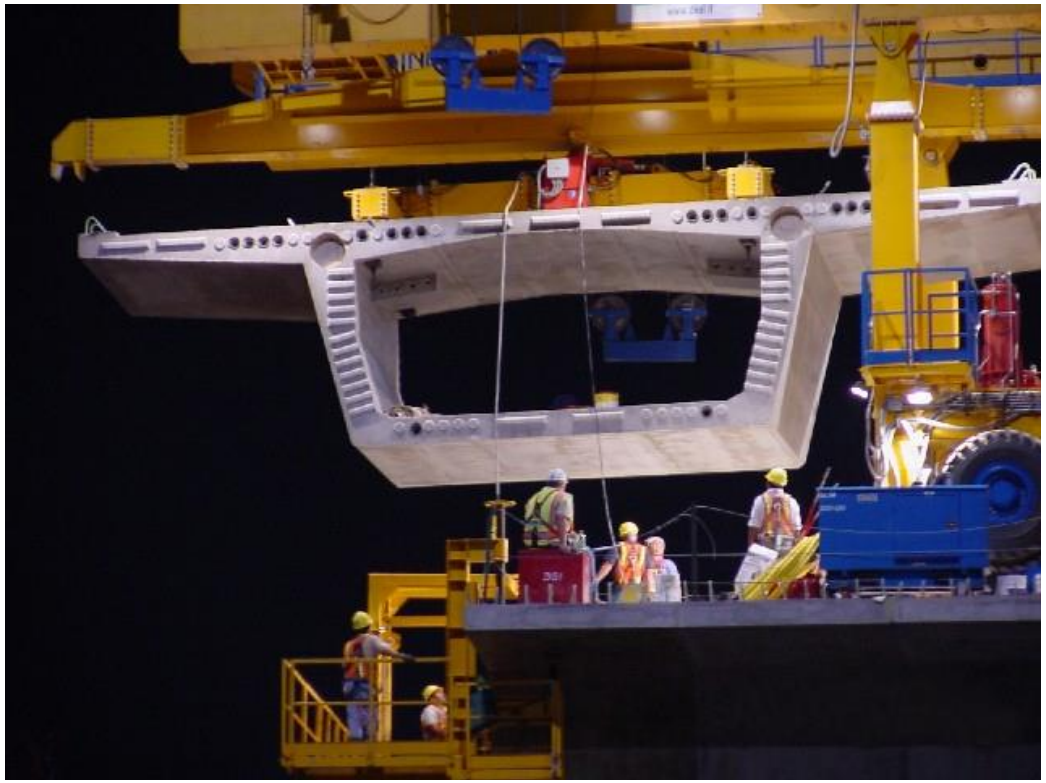


Materials Acceptance and Certification System

https://mac.fdot.gov/

Segmental Precast Concrete for Post-Tensioned Bridges

SS 452



These items are produced by Contractor (or sub) and verified by CEI personnel.

Buy America requirements for Precast Concrete Products

There are two documents sent from the precast concrete producer to the project which contain Buy America / source of steel references:

A. ***Material Certification*** – this document is provided at the beginning of the project stating that the Producer will manufacture the products in accordance with their QC Plan and the Contract Documents.

B. ***Delivery Ticket(s) -*** must contain a Buy America compliance statement, ***and*** the dollar amount of any foreign steel used (Producer must put $0 if none).

Material Certification provided at beginning of project

SS 6-5.2

MM 6.2, 6.3, 8.1 & 8.2

"For Use on Producer's Letterhead"

MATERIAL CERTIFICATION

MANUFACTURED PRECAST PRESTRESSED CONCRETE PRODUCTS
SPECIFICATION NUMBER *(450)

FDOT Financial Identification Number (FIN):

FDOT Contract Number:

Project Location:

_____

Description of Products:

We certify that the described precast prestressed concrete products will be manufactured by our plant in accordance with the requirements set forth in the Florida Department of Transportation Contract Documents, the plant's approved quality control plan, and Section 6 (Source of Supply–Steel) of the Florida Department of Transportation Standard Specifications. The plant's quality control manager or the inspectors under his/her direct supervision will stamp the products prior to their shipment to the project site. The quality control manager's stamp is confirmation of the aforementioned certification. Each shipment of the precast prestressed concrete products to the project site will be accompanied with a signed or stamped delivery ticket, which will provide the description and list of the products.

Manufacturer Officer or Designee:

Name *(print)*:_____

Signature:_____

Date:_____

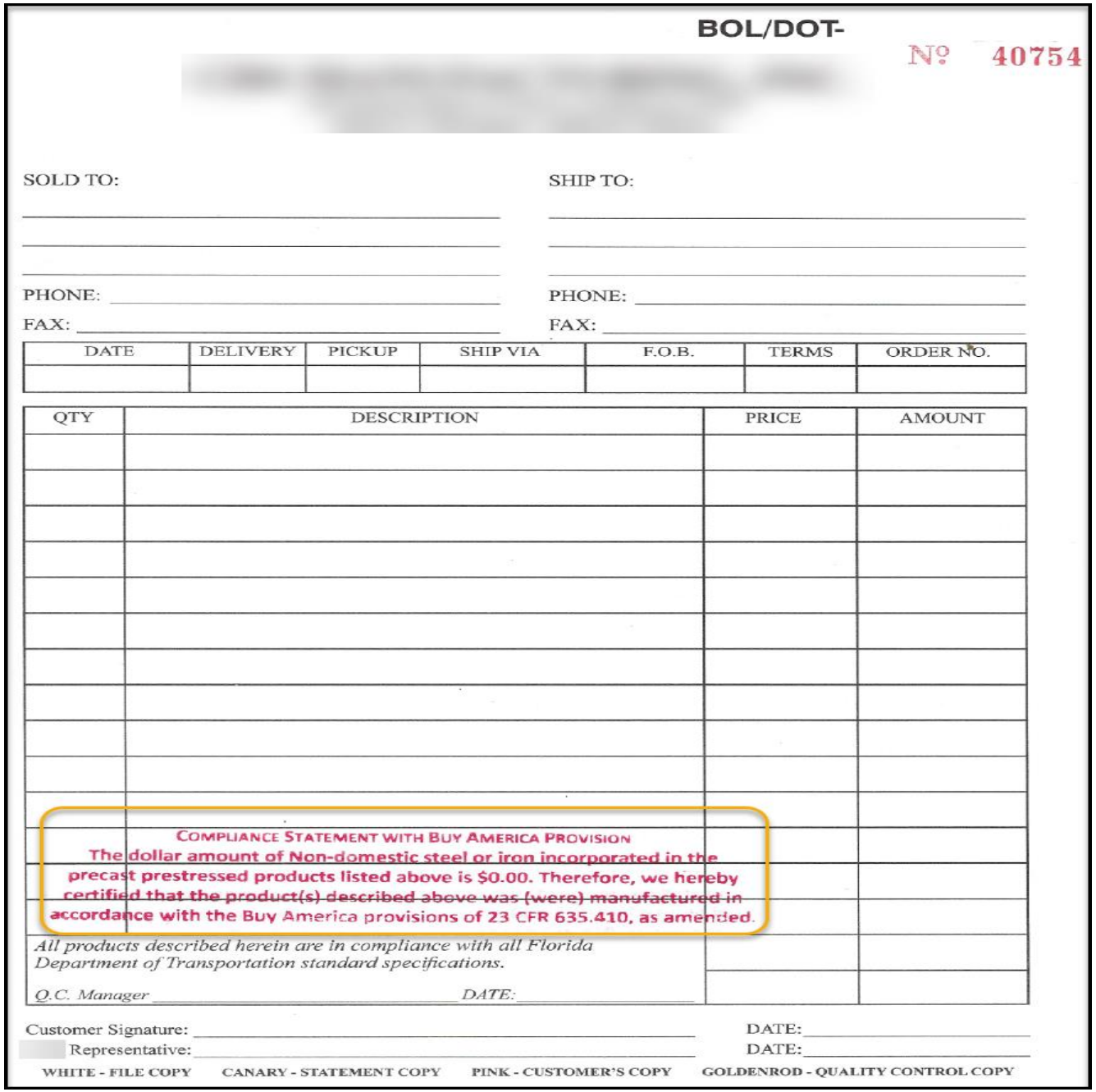
(Notarized)

Delivery Ticket provided with each shipment

SS 6-5.2

MM 6.2, 6.3, 8.1 & 8.2

The dollar amount of any foreign steel and iron used in the delivered precast products must be declared so those amounts can be included in the project total for compliance with Section 6-5.2 Source of Supply-Steel.



BOL/DOT-

№ 40754

SOLD TO:

SHIP TO:

PHONE:

FAX:

PHONE:

FAX:

DATE	DELIVERY	PICKUP	SHIP VIA	F.O.B.	TERMS	ORDER NO.

QTY	DESCRIPTION	PRICE	AMOUNT

COMPLIANCE STATEMENT WITH BUY AMERICA PROVISION
The dollar amount of Non-domestic steel or iron incorporated in the precast prestressed products listed above is $0.00. Therefore, we hereby certified that the product(s) described above was (were) manufactured in accordance with the Buy America provisions of 23 CFR 635.410, as amended.

All products described herein are in compliance with all Florida Department of Transportation standard specifications.

Q.C. Manager _____ *DATE:* _____

Customer Signature: _____ DATE: _____

Representative: _____ DATE: _____

WHITE - FILE COPY CANARY - STATEMENT COPY PINK - CUSTOMER'S COPY GOLDENROD - QUALITY CONTROL COPY

Buy America requirements for Precast Concrete Products

SECTION 6
CONTROL OF MATERIALS

6-5.2 Source of Supply-Steel: Use steel and iron manufactured in the United States, in accordance with the Buy America provisions of 23 CFR 635.410, as amended. Ensure that all manufacturing processes for this material occur in the United States. As used in this specification, a manufacturing process is any process that modifies the chemical content, physical shape or size, or final finish of a product, beginning with the initial melting and continuing through the final shaping and coating. If a steel or iron product is taken outside the United States for any manufacturing process, it becomes foreign source material. When using steel or iron materials as a component of any manufactured product (e.g., concrete pipe, prestressed beams, corrugated steel pipe, etc.), these same provisions apply. Foreign steel and iron may be used when the total actual cost of such foreign materials does not exceed 0.1% of the total Contract amount or $2,500, whichever is greater.

Foreign steel and iron may be used when the total actual cost of such foreign materials does not exceed 0.1% of the total Contract amount or $2,500, whichever is greater.

Part 3

Structural Materials

Richard DeLorenzo
Structural Lab Manager
Richard.DeLorenzo@dot.state.fl.us
(352) 955-6667

Metal Accessory Materials for Concrete Pavement and Concrete Structures (SS 931)

- Reinforcing Steel Bars
- Dowel Bars
- Metal Dowel Bar Assemblies
- Welded Wire Reinforcement

Prestressing Strand and Bar (SS 933)

- Strand for Prestressing (Post-Tensioning)
- Steel Bars for Prestressing (Post-Tensioning)

Structural Steel and Miscellaneous Metal Items (Other than Aluminum) (SS 962)

- Structural Steel, Steel Castings, Steel Forgings, Iron Castings, Bolts Nuts, Washers and Direct-Tension-Indicator (DTI) Devices, Anchor Rods, Bridge Bearing Materials, and Miscellaneous Metal Items

Structural Materials

Components for Guardrail (SS 967)

- Steel Posts
- Steel Offset Blocks
- Steel Panels
- Bolts, nuts, washers, and other accessories

Approved Products List (APL)

- Curing Compound (SS 925)
- Epoxy Bonding Compound (SS 926)
- Materials for Concrete Repair (SS 930)
- Non-Shrink Grout (SS 934)
- Epoxy Anchor (SS 937)
- Post-Tensioning Grout (SS 938)

Metal Accessory Materials for Concrete Pavement and Concrete Structures (SS 931)

- Reinforcing Steel Bars
- Dowel Bars
- Metal Dowel Bar Assemblies
- Welded Wire Reinforcement

Acceptance of Reinforcing Steel Bars

Manufacturer's certified mill analysis

- Provided to the Engineer prior to use, for each heat, size, and grade per shipment.

Samples taken by the Department

- The Engineer will select samples representing each LOT of reinforcing steel. (Lot is defined as 100 tons or less).
- Projects with less than two tons of bars do not require Department sampling.

Manufacturer's compliance with the National Transportation Product Evaluation Program (NTPEP)

- Verified by SMO for samples taken.

Acceptance of Reinforcing Steel Bars

Project personnel to collect samples;

- Select 3 pieces, 7’ long, randomly selected by Department.
- Sample the most frequently used bar size
- Mill Certificate, upload to MAC sample.
- Securely attach MAC ID to test samples.

Send 1 bar, hold 2 (as check samples if needed)

- No preselected “test bars”, “splice bars”, or “FDOT test samples”.
- Don’t wait until the end of the project to submit samples.

CMC STEEL FLORIDA
16770 Rebar Road
Baldwin FL 32234-4100

CERTIFIED MILL TEST REPORT

For additional copies call
904-266-1468

We hereby certify that the test results presented here are accurate and conform to the reported grade specification

Alex Reneste
Quality Assurance Manager

HEAT NO.:5004371
SECTION: REBAR 16MM (#5) 60'0" 420/60
GRADE: ASTM A615-18e1 Gr 420/60
ROLL DATE: 10/11/2019
MELT DATE: 10/11/2019
Cert. No.: / 004371K002

SOLD TO

Delivery#:
BOL#:
CUST PO#:
CUST P/N:
DLVRY LBS / HEAT: 0.000 LB
DLVRY PCS / HEAT:

- Heat Number
- Bar Size
- Grade
- Specification

Characteristic	Value
C	0.43%
Mn	0.99%
P	0.015%
S	0.039%
Si	0.24%
Cu	0.34%
Cr	0.14%
Ni	0.10%
Mo	0.025%
V	0.004%
Cb	0.002%
Sn	0.022%
Yield Strength test 1	65.9ksi
Yield Strength test 1 (metri	455MPa
Tensile Strength test 1	106.1ksi
Tensile Strength 1 (m	
Elongation test 1	
Elongation Gage Lgth	
Tensile to Yield rati	
Elongation Gage Lgth 1	

Characteristic	Value
Bend Test 1	Passed
Rebar Deformation Avg. Spaci	0.392IN
Rebar Deformation Avg. Heigh	0.041IN
Rebar Deformation Max. Gap	0.126IN

Characteristic	Value

The Following is true of the material represented by this MTR:

**Material is fully killed*
**100% melted and rolled in the USA*
**EN10204:2004 3.1 compliant*
**Contains no weld repair*
**Contains no Mercury contamination*
**Manufactured in accordance with the latest version of the plant quality manual*
**Meets the "Buy America" requirements of 23 CFR635.410, 49 CFR 661*
**Warning: This product can expose you to chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov*

- Melted and Rolled in the USA
- Meets the "Buy America" requirements of 23 CFR 635.410, 49 CFR 661 and SS 6-5.2

REMARKS :

Identification of Rebar

The Concrete Reinforcing Steel Institute (CRSI)

Manual of Standard Practice

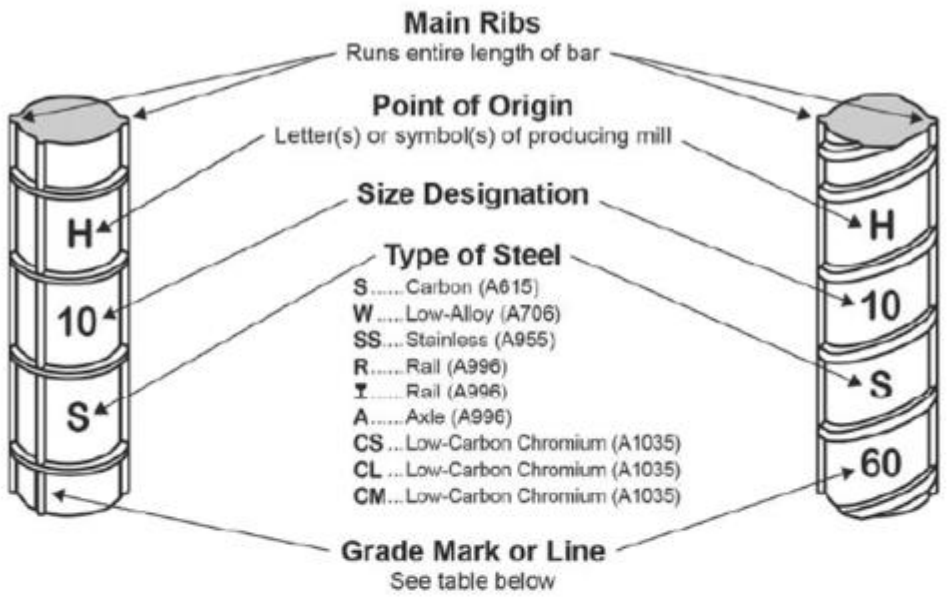
Acts as a guide to available reinforcing steel and accepted industry practices.

Identifies the U.S. Manufactures of Concrete Reinforcing Steel Bars

[Manual of Standard Practice - CRSI Resource Materials]

https://resources.crsi.org/resources/manual-of-standard-practice/

Identification of Rebar



Minimum Yield Designation		
Grade of Steel	**Grade Mark***	**Grade Line****
40	blank	no lines
50	blank	no lines
60	60	1 line
75	75	2 lines
80	80	3 lines
100	100 or C (A615)	4 lines (A615)
100	100 (A1035)	3 lines (A1035)
120	120	4 lines

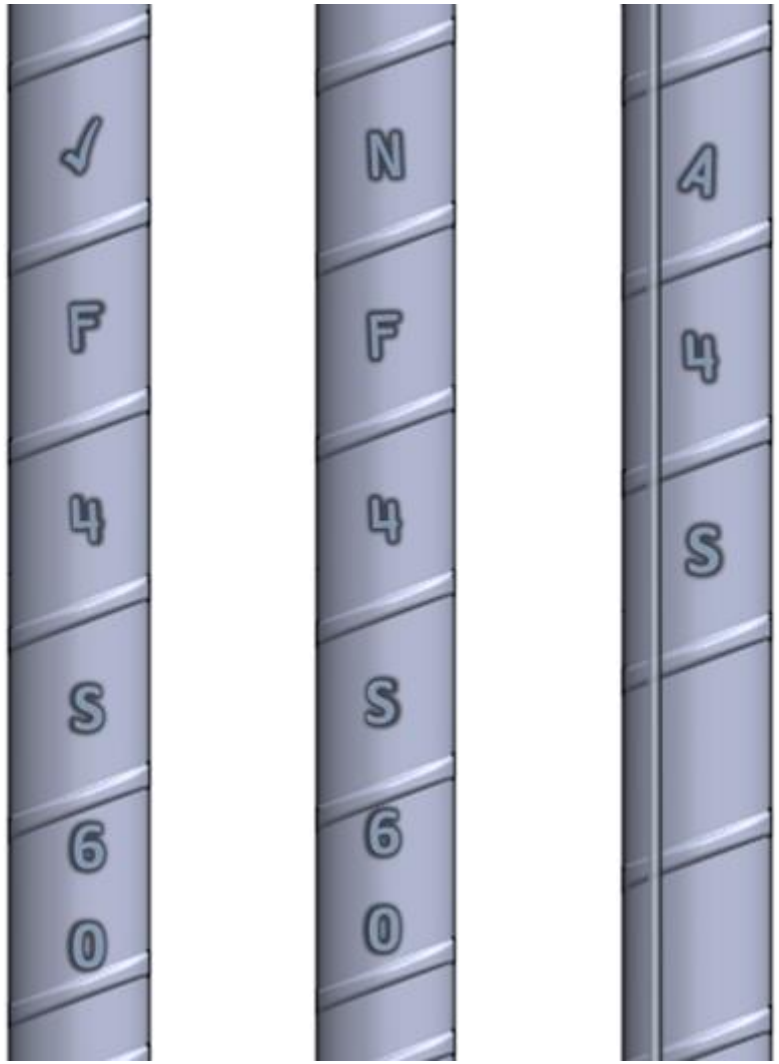
*For stainless-steel (A955) reinforcing bars: Gr 60 = "•", for Gr 75 = "••"
**Grade lines must be at least 5 deformation spaces long

ASTM Identification Marks

Bar Markings allows you to identify:

- Producing Mill
- Bar Size
- Type of Steel
- Grade

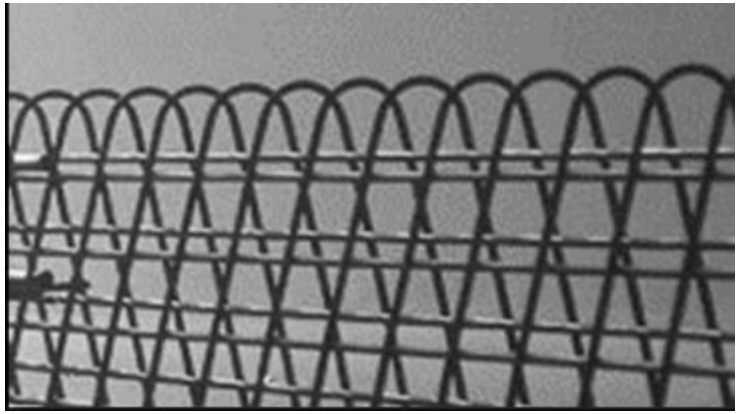
Steel Mill Stamps



- **Examples of common mill stamps used in Florida.**
  - ✓F - CMC Steel Florida
  - NF - Nucor Steel Florida
  - A - Nucor Steel Alabama
- **Foreign Steel will identify the country of origin.**

Acceptance of Dowel Bars and Welded Wire Reinforcement

- Manufacturer's certified mill analysis.
- Provided to the Engineer prior to use, for each heat and size per shipment.



Dowel Bar Assemblies

- Product included on the Department's Approved Products List (APL).

Prestressing Strand and Bar (SS 933)

- Strands for Prestressing (Post-Tensioning).
- Steel Bars for Prestressing (Post-Tensioning).

Steel Pre-Stressing Strand (Post-Tensioning)

Manufacturer's certified mill analysis.

- Provided to the Engineer prior to use, for each heat/ production lot, per shipment.

Project personnel to collect samples.

- The Engineer will select one sample per producer, per size, per shipment.
- Select 3 pieces, 5' long, randomly selected by Department.
- Send 1 bar, hold 2 (as check samples if needed).
- Certified mill analysis, upload to MAC sample.
- Securely attach MAC ID to test samples.
- Don't wait until the end of the project to submit samples.

Steel Stressing Bars

(Post-Tensioning)

Manufacturer's certified mill analysis

- Provided to the Engineer prior to use, for each heat/production lot, per shipment.

Project personnel to collect samples;

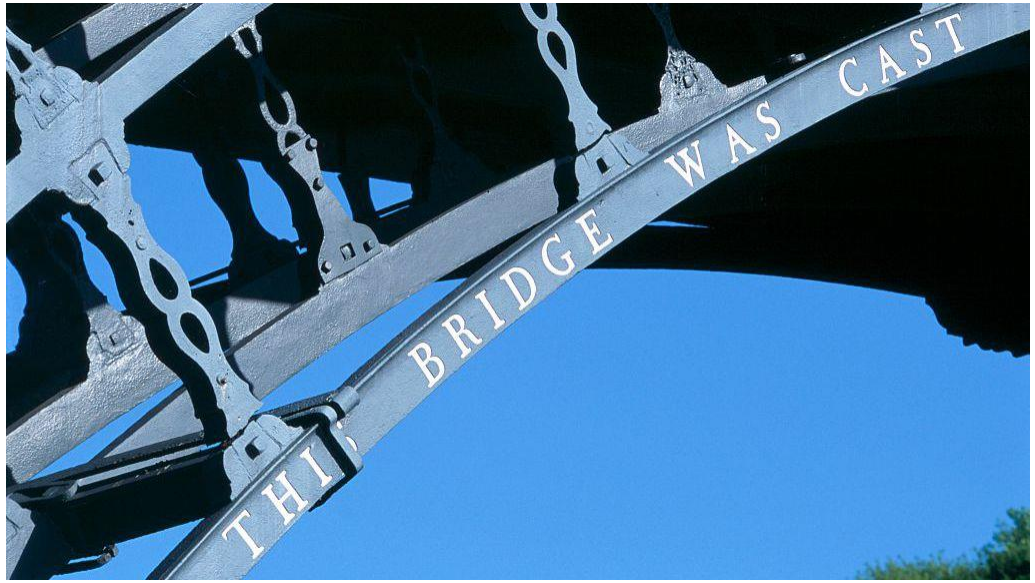
- The Engineer will select one sample per heat or production lot producer, per size, per shipment.
- Select 3 pieces, 5' long, randomly selected by Department.
- Send 1 bar, hold 2 (as check samples if needed)
- Mill Certificate, upload to MAC sample.
- Securely attach MAC ID to test samples.
- Don't wait until the end of the project to submit samples.

Structural Steel and Miscellaneous Metal Items (Other than Aluminum) (SS 962)

Includes Structural Steel, Steel Castings, Steel Forgings, Iron Castings, Bolts Nuts, Washers and Direct-Tension-Indicator (DTI) Devices, Anchor Rods, Bridge Bearing Materials, and Miscellaneous Metal Items.

Manufacturer's certified mill analysis.

- Provided to the Engineer prior to use, for each heat/ production lot, per shipment.



When should you submit Certified Mill Analysis in MAC:

If the Certified Mill Analysis are reviewed through Commercial Inspection, *No MAC entry is needed*.

- The Commercial Inspection Report is retained in the construct file.

When the Certified Mill Analysis is received directly from the Contractor.

- MAC entry is required.
- Mill Analysis, upload to MAC sample.
- Do Not wait until the end of the project to submit.

Commercial Inspection Report

- Project Information
- Fabricator
- Materials
- Description
- Inspection Status
- Signature on Inspector

HRV

Weekly Narrative Report

Client Name: Florida Department of Transportation
HRV Service Order: 2564-028
Project Description: SR 23 (FIRST COAST EXPRESSWAY) FROM EAST OF CR209 TO NORTH OF SR16
Report No.: 020 Final
Contract Number: 422938-5-52-01 / T2724 / TWO #35
Inspector: William Finnen
Fabricator Proj. #: H2565
Inspection Period: 01/11/2021 thru 01/15/2021
Fabricator: Walpar
Location (city/state): Birmingham, AL

PAGE 1 OF

FABRICATION INSPECTION STATUS

___ In Process % Completed: 100% Hours: Sunday: 0 Monday: 8.0 Tuesday: 0 Wednesday: 0 Thursday: 0 Friday: 0 Saturday: 0
X Final

X Attachments: BOL 66703, 66705, 66706; CMTRS for Hardware; Photos

Narrative Description of Activities:

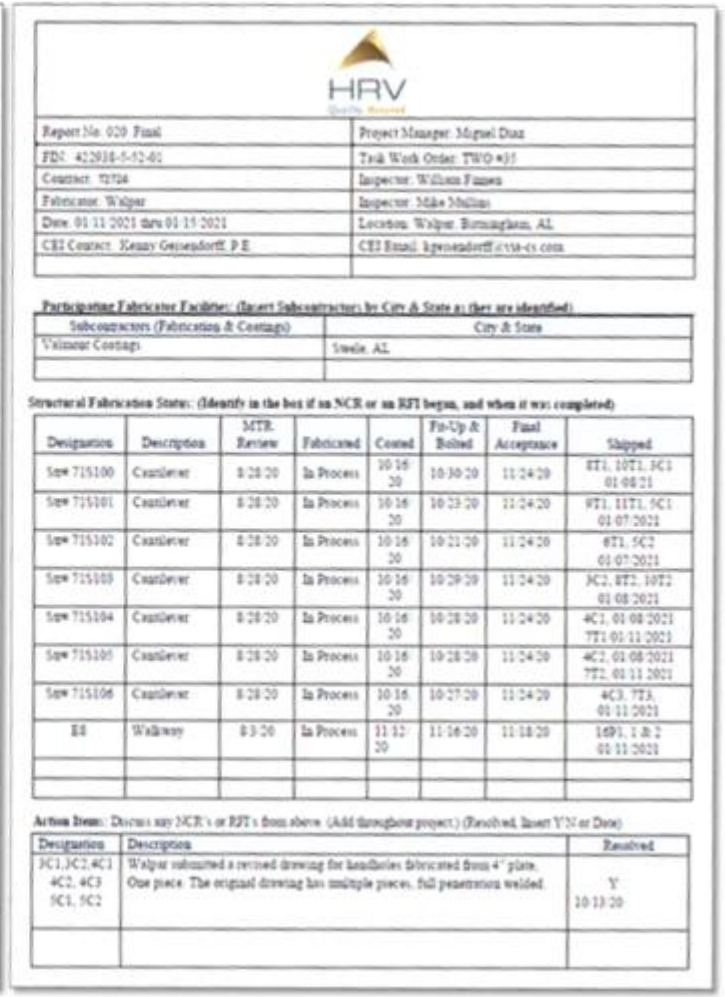
Monday January 11, 2021

Shipping of approved structures for FDOT project 2565 continued.

Load # 05, Cantilever Post 2565-4C3, Cantilever Truss 2565-7T3
Load # 06, Walk Platform Assembly 2565-16P1 # 01, Cantilever Truss 2565-7T1
Load # 07, Walk Platform Assembly 2565-16P1 # 02, Cantilever Truss 2565-7T2

Load 5

Inspector Signature: _____ Date: 01/18/2021



HRV

Report No. 020 Final	Project Manager: Miguel Diaz
FDOT: 422938-5-52-01	Task Work Order: TWO #35
Contract: T2724	Inspector: William Finnen
Fabricator: Walpar	Inspector: Mike Phillips
Date: 01/11/2021 thru 01/15/2021	Location: Walpar, Birmingham, AL
CEI Contact: Kenny Gerstendorff, P.E.	CEI Email: kgerstendorff@vhb-cs.com

Participating Fabricator Facilities: (Insert Subcontractors by City & State as they are identified)

Subcontractors (Fabrication & Coatings)	City & State
Vulcoat Coatings	Steele, AL

Structural Fabrication Status: (Identify in the box if an NCR or an RFI began, and when it was completed)

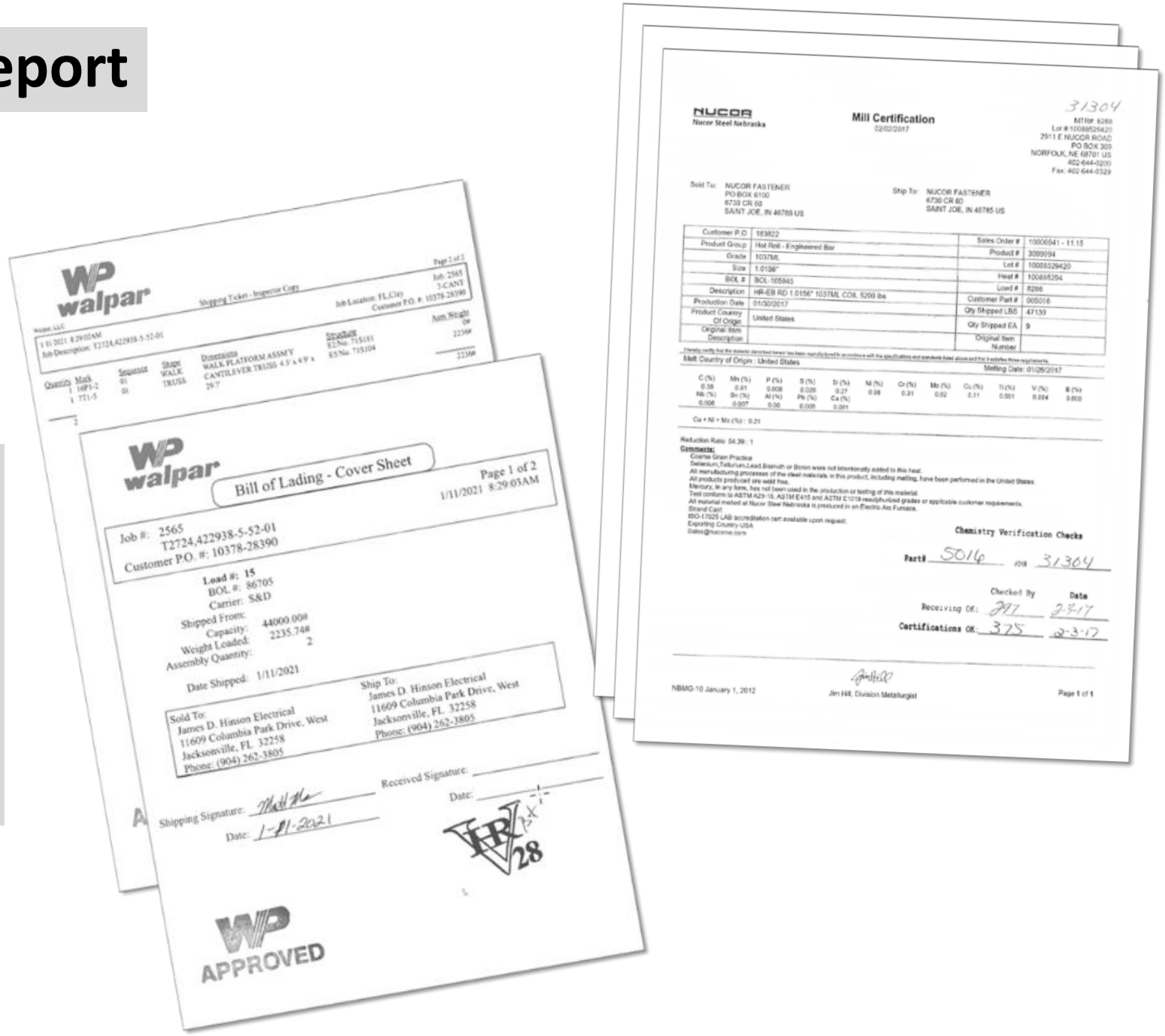
Designation	Description	MTR Review	Fabricated	Coated	Fit-Up & Bolted	Final Acceptance	Shipped
Sys# 715100	Cantilever	8/28/20	In Process	10/16/20	10/30/20	11/24/20	8T1, 10T1, 3C1 01/08/21
Sys# 715101	Cantilever	8/28/20	In Process	10/16/20	10/23/20	11/24/20	9T1, 11T1, 5C1 01/07/2021
Sys# 715102	Cantilever	8/28/20	In Process	10/16/20	10/21/20	11/24/20	6T1, 5C2 01/07/2021
Sys# 715103	Cantilever	8/28/20	In Process	10/16/20	10/29/20	11/24/20	3C2, 8T2, 10T2 01/08/2021
Sys# 715104	Cantilever	8/28/20	In Process	10/16/20	10/28/20	11/24/20	4C1, 01/08/2021 7T1 01/11/2021
Sys# 715105	Cantilever	8/28/20	In Process	10/16/20	10/28/20	11/24/20	4C2, 01/08/2021 7T2, 01/11/2021
Sys# 715106	Cantilever	8/28/20	In Process	10/16/20	10/27/20	11/24/20	4C3, 7T3, 01/11/2021
E8	Walkway	8/3/20	In Process	11/12/20	11/16/20	11/18/20	16P1, 1 & 2 01/11/2021

Action Items: Discuss any NCR's or RFI's from above. (Add throughout project.) (Resolved, Insert Y/N or Date)

Designation	Description	Resolved
3C1, 3C2, 4C1 4C2, 4C3 5C1, 5C2	Walpar submitted a revised drawing for handholes fabricated from 4" plate. One piece. The original drawing has multiple pieces, full penetration welded.	Y 10/13/20

Commercial Inspection Report

- Project Information
- Fabricator Approval
- Bill of Lading
- Certified Mill Test Reports



Components for Guardrail (SS 967)

- Steel Posts.
- Steel Offset Blocks.
- Steel Panels.
- Bolts, nuts, washers, and other accessories.

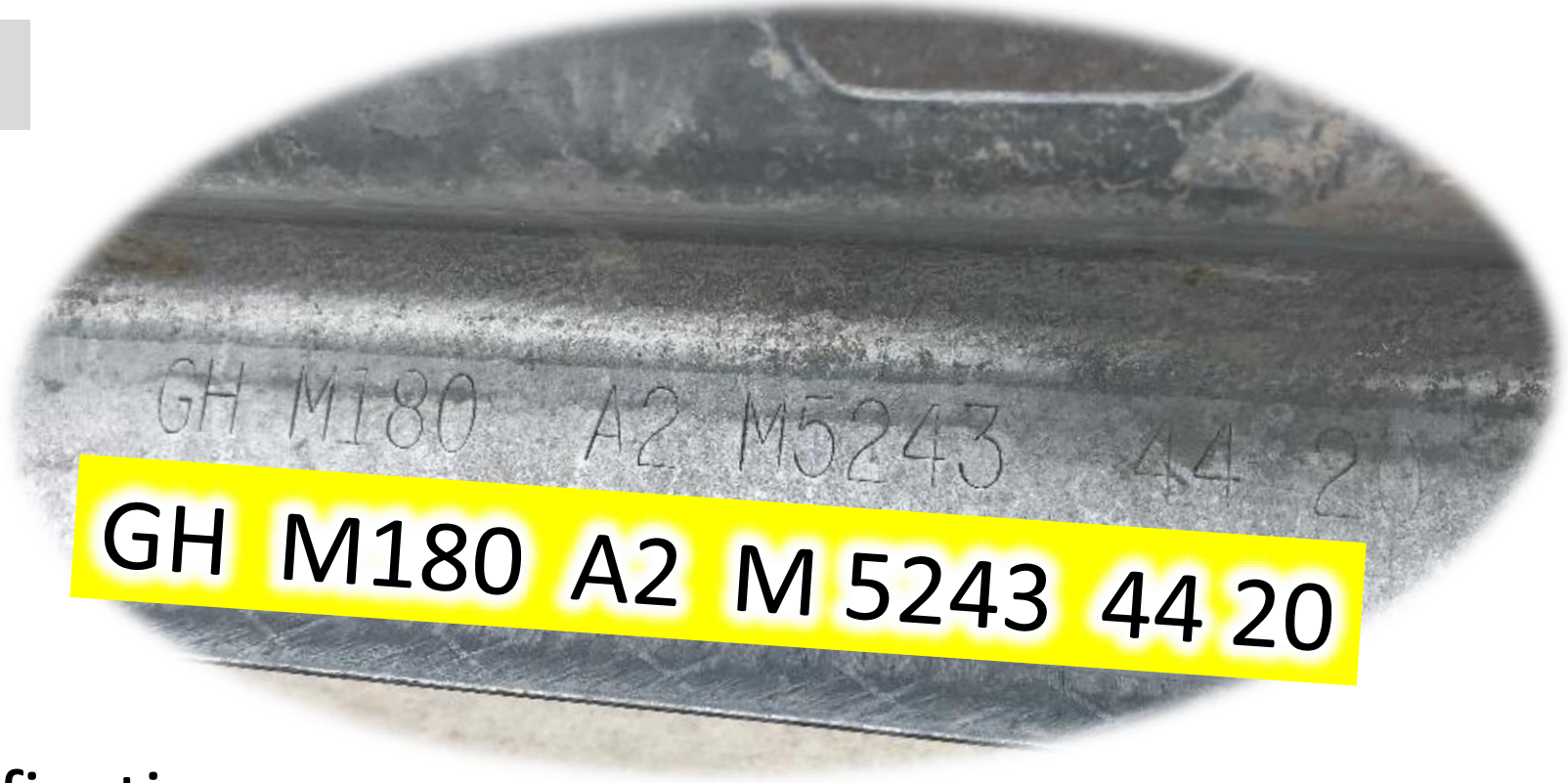
536-4 Acceptance.

Acceptance of materials and installation of guardrail will be based on conformance with the requirements of this Section and visual inspection by the Engineer.

Components for Guardrail

- Approved Metals Production Facility.
- Identify and record the manufacturer’s mill stamp on panels.
- Randomly select 1 Stamp Number per 1000 feet of installed guardrail, up to a maximum of 10 Samples per Project.
- Create a sample in MAC for Steel Panel Stamp Number Review.
- Approved Products Listing (APL) for Approach Terminal Assemblies, Delineators, and Composite Offset Blocks.

Guardrail Panel Stamp



GH	Manufacturer
M180	AASHTO Specification
A2	Class and Type
M	Operator ID
5243	Mill Heat Number
44 20	Week/ Year Galvanized Lot

Approved Product List (APL)

Curing Compound (SS 925)

Epoxy Bonding Compound (SS 926)

Materials for Concrete Repair (SS 930)

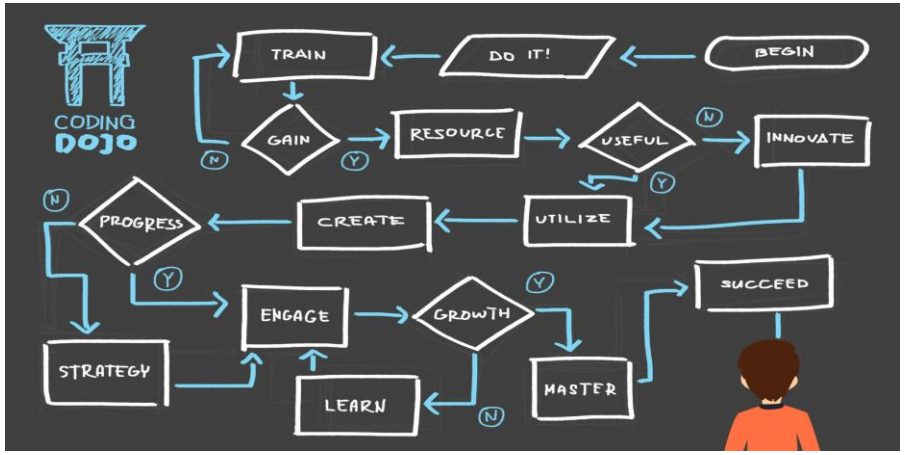
Non-Shrink Grout (SS 934)

Epoxy Anchor (SS 937)

Post-Tensioning Grout (SS 938)

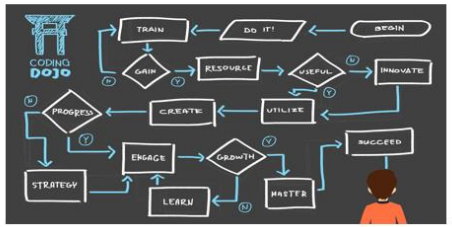
Part 4

MAC basics related to Concrete



Patrick (Pat) Carlton
Concrete Mix Design Specialist
Patrick.Carlton@dot.state.fl.us
(352) 955-6676

MAC basics related to Concrete



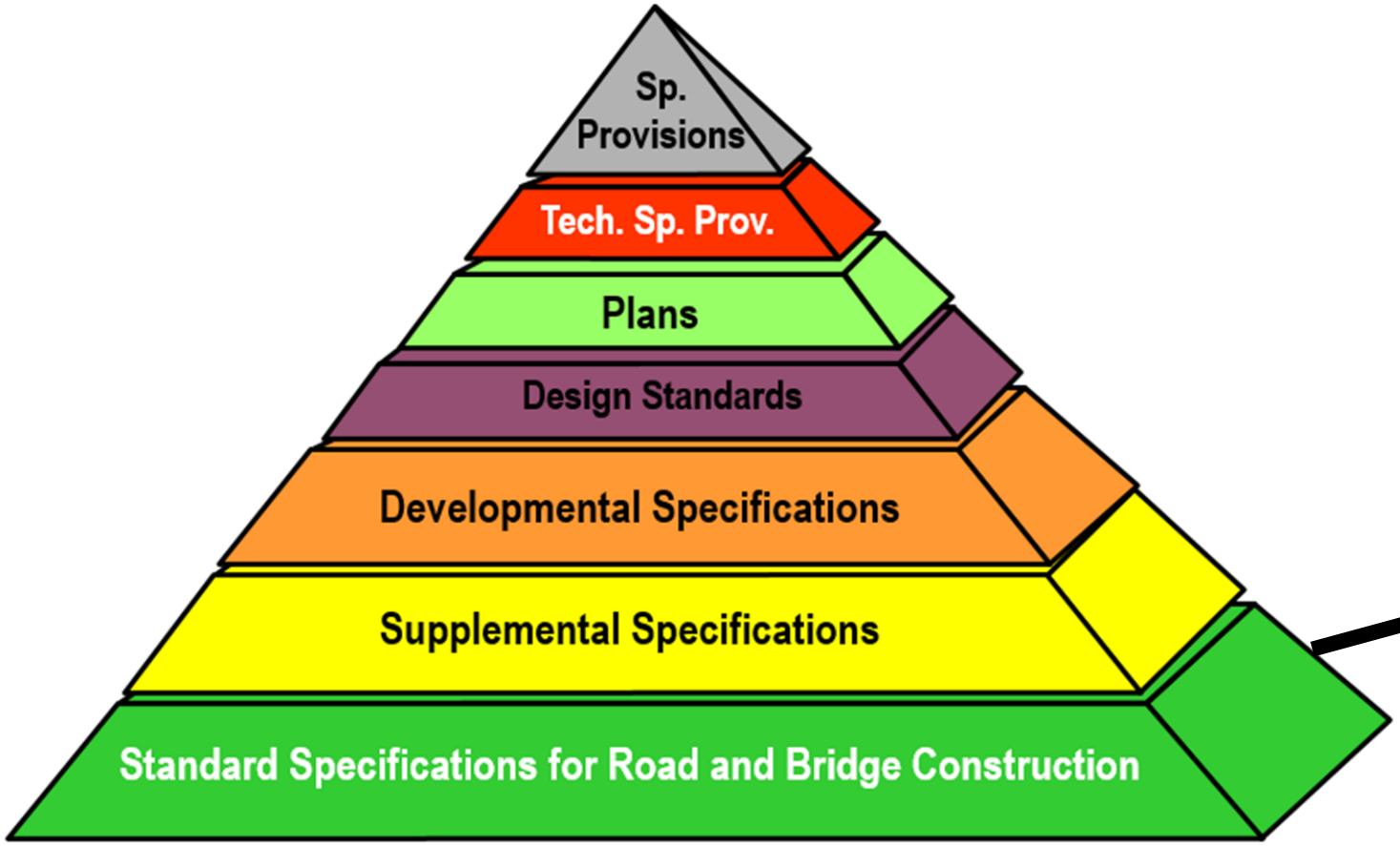
Contract Documents Ranking

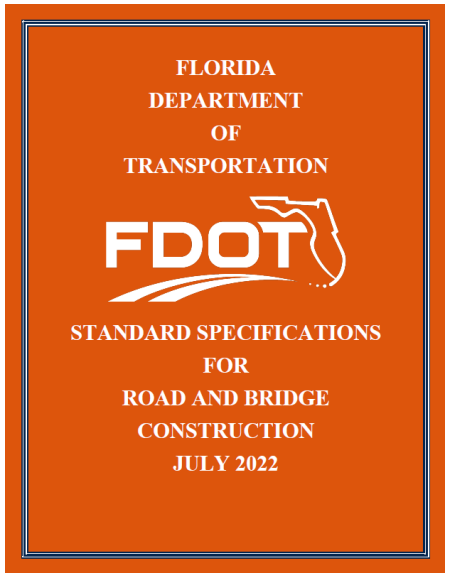
MAC specifications

Concrete Durability Data

Contract Documents Ranking

Coordination of Contract Documents SS 5-2





MAC Specs

346 - Structural Portland Cement Concrete, Supplemental Specification

Modified Special Provision (MSP)

Technical Special Provision (TSP)

Plans Note

Spec Categories

Class I (3000 PSI)
- Conventional
- Increased Slump
- Slip Form

Class II (3400 PSI)
- Conventional
- Increased Slump
- Slip Form

Class II Bridge Deck (4500 PSI)
- Conventional
- Increased Slump
- Slip Form

Class III (5000 PSI)
- Conventional
- Increased Slump
- Slip Form

Class III Seal (3000 PSI)
- Conventional

Class IV (5500 PSI)
- Conventional
- Increased Slump
- Slip Form

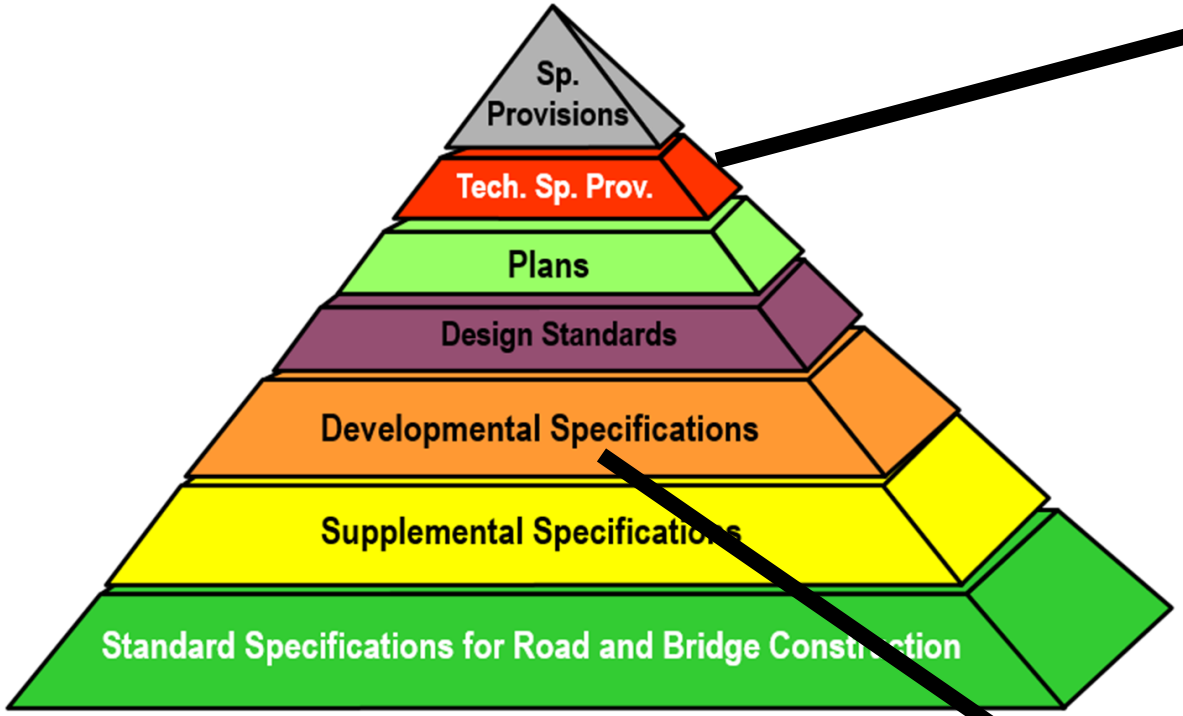
Class IV Drilled Shaft (4000 PSI)
- Conventional

Class V (6500 PSI)
- Conventional
- Increased Slump
- Slip Form

Class V Special (6000 PSI)
- Conventional
- Increased Slump
- Slip Form

Class VI (8500 PSI)
- Conventional
- Increased Slump
- Slip Form

Class VII (10000 PSI)
- Conventional
- Increased Slump
- Slip Form



TECHNICAL SPECIAL PROVISION
FOR
CONCRETE MIX AND WORK FOR BRIDGE APPROACH SLABS

FINANCIAL PROJECT ID: 423126-1-52-01, 423126-2-52-01, 429300-2-52-01, & 251688-1-52-01

GARY J. SPICER, JR. LICENSE No 78491 STATE OF FLORIDA PROFESSIONAL ENGINEER

This item has been digitally signed and sealed by:

on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Spicer Bridge Consultants, Inc.,
Gary Spicer Jr., P.E. No. 78491

The official record of this Technical Special Provision is the electronic document signed and sealed under rule 61G15-23.004 F.A.C.

Prepared By:	Gary Spicer Jr., P.E.
Fla. P.E. No:	78491
Firm Name:	Spicer Bridge Consultants, Inc.
Firm Address:	100 E. Pine Street, Suite 110 Orlando, FL 32801
Certificate of Registry:	31628
Pages:	1 through 3
Date:	July 15, 2020

VOLUMETRIC MIXERS Use only with Structural Concrete Class I and II. NOTE: Must be used with Dev346VM and Dev105VM	Jose Armenteros	**DevMM9.2VM**
VOLUMETRIC MIXERS Use only with Structural Concrete Class I and II. NOTE: Must be used with Dev346VM and DevMM9.2VM	Jose Armenteros	**Dev105VM**
VOLUMETRIC MIXERS Use only with Structural Concrete Class I and II. NOTE: Must be used with Dev105VM and DevMM9.2VM	Jose Armenteros	**Dev346VM**

MAC Specs

346 - Structural Portland Cement Concrete, Special Provision

Modified Special Provision (MSP)

Technical Special Provision (TSP)

Plans Note

Class IV [100yr] (5500 PSI)
- Conventional
- Increased Slump

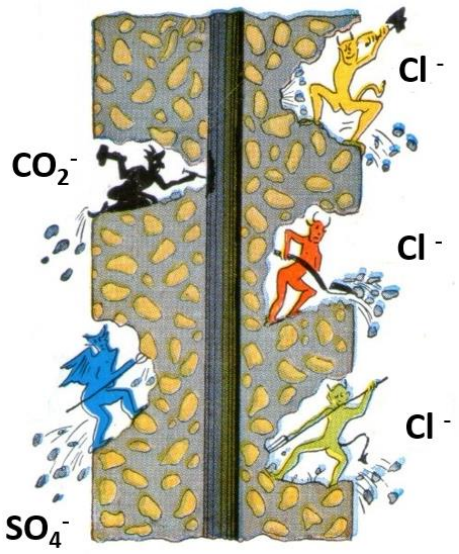
Class V [Special-100yr] (6000 PSI)
- Conventional
- Increased Slump

Class V [100yr] (6500 PSI)
- Conventional
- Increased Slump

Class VI [Special-100yr] (8000 PSI)
- Conventional
- Increased Slump
- Auger Cast Piles

Class VII [100yr] (10000 PSI)
- Conventional
- Increased Slump

Concrete Durability Data



Test
AASHTO T 358 Surface Resistivity Indication of Concrete's Ability to Resist Chloride Ion Penetration

Tester	Testing Lab	Date Test Performed
C25242086	DSM001 - State Materials Office	3/29/2021

Samples	3		
Curing Condition	Lime Water	Lime Water	Lime Water
Ambient Lab Temperature (°F)	72	72	72
Sample (kohm-cm)	A	B	C
0°	9.4	10.0	9.8
90°	10.1	9.8	10.4
180°	10.5	10.0	9.1
270°	9.9	11.4	9.7
0°	9.2	9.5	9.8
90°	10.0	10.7	10.2
180°	10.3	9.9	9.1
270°	9.8	11.3	9.9
Average (kohm-cm)	9.9	10.3	9.8
RSD (%)	4.0	6.8	5.1
Set Average (kohm-cm)	11.0		

Test Notes

2021 Construction Academy

April 13, 2021

QUESTIONS

Jose Armenteros
Concrete Materials Engineer

Thomas Frank
Concrete Field Operation Manager

Richard DeLorenzo
Structural Materials Lab Manager

Patrick (Pat) Carlton
Concrete Mix Design Specialist