

#1

COMPLETE

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Q1 State Representative

Name	Neal Fannin
Agency	PADOT
State / Province	PA
Email	nfannin@pa.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
Solid Stainless,
Galvanized,
 Other (please specify):
 Almost exclusively green epoxy

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
Solid Stainless,
Galvanized,
 Comments:
 Almost exclusively green epoxy

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
GFRP,
Solid Stainless,
Composite,
Other (Please specify in Comments) ,
 Comments:
 Zinc clad Zinc clad tubes

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	Cost, structure location and corrosion potential
For Bridge Decks	Cost, structure location and corrosion potential
For Pavements	Cost, structure location and corrosion potential

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	Section 709.1(c) of the following: http://www.dot.state.pa.us/public/pdf/BOCM_MTD_LAB/PUBLICATIONS/PUB_35/Current_Edition/Bulletin15.pdf
Approved/Qualified List for Dowel Bars	Section 705.3 of the following: http://www.dot.state.pa.us/public/pdf/BOCM_MTD_LAB/PUBLICATIONS/PUB_35/Current_Edition/Bulletin15.pdf
Approved List of Epoxy Coaters	Section 709.1(c) of the following: http://www.dot.state.pa.us/public/pdf/BOCM_MTD_LAB/PUBLICATIONS/PUB_35/Current_Edition/Bulletin15.pdf
Approved List of Galvanizers	Section 1105.02(s) of the following: http://www.dot.state.pa.us/public/pdf/BOCM_MTD_LAB/PUBLICATIONS/PUB_35/Current_Edition/Bulletin15.pdf

Q7 Is there any research on reinforcement being performed/sponsored by your DOT? **No**

Q8 Do you use Mass Concrete? **Yes**

Q9 What dimensions are considered as mass concrete?

Least dimension greater than or equal to 6 feet

Q10 What are the mix design requirements for mass concrete?

- Provide Portland Cement of Type I, II, IP, or IS.
- Use any combination of Ground Granulated Blast Furnace Slag (GGBFS) (25% to 60%) and Class F fly ash (15% to 25%). Lower replacement quantities of Supplementary Cementitious Materials (SCM's) may be approved provided all other requirements are met, including Alkali-Silica Reactive (ASR) remediation if potentially reactive aggregates are used. The maximum total SCM substitution of Portland cement shall not exceed 60%, including blended cement.
- Provide a Cement Factor of a minimum of 400 pounds per cubic yard, including pozzolans/SCMs, with 250 pcy minimum of Portland Cement.
- Maximum water to cementitious ratio shall be 0.50.
- Provide air entrainment for elements above frost line. To improve workability and aid in air entrainment, water reducing or retarding admixtures may be used. If water reducing admixtures are used the slump may be increased as permitted in Publication 408.
- Develop the mix design to limit the maximum internal temperature of the placement to 160°F or less.
- Develop the mix design to limit the maximum differential between the internal temperature and surface temperature of the concrete to 36°F or less.
- Coarse aggregate may include Nos. 3 and 467 (Type-A) per Section 703, Table-C.
- Perform initial trial mix design compressive strength and production compressive strength testing for acceptance at 56-days. Final acceptance also based on 56-day results.
- Confirm via ASTM C157 that mix design shrinkage is <0.080%, (<800 microstrains).
- The coefficient of thermal expansion at 28-days tested in accordance with the U.S.Army Corps of Engineers (USACE) Method CRDC39-81 shall not exceed 5.0 millionths per degree F.

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **Yes**

Q13 What are the mix design requirements for drilled shafts?

Same as question 10

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential **36 Degrees F**

Maximum Temperature **160 degrees F**

Q15 Do you have any experience with self consolidated concrete? **Yes,**
If yes, what types of applications:
Only in precast

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Self Consolidating Concrete <https://www.dot.state.pa.us/public/PubsForms/Publicatio>

Q17 Any additional comments?

No

#2

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Q1 State Representative

Name	Bryan Lee
Agency	UDOT
State / Province	Utah
Email	Bryanlee@utah.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply? **Green Epoxy**

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)? **Green Epoxy, Solid Stainless**

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)? **Green Epoxy**

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	Green Epoxy is specified in the standards and is most common.
For Bridge Decks	Green Epoxy is specified in the standards and is most common
For Pavements	Green Epoxy is specified in the standards and is most common

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	https://app.udot.utah.gov/prod/mat/f?p=150:1005:0
Approved List of Epoxy Coaters	https://app.udot.utah.gov/prod/mat/f?p=150:1005:0
Approved List of Galvanizers	https://app.udot.utah.gov/prod/mat/f?p=150:1005:0

Q7 Is there any research on reinforcement being performed/sponsored by your DOT? **No**

Q8 Do you use Mass Concrete? **No**

Q9 What dimensions are considered as mass concrete? **Respondent skipped this question**

Q10 What are the mix design requirements for mass concrete? **Respondent skipped this question**

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

Class A mix, .48 W/CM, No air requirement, f'c 3000, f'cr 3900

Q14 What is the maximum temperature differential and maximum temperature for mass concrete? **Respondent skipped this question**

Q15 Do you have any experience with self consolidated concrete? **Yes,**
If yes, what types of applications:
Mostly pre-cast

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Self Consolidating Concrete <http://www.udot.utah.gov/main/uconowner.gfn=31730316757114651> Section 03056

Drilled Shafts <http://www.udot.utah.gov/main/uconowner.gfn=31730316757114651> Section 02466

Dowel Bars <http://www.udot.utah.gov/main/uconowner.gfn=31730316757114651> Section 02752

Reinforcing Bars <http://www.udot.utah.gov/main/uconowner.gfn=31730316757114651> Section 03211

Q17 Any additional comments? **Respondent skipped this question**

#3

COMPLETE

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Q1 State Representative

Name	Tyson Rupnow
Agency	LADOTD
State / Province	LA
Email	Tyson.Rupnow

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Solid Stainless,
Galvanized,
Other,
 Other (please specify):
 black steel Stainless and galvanized are used only in extreme conditions such as a structure in a tidal zone, and only if absolutely deemed necessary.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Other (Please Specify in Comments),
 Comments:
 black steel

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Other (Please specify in Comments),
 Comments:
 Only plastic coated dowels are allowed for load transfer. Black steel is required for longitudinal joint tie bars.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	exposure
For Bridge Decks	exposure
For Pavements	exposure

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

http://wwwapps.dotd.la.gov/engineering/materials_lab/QualifiedProjectList/ApprovedMaterialsListFiltered.aspx

Approved/Qualified List for Dowel Bars

http://wwwapps.dotd.la.gov/engineering/materials_lab/QualifiedProjectList/ApprovedMaterialsListFiltered.aspx

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

No

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

Mass concrete is defined as a structural concrete placement having a least dimension of 48 inches or greater, or if designated on the plans or in the project specifications as being mass concrete.

Q10 What are the mix design requirements for mass concrete?

Use Type II portland cement. Replace portland cement with fly ash at 20 percent to 50 percent by weight or replace with slag cement at 50 percent to 70 percent by weight or a ternary mix meeting specification requirements. Certify that the cementitious combination generates a heat of hydration of not more than 70 calories/gram at 7 days as determined by ASTM C186 or ASTM C1702.
901.12.3.2 Aggregates: Use Type B or D aggregate gradation for mass concrete. See 1003.08.3.
901.12.3.3 Admixtures:
mass concrete.
Do not use accelerating admixtures i

Q11 Do you have any exclusions for mass concrete?

Comment:
Yes - Class S concrete (drilled shafts)

Q12 Do you consider drilled shafts mass concrete?

Comment:
See previous notes.

Q13 What are the mix design requirements for drilled shafts?

Typically a structural concrete mixture.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

35 Degrees F

Maximum Temperature

160 Degrees F

Q15 Do you have any experience with self consolidated concrete?

Yes,
If yes, what types of applications:
Drilled shafts.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Respondent skipped this question

Q17 Any additional comments?

Respondent skipped this question

#4

COMPLETE

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Q1 State Representative

Name	Brian Hunter
Agency	NCDOT
State / Province	NC
Email	bhunter@ncdot.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Solid Stainless,
ASTM 934 Epoxy,
Galvanized,
Green Epoxy,
 Other (please specify):
 We have two trials using the galvanized bars.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

GFRP,
Solid Stainless,
ASTM 934 Epoxy
Green Epoxy,
 Comments:
 We have a trial project planned for the GFRP.

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Comments:
 Our concrete pavements are not reinforced, but we do require epoxy coated dowel bars at the joints.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	Structure Management Design Manual - Corrosion Protection Guidelines
For Bridge Decks	Proximity to water in corrosive zones
For Pavements	N/A

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	: https://apps.ncdot.gov/vendor/approvedproducts/Producer.aspx Choose Reinforcing Steel as Facility Type
Approved/Qualified List for Dowel Bars	https://apps.ncdot.gov/vendor/approvedproducts/Producer.aspx Choose Dowel Baskets as Facility Type
Approved List of Epoxy Coaters	https://apps.ncdot.gov/vendor/approvedproducts/Producer.aspx Choose Coated Rebar Fabricator as Facility Type
Approved List of Galvanizers	Galvanizers https://apps.ncdot.gov/vendor/approvedproducts/Producer.aspx Choose Structural Steel Galvanizer as Facility Type

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

No,
If yes, please provide additional information regarding the research.:
But we are doing a trial on GFRP rebar

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

When the smallest dimension of that component is 6'.

Q10 What are the mix design requirements for mass concrete?

Mass concrete shall contain an approved set-retarding, water-reducing admixture, and flyash or ground granulated blast furnace slag in the amount of 25% by weight of the total cementitious material (portland cement plus flyash). Flyash or ground granulated blast furnace slag used in the mass concrete mix shall meet the requirements of Articles 1024-5 and 1024-6 of the Standard Specifications. Portland Cement shall meet the requirements of AASHTO M85 for Type II. The total cementitious material shall not exceed 600 lbs. per cubic yard of concrete. The Contractor shall test and submit results for the compressive strength of his proposed mix design for review and approval. The strength must be taken as the average of at least three cylinders made in the laboratory and meet the minimum 28 day strength requirements noted in the contract plans.

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

See table 1000-1 and section 411 [https://connect.ncdot.gov/resources/Specifications/StandSpecLibrary/2018 Standard Specifications for Roads and Structures.pdf](https://connect.ncdot.gov/resources/Specifications/StandSpecLibrary/2018%20Standard%20Specifications%20for%20Roads%20and%20Structures.pdf)

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

The temperature difference between the core and exterior surfaces shall not exceed 35°F

Maximum Temperature

The mass concrete temperature after placement shall not exceed 158°F

Q15 Do you have any experience with self consolidated concrete? **Yes**

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

Concrete <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjs-Oa0xcvZAhWEg-AKHxhYAgQFggpMAA&url=https%3A%2F%2Fconnect.ncdot.gov%2Fresources%2FStructures%2FStructures%2520Project%2520Special%2520Provisions%2FPSP039%2520Mass%2520Concrete.doc&usg=AOvVaw1QgjyJESgfHkiN9AcM5Z5t>

Drilled Shafts

See table 1000-1 and section 411 [https://connect.ncdot.gov/resources/Specifications/StandSpecLibrary/2018 Standard Specifications for Roads and Structures.pdf](https://connect.ncdot.gov/resources/Specifications/StandSpecLibrary/2018%20Standard%20Specifications%20for%20Roads%20and%20Structures.pdf)

Dowel Bars

See section 1070-6 [https://connect.ncdot.gov/resources/Specifications/StandSpecLibrary/2018 Standard Specifications for Roads and Structures.pdf](https://connect.ncdot.gov/resources/Specifications/StandSpecLibrary/2018%20Standard%20Specifications%20for%20Roads%20and%20Structures.pdf)

Reinforcing Bars

See section 1070 [https://connect.ncdot.gov/resources/Specifications/StandSpecLibrary/2018 Standard Specifications for Roads and Structures.pdf](https://connect.ncdot.gov/resources/Specifications/StandSpecLibrary/2018%20Standard%20Specifications%20for%20Roads%20and%20Structures.pdf)

Q17 Any additional comments?

Respondent skipped this question

#5

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Q1 State Representative

Name	Mark Russell
Agency	WSDOT
State / Province	Washington
Email	russelm@wsdot.wa.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
 Other (please specify):
 Bridge structures typically include uncoated ASTM A706 bar. There is a small quantity of solid stainless and galvanized rebar in service.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
 Comments:
 Tie bars only. WSDOT does not construct CRCP.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	WSDOT Bridge and Structures Policy
For Bridge Decks	WSDOT Bridge and Structures Policy
For Pavements	WSDOT Pavement Policy

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Dowel Bars	N/A
Approved List of Galvanizers	N/A

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

If yes, please provide additional information regarding the research.:

WSDOT Bridge and Structures has had research interest in Grade 80 ASTM A706 rebar. We do have one pilot project that is complete using shape memory alloy bar in place of conventional rebar.

Q8 Do you use Mass Concrete?

Yes,

Comment:

WSDOT bridge elements such as pier caps, footings and shafts can meet the definition of mass concrete.

Q9 What dimensions are considered as mass concrete?

Elements with the least dimension of 6 feet or greater are considered mass concrete

Q10 What are the mix design requirements for mass concrete?

WSDOT allows a lower cement content than other structural concrete, but requires testing data to demonstrate freeze-thaw durability and low permeability. 4000 psi is required for a 28-day compressive strength.

Q11 Do you have any exclusions for mass concrete?

Respondent skipped this question

Q12 Do you consider drilled shafts mass concrete?

Comment:

There is internal WSDOT discussion on whether large diameter drilled shafts should be considered mass concrete when they extend above the ground line.

Q13 What are the mix design requirements for drilled shafts?

Concrete Class 5000P per WSDOT Standard Specification 6-02. <http://www.wsdot.wa.gov/publications/manuals/fulltext/M41-10/Division6.pdf>

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

35 F

Maximum Temperature

160 F

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

Commonly in precast prestressed concrete girders. Sometimes in concrete repair work.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete	Contract specific specification
Self Consolidating Concrete	6-02.3(2)A2 - http://www.wsdot.wa.gov/publications/manuals/fulltext/M41-10/Division6.pdf
Drilled Shafts	6-19 - http://www.wsdot.wa.gov/publications/manuals/fulltext/M41-10/Division6.pdf
Dowel Bars	9-07.5 - http://www.wsdot.wa.gov/publications/manuals/fulltext/M41-10/Division9.pdf
Reinforcing Bars	9-07.2, 9-07.3 - http://www.wsdot.wa.gov/publications/manuals/fulltext/M41-10/Division9.pdf

Q17 Any additional comments?

Respondent skipped this question

#6

COMPLETE

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Q1 State Representative

Name	Caleb Gunter
Agency	South Carolina Department of Transportation
State / Province	South Carolina
Email	guntercb@gmail.com

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Galvanized,
Other,
 Other (please specify):
 All rebar used in SCDOT structures is AASHTO M 31-Type W, Grade 60 (ASTM A 706 - Grade 60). We rarely use galvanized rebar.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Other (Please Specify in Comments),
 Comments:
 We also use only AASHTO M 31-Type W, Grade 60 (ASTM A 706 - Grade 60) for bridge decks. We rarely, if ever, use galvanized rebar for bridge decks.

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Other (Please specify in Comments),
 Comments:
 For SCDOT concrete paving, AASHTO M 31 - Type S (ASTM A 615) - Grade 40 or 60 or AASHTO M 31 - Type W (ASTM A 706) - Grade 60 can be used for the reinforcement. For dowel bars, plain round bars conforming to the requirements of AASHTO M 31, AASHTO M 322, or ASTM A 706 - Grade 60 are required.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	Due to seismic design requirements we almost exclusively use ASTM A 706 - Grade 60
For Bridge Decks	Due to seismic design requirements we almost exclusively use ASTM A 706 - Grade 60
For Pavements	We always use steel rebar reinforcement

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	http://info2.scdot.org/Materials/QualProd/60%20QPL.pdf
Approved/Qualified List for Dowel Bars	N/A
Approved List of Epoxy Coaters	N/A
Approved List of Galvanizers	N/A

Q7 Is there any research on reinforcement being performed/sponsored by your DOT? **No**

Q8 Do you use Mass Concrete? **Comment:**
Comment – But only for specific projects

Q9 What dimensions are considered as mass concrete?

Drilled shafts with a diameter of 6 feet or larger

Q10 What are the mix design requirements for mass concrete?

Can use Fly Ash up to 40% at a 1.2:1 replacement ratio

Q11 Do you have any exclusions for mass concrete? **Yes**

Q12 Do you consider drilled shafts mass concrete? **Yes**

Q13 What are the mix design requirements for drilled shafts?

http://www.scdot.org/business/pdf/2007_full_specbook.pdf - Section 701.2.12.2

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential	35 degrees Fahrenheit
Maximum Temperature	80 degrees Fahrenheit

Q15 Do you have any experience with self consolidated concrete?

Yes,
If yes, what types of applications:
Specialty type project – limited usage.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

On a per-project basis.

Self Consolidating Concrete

On a per-project basis.

Drilled Shafts

On a per-project basis.

Dowel Bars

Section 501.2.7 of:

http://www.scdot.org/business/pdf/2007_full_specbook.pdf

Reinforcing Bars

http://www.scdot.org/business/technicalPDFs/supSpecs/Reinforcing_Steel_8-3-15.pdf

Q17 Any additional comments?

Respondent skipped this question

#7

COMPLETE

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Q1 State Representative

Name	Jose Armeneteros
Agency	Florida DOT
State / Province	FL
Email	Jose.Armenteros@dot.state.fl.us

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

GFRP,
Solid Stainless,
Other,
 Other (please specify):
 ASTM A615 Carbon Steel rebar is typically used. GFRP and Stainless are used on a limited basis.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Other (Please Specify in Comments),
 Comments:
 ASTM A614. Same as other structures.

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

GFRP,
Other (Please specify in Comments) ,
 Comments:
 ASTM A615. Pavements are typically non-reinforced, carbon steel and GFRP used for load transfer, dowel and tie bars.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)

Environmental Classification

For Bridge Decks

Environmental Classification

For Pavements

GFRP used on toll roads with high speed scanners

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

NTPEP

Approved/Qualified List for Dowel Bars

Accepted by certified mill test report

Approved List of Epoxy Coaters

N/A

Approved List of Galvanizers

N/A

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

Yes,

If yes, please provide additional information regarding the research.:

Design and use of stainless steel rebar and seven-wire strand in prestressed concrete.

Q8 Do you use Mass Concrete?

Yes,

Comment:

Used when designated in the contract documents. A mass concrete control plan (MCCP) must be developed and administered by a specialty engineer. The purpose of the plan is to establish temperature control measures that insure that the maximum core temperature and maximum core-surface temperature differentials are not exceeded.

Temperature control measures must remain in place until the core-ambient temperature differential is less than or equal to 50°F.

Q9 What dimensions are considered as mass concrete?

Bridge components except drilled shafts and segmental superstructure pier and expansion joint segments: When the minimum dimension of the concrete exceeds 3 feet and the ratio of volume of concrete to the surface area is greater than 1 foot, provide for mass concrete. (The surface area for this ratio includes the summation of all the surface areas of the concrete component being considered, including the full underside (bottom) surface of footings, caps, construction joints, etc.) Volume and surface area calculations in units of feet.

Drilled shafts: All drilled shafts with diameters greater than 6 feet are considered mass concrete.

Segmental superstructure pier and expansion joint segments > 6500 psi: Considered mass concrete regardless of volume-to-surface area ratio

Segmental superstructure pier and expansion joint segments ≤ 6500 psi:

Considered mass concrete volume-to-surface area ratio is greater than 1 foot, using internal core volume and only surface area exposed to air.

Straddle and Integral Pier Caps: Provide for mass concrete when design concrete strengths greater than 6500 psi are used regardless of the ratio of volume to surface area. For design concrete strengths less than or equal to 6500 psi, provide for mass concrete when the ratio of volume to surface area is greater than 1 foot.

Q10 What are the mix design requirements for mass concrete?

- Use Type IL or Type II(MH) for all mass concrete elements.
- Class F fly ash or slag is required in all classes of concrete.
- Fly ash: Use 18% to 50% replacement of cement, by weight; use 35% to 50% if core temperature is expected to rise above 165°F.
- Slag: Use 50% to 70% replacement of cement, by weight; use 50% to 55% of total cementitious content, by weight, when used in combination with silica fume, ultrafine fly ash, or metakaolin.
- Fly ash and Slag: Use 30% portland cement by weight, 10% to 20% fly ash, and 50% to 60% slag.
- Do not use high alkali cement.

Q11 Do you have any exclusions for mass concrete? **Yes**

Q12 Do you consider drilled shafts mass concrete? **Yes**

Q13 What are the mix design requirements for drilled shafts?

- Class F fly ash or slag is required in all classes of concrete.
- Fly ash: Use 33% to 37% replacement of cement, by weight.
- Slag: Use 58% to 62% replacement of cement, by weight.
- Fly ash and Slag: Use 30% portland cement by weight, 10% to 20% fly ash, and 50% to 60% slag.
- Silica fume, metakaolin, and ultrafine fly ash are not approved for use in drilled shafts.
- Minimum cementitious material content is 658 lb/yd³.
- Maximum water-to-cementitious material ratio is 0.41

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential	35°F core-surface temperature differential
Maximum Temperature	180°F

Q15 Do you have any experience with self consolidated concrete?

Yes,
If yes, what types of applications:
Precast and Prestressed structural elements. A current research project is evaluating SCC for drilled shafts.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

FDOT Standard Specifications for Road and Bridge Construction,
<http://www.fdot.gov/programmanagement/Implemented/SpecBooks/July2018/Files/718eBook.pdf>, Section 346-3.3.
(2) FDOT Structures Design Guidelines, Section 1.4.4, Volume I:
<http://www.fdot.gov/structures/StructuresManual/CurrentRelease/Vol1SDG.pdf>

Self Consolidating Concrete

FDOT Materials Manual:
<http://www.fdot.gov/programmanagement/Implemented/URLinSpecs/Files/Section84-12717.pdf>, Section 8.4, Volume II.

Drilled Shafts

FDOT Standard Specifications for Road and Bridge Construction,
<http://www.fdot.gov/programmanagement/Implemented/SpecBooks/July2018/Files/718eBook.pdf>, Section 346-3.2.

Dowel Bars

FDOT Standard Specifications for Road and Bridge Construction,
<http://www.fdot.gov/programmanagement/Implemented/SpecBooks/July2018/Files/718eBook.pdf>, Section 346-2.3.

Reinforcing Bars

FDOT Standard Specifications for Road and Bridge Construction,
<http://www.fdot.gov/programmanagement/Implemented/SpecBooks/July2018/Files/718eBook.pdf>, Section 931-1.1 Steel Bars; Section 932-3 Fiber Reinforced Polymer (FRP) Reinforcing Bars.

Q17 Any additional comments?

Respondent skipped this question

#8

COMPLETE

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Q1 State Representative

Name	Nicole Carter
Agency	KDOT
State / Province	KS
Email	nicole.carter@ks.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
ASTM 934 Epoxy,
Other,
 Other (please specify):
 Epoxy Coated Steel Wire and Welded Wire Fabric (ASTM A 775 or ASTM A 884); Non-Epoxy Steel for RCB's that have less than 2-feet of fill on top of the structure.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
ASTM
934 Epoxy

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
ASTM 934 Epoxy,
Other (Please specify in Comments)
 Comments:
 Typically dowels only, welded steel wire fabric sometimes

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)

History of good performance

For Bridge Decks

Benefits/Cost Ratio

For Pavements

Standard Specifications

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

<https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burMatrRes/PQL/pql-29-0.pdf> - PQL for Welded Steel Wire Fabric For Concrete Reinforcement

Approved/Qualified List for Dowel Bars

<https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burMatrRes/PQL/pql-28-0.pdf> - PQL for Steel Bars for Concrete Reinforcement

Approved List of Epoxy Coaters

<https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burMatrRes/PQL/pql-10-01.pdf> - PQL for Epoxy Coatings for Epoxy Coated Steel for Concrete Reinforcement
<https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burMatrRes/PQL/pql-10-03.pdf> - PQL for Epoxy Applicator Plants For Epoxy Coated Steel For Concrete Reinforcement

Other (Please specify)

<https://www.ksdot.org/Assets/wwwksdotorg/bureaus/burMatrRes/PQL/pql-32-0.pdf> - PQL for Reinforcing Steel Splices

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

Yes,

If yes, please provide additional information regarding the research.:

Corrosion: Cathodic protection of existing bridge deck reinforcement

Q8 Do you use Mass Concrete?

No

Q9 What dimensions are considered as mass concrete?

NA

Q10 What are the mix design requirements for mass concrete?

NA

Q11 Do you have any exclusions for mass concrete?

Comment:

NA

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

KDOT Standard Specifications Sections 401 and 402

<http://www.ksdot.org/Assets/wwwksdotorg/bureaus/burConsMain/specprov/2015/PDF/15-04005.pdf>

<http://www.ksdot.org/Assets/wwwksdotorg/bureaus/burConsMain/specprov/2015/PDF/15-04002.pdf>

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential **NA**

Maximum Temperature **NA**

Q15 Do you have any experience with self consolidated concrete? **Yes,**
If yes, what types of applications:
Pre-cast and pre-stressed items

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete	General Concrete Section 401, 402, 404 http://www.ksdot.org/bureaus/burConsMain/specprov/2015specprov.asp
Self Consolidating Concrete	Section 715 and 404 http://www.ksdot.org/bureaus/burConsMain/specprov/2015specprov.asp
Drilled Shafts	Section 703 http://www.ksdot.org/bureaus/burConsMain/specprov/2015specprov.asp
Dowel Bars	Section 1601 and 1603 http://www.ksdot.org/bureaus/burConsMain/specprov/2015specprov.asp
Reinforcing Bars	Section 1601 and 1603 http://www.ksdot.org/bureaus/burConsMain/specprov/2015specprov.asp

Q17 Any additional comments?

Each link to specifications most likely have been replaced by special provisions

#9

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Q1 State Representative

Name	Drew Waldrop
Agency	ALDOT
State / Province	AL
Email	waldropa@dot.state.al.us

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Other,
 Other (please specify):
 AASHTO M 31 or M 32 standard on all structures. We do not have as aggressive an environment in Alabama, and have not determined a need to experiment with high performance reinforcement yet.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Other (Please Specify in Comments),
 Comments:
 AASHTO M 31 or M 32 standard on all structures. We do not have as aggressive an environment in Alabama, and have not determined a need to experiment with high performance reinforcement yet.

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	Specification
For Bridge Decks	Specification
For Pavements	Specification

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	http://www.dot.state.al.us/mtweb/Testing/MSDSAR/pdf/QMSD/Li12.pdf
Approved/Qualified List for Dowel Bars	N/A
Approved List of Epoxy Coaters	N/A
Approved List of Galvanizers	N/A

Q7 Is there any research on reinforcement being performed/sponsored by your DOT? **No**

Q8 Do you use Mass Concrete? **No,**
Comment:
Not yet; our mass concrete specification should be out by the end of 2018.

Q9 What dimensions are considered as mass concrete?

In current draft: Least dimension greater than 5'

Q10 What are the mix design requirements for mass concrete?

In current draft:
No Type III cement
Allow up to 75% substitution rate for SCMs (Cap of 40% F ash, 75% slag, 10% microsilica)
If straight cement mixes are used, maximum concrete temp is lowered to 160, vs 185.

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

4000 psi @ 28 days
600-800 lbs of cementitious material
Max w/c of 0.40
6-9" slump
In moderately aggressive environments, must use Type II cement, 20-30% F ash or 35-50% slag.
In severely aggressive environments, must use Type II cement, 20% F ash and 10% microsilica, or 50% slag & 5% microsilica.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

If CTE is measured, varies. If not, 35 degrees.

Maximum Temperature

160 if straight cement mix used; 185 with appropriate SCM usage

Q15 Do you have any experience with self consolidated concrete?

Yes,
If yes, what types of applications:
Precast/prestress

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

N/A (draft form only right now)

Self Consolidating Concrete

Section 512/513 of Std Specs
<http://www.dot.state.al.us/conweb/pdf/Specifications/2018StandardSpecificationsCompleteBook.pdf>

Drilled Shafts

Section 506:
<http://www.dot.state.al.us/conweb/pdf/Specifications/2018StandardSpecificationsCompleteBook.pdf>

Dowel Bars

Section 835:
<http://www.dot.state.al.us/conweb/pdf/Specifications/2018StandardSpecificationsCompleteBook.pdf>

Reinforcing Bars

Section 835:
<http://www.dot.state.al.us/conweb/pdf/Specifications/2018StandardSpecificationsCompleteBook.pdf>

Q17 Any additional comments?

Respondent skipped this question

#10

COMPLETE

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Q1 State Representative

Name	Michael Rigby
Agency	Arizona Department of Transportation
State / Province	AZ
Email	mrigby@azdot.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
ASTM 934 Epoxy,
Other,
 Other (please specify):
 Deformed Grade 60 rebar (ASTM A615)

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
ASTM 934 Epoxy ,
Other (Please Specify in Comments),
 Comments:
 Deformed Grade 60 rebar (ASTM A615)

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
Other (Please specify in Comments) ,
 Comments:
 Reinforcing bars (tie bars and dowel bars) are deformed and either Grade 40 or 60 depending on what the plans specify. They conform to AASHTO M31 (ASTM A615).

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)

Grade 60 steel

For Bridge Decks

Elevation over 4,000 ft we use epoxy rebar

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

Made in America

Approved/Qualified List for Dowel Bars

Made in America

Approved List of Epoxy Coaters

NA

Approved List of Galvanizers

NA

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

No

Q8 Do you use Mass Concrete?

No

Q9 What dimensions are considered as mass concrete?

NA

Q10 What are the mix design requirements for mass concrete?

NA

Q11 Do you have any exclusions for mass concrete?

No

Q12 Do you consider drilled shafts mass concrete?

No

Q13 What are the mix design requirements for drilled shafts?

$f'_c = 3,500$ psi

Where concrete is placed in drilled shaft excavations containing slurry or water, the cement content of the concrete shall be between 660 and 750 pounds per cubic yard.

Maximum aggregate size shall be limited to 1/5 of minimum clear bar spacing, not to exceed 3/4 inch for drilled shafts constructed with a wet method or with temporary casing, and one inch for drilled shafts constructed with a dry method.

Air-entraining admixtures are required for concrete drilled shafts in all areas where scour is anticipated.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential **NA**

Maximum Temperature **NA**

Q15 Do you have any experience with self consolidated concrete?

Yes,
If yes, what types of applications:
Prestressed/Precast bridge girders, MSE panels

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete	NA
Self Consolidating Concrete	https://apps.azdot.gov/files/materials-manuals/Policy-Procedure-Directives/ppd22.pdf
Drilled Shafts	https://azdot.gov/docs/business/2008-standards-specifications-for-road-and-bridge-construction.pdf?sfvrsn=0
Dowel Bars	https://azdot.gov/docs/business/2008-standards-specifications-for-road-and-bridge-construction.pdf?sfvrsn=0
Reinforcing Bars	https://azdot.gov/docs/business/2008-standards-specifications-for-road-and-bridge-construction.pdf?sfvrsn=0

Q17 Any additional comments?

Drilled Shaft specifications are found in Section 609 of the Standard Specifications.
Dowel Bar and reinforcing bar specifications are found in Section 1003 of the Standard Specifications.

#11

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Q1 State Representative

Name	T.J. Murphy
Agency	NDDOT
State / Province	ND
Email	tjmurphy@nd.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Other,
 Other (please specify):
 AASHTO M 31 uncoated.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
Other (Please Specify in Comments),
 Comments:
 AASHTO M 31, Coated with Epoxy ASTM A 775.

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
Other (Please specify in Comments)
 Comments:
 Dowels AASHTO M 31 or M 322, Coated with Epoxy per ASTM A 775 Tie Bars AASHTO M 31, Coated with Epoxy for centerline ties only per ASTM A 775 Reinforcing Steel AASHTO M 31

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	No epoxy coating
For Bridge Decks	epoxy coating
For Pavements	Epoxy Coating for dowel and centerline ties.

Q6 Please provide your approved/qualified lists for the following, if applicable.

Respondent skipped this question

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

No

Q8 Do you use Mass Concrete?

Yes,

Comment:

By special provision project by project

Q9 What dimensions are considered as mass concrete?

Footings and Piers

Q10 What are the mix design requirements for mass concrete?

Mass Concrete Mix Design

Class AE-3 Concrete shall meet the requirements of the NDDOT Standard Specifications for Road and Bridge Construction, 2008, except as modified herein.

Develop a Class AE-3 Concrete mix design for all mass concrete elements. Submit the concrete mix design with the Heat Generation and Dissipation Analysis and any test results a minimum of 30 days before any Mass Concrete mix is placed.

All concrete mixes for mass concrete elements shall be designed by the Contractor to meet the requirements of the Contract Documents, including but not limited to the requirements specified herein. The Contractor shall submit concrete mix designs along with all testing results to the Engineer for review before authorization will be given to cast the first mass concrete element. Since the concrete mix design can be an input in the Heat Generation and Dissipation Analysis, mix designs and testing results should be submitted prior to, or along with, the mass concrete submittals specified in this Special Provision.

Compressive Strength

Mass concrete shall have the 28-day compressive strength for the element cast as shown in the Contract Documents. The specified 28-day strength may be attained in 56 days for mix designs that include cementitious replacement. No individual strength test result shall be below 80% of the full required compressive strength at 28 days.

Concrete elements shall obtain at least 80% of the design strength for Class AE-3 prior to loading with successive lifts or elements. The full substructure design strength shall be obtained prior to superstructure construction.

Allow the concrete element to develop a minimum of 80% of the designed strength, for Class AE-3 Concrete, before loading with successive lifts or elements.

Before superstructure construction, allow the substructure to achieve design strength.

Finely Divided Mineral Admixtures

Fly ash may be used in the mix to reduce the heat of hydration in accordance with the following.

Fly ash can be used as an admixture to reduce the heat of hydration as long as it meets the following:

Fly-ash may be used up to 40% by weight of total cementitious materials. Fly ash shall be in accordance with Section 820, from a NDDOT approved source, shall be compatible with the type of cement, and shall be thoroughly blended in the mix.

Water Reducers, Retarders, and Accelerators

Water reducers and retarders, and combinations thereof may be used and shall conform to ASTM C494 type A, B, C, D, or E. Chloride or chloride bearing ingredients shall not be used.

Use water reducers, retarder, accelerator or a combination that meet the requirements of ASTM C494 Types A, B, C, D or E. Do not use water reducers, retarders, or accelerators that contain chloride.

Admixtures shall be used in accordance with manufacturer's recommendations with the amount determined through trial mixes prepared and tested in accordance with the Project Specifications.

Use admixtures according to the manufacturer's recommendations and in the proportion of the mix design.

Manufacturer's certification showing compliance with these specifications is required.

Provide certification according to Section 106.01 C "Certificate of Compliance".

Use of Ice

Other precautions for reducing the heat of hydration may be taken, such as the addition of controlled quantities of ice in lieu of equal quantities of mixing water. However, the mix shall contain no frozen pieces of ice after blending and mixing components.

Ice may be used to reduce the heat of hydration as long as the ice is added in controlled quantities in place of equal quantities of mixing water and there are no frozen pieces of ice after mixing the components.

Sample Preparation and Testing

Trial batching, and the preparation and testing of samples (ACI 301) shall be performed by either an AMRL (AASHTO Materials Reference Laboratory) certified laboratory (Portland Cement Concrete certification) or a CCRL (Cement and Concrete Reference Laboratory) certified laboratory (concrete certification).

Develop trial batches and prepare the samples according to ACI 301. Perform testing of the trial batches in labs certified for Portland Cement Concrete by either an AASHTO Materials Reference Laboratory (AMRL) or Cement and Concrete Reference Laboratory (CCRL).

Testing of the plastic properties of the concrete including air content shall be made only after the addition of the high range water-reducing (HRWR) admixture.

Test the plastic properties of the concrete after all admixtures are added.

All concrete cylinders used for 28-day (or 56-day) compressive strength testing shall be cured in a moist room according to ASTM C511.

Cure all concrete cylinders used for compressive strength according to ASTM C 511.

Field sampling for testing shall be at the point of placement. Air loss, temperature change and segregation potential for pumped concrete shall be considered.

Mix Design Documentation

The Contractor shall submit mix designs for each class of concrete required for each mass concrete element on the project as specified below.

Submit a mix design for each class of concrete required for each mass concrete element of the project.

Each mix design submittal shall include certified test data documenting results for air content, slump, yield, unit weight, and strength (f'_{cr}), where strength is defined as the specified minimum compressive strength plus the required over-design in accordance with ACI 301 ($f'_{cr} = f'_c + \text{required over-design}$).

For each mix design include the test data for the following:

Air content;

Slump;
Yield;
Unit weight; and
Strength (f'_{cr}).

Submittals shall be made at least 30 calendar days prior to the scheduled concrete placement.
Submit the mix design a minimum of 30 calendar days before concrete placement.

The certified test data shall also include:

Include the following certified test data:

- Fine Aggregate:
 - o Weight (lbs - SSD);
 - o Source;
 - o Type;
 - o Specific gravity; and
 - o Percent Absorption;
- Weight, Source and Type of Fine Aggregates (lbs. - SSD).
- Weight, Source, Type and Size of Coarse Aggregates (lbs. - SSD).
- Course Aggregate:
 - o Weight (lbs – SSD);
 - o Source;
 - o Size;
 - o Specific gravity; and
 - o Percent Absorption
- Percent Absorption for Aggregates.
- Weight, Source, and Type of Cement (lbs.).
- Cement:
 - o Weight;
 - o Source;
 - o Specific gravity; and
 - o Type;
- If blended cement is used, the mix design shall note the components of the blended cement, the proportions of those components, and the component proportionate weights.
- If blended cement is used note the following:
 - o Components of the blended cement;
 - o Proportions of the components; and
 - o Components proportionate weights
- Weight, Source, and Class of Fly Ash (lbs.).
- Fly Ash:
 - o Weight (lbs)
 - o Source;
 - o Specific Gravity; and
 - o Class;
- Weight of Water (lbs.).
- Admixtures including Type, Brand Name, and Dosage.
 - o Admixtures: Type;
 - o Brand Name; and
 - o Dosage;
- Specific Gravity for all Aggregates, Cements, and Mineral Admixtures.
- Water/Cement Ratio (Include all cementitious material on a 1 to 1 basis, including all pozzolans).
- Water/Cement Ratio (including all cementitious material on a 1 to 1 basis for all pozzolan); and
- The following test results

- o Concrete Temperature.
- o Tested Slump.
- o Tested Air Content.
- o Unit weight.
- o Yield.
- o Tested Strength (f'cr) at 28 days (or 56 days)(Moist Room Cured) and Standard Deviation.
- o Strength Gain Curves.
- o Rapid Chloride Permeability Test Results (ASTM C1202).

The Contractor shall run 9-yard trial batches of concrete mixes meeting these special provisions to assure workability. If the workability of the trial batch is not acceptable to the Contractor and the Engineer, the Contractor will modify the mix design or batching sequence and retest.

Create a 9 yard trial batch of each class of concrete to assess workability. If the trial batch is not workable, modify the mix design or batching sequence and retest.

Modifications to aggregate weights, excluding adjustments for specific gravity or absorption changes, by more than 3% or a change in aggregate source will constitute a change to the mix design. New certified test data will be required for acceptance of the mix. Changes in aggregate weights by more than 3%, not including specific gravity or absorptions changes, or aggregate source will require a new mix design.

Provide a new mix design whenever the aggregate source changes or when the aggregate weight, excluding adjustments for specific gravity or absorption, changes by more than 3%.

Q11 Do you have any exclusions for mass concrete? **Yes**

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

Concrete Mix Design

Contractor is responsible for design of all concrete mix designs for the project. Concrete mix designs to be designed and certified by a North Dakota licensed Professional Engineer.

Define concrete mix designs based on field experience of concrete production facility or laboratory trial mixes, in accordance with ACI 301-10, Section 4 "Concrete mixtures."

.Laboratory trial mixes to be tested at an AASHTO Accredited Independent Testing Agency retained and paid for by the Contractor.

Develop concrete mix designs with materials conforming to Section 802.01 of the Standard Specifications, but with the following revisions and additions:

- a. ACI 301 Exposure Class: S2.
- b. Minimum 28-day compressive strength: 4,500 psi.
- c. Maximum water-cement ratio: 0.45.
- d. Use Sulfate Resisting Portland Cement, Type V, meeting the requirements of ASTM C 150 or AASHTO M85. Other available Types of cement are permitted which meet the requirements of ACI 301-10 Table 4.2.2.7a for exposure Class S2 or use combinations of sulfate resistant mortars made using blends of Portland cement with pozzolans or slags, and blended hydraulic cements meeting the requirements of ASTM C1012.
- e. An alternate coarse aggregate gradation not shown in Table 802.3 may be used.
- f. Maintain a concrete slump equal to or greater than 7 inches throughout placement of concrete for the entire drilled shaft.
- g. Use Air-Entraining Admixture in at least the top 4 feet of drilled shaft concrete.
- h. Provide water reducing and/or retarding concrete admixtures Types A, B or D, as classified under ASTM C 494 that meet the requirements of AASHTO M 194 to achieve the required concrete workability and slump throughout concrete placement.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

First 48hrs 35F, Day 2-7 50F, Day 8 to 14 60F

Maximum Temperature

150 F

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

Limited to a few fascia precast beams

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

SP

Self Consolidating Concrete

SP

Drilled Shafts

SP

Dowel Bars

<https://www.dot.nd.gov/divisions/environmental/docs/supspecs/fullsupplementalspecswith10012017.pdf>

Reinforcing Bars

<https://www.dot.nd.gov/divisions/environmental/docs/supspecs/fullsupplementalspecswith10012017.pdf>

Q17 Any additional comments?

Respondent skipped this question

#12

COMPLETE

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Page 1

Q1 State Representative

Name	Eric Prieve
Agency	Colorado DOT
State / Province	CO
Email	eric.prieve@state.co.us

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?	Green Epoxy
--	--------------------

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?	Green Epoxy
---	--------------------

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?	Green Epoxy
--	--------------------

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	Epoxy only option
For Bridge Decks	Epoxy only option
For Pavements	Epoxy only option

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	Use NTPEP
Approved/Qualified List for Dowel Bars	Use NTPEP
Approved List of Epoxy Coaters	https://www.codot.gov/content/apl/EpoxyCoatingForReinforcingSteel.pdf
Approved List of Galvanizers	N/A

Q7 Is there any research on reinforcement being performed/sponsored by your DOT? **No**

Q8 Do you use Mass Concrete? **Yes,**
Comment:
Mostly for design build projects

Q9 What dimensions are considered as mass concrete?

From ACI 207 "Mass concrete is any volume of concrete with dimensions large enough to require that measures be taken to cope with the generation of heat from hydration of the cement and attendant volume change to minimize cracking."

Q10 What are the mix design requirements for mass concrete?

None. Contractor must follow ACI 207 to minimize temperature differentials within the limits of ACI 207

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

Maximum 3/8 inch aggregate. 6 to 9 inch slump or SCC. Slump retention of 2 hours to allow casing removal

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential **Per ACI 207**

Maximum Temperature **Per ACI 207**

Q15 Do you have any experience with self consolidated concrete? **Yes,**
If yes, what types of applications:
Drilled shafts, walls, decorative, bridge joint locking

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

ACI 207 listed in notes.

Self Consolidating Concrete

Not published on web yet

Drilled Shafts

Not published on web yet

Dowel Bars

https://www.codot.gov/business/designsupport/cdot-construction-specifications/2017-construction-standard-specs/2017-specs-book/division-700-2017-final.pdf/at_download/file

Reinforcing Bars

https://www.codot.gov/business/designsupport/cdot-construction-specifications/2017-construction-standard-specs/2017-specs-book/division-700-2017-final.pdf/at_download/file

Q17 Any additional comments?

Respondent skipped this question

#13

COMPLETE

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Page 1

Q1 State Representative

Name	Chad Hayes
Agency	Wis.DOT
State / Province	WI
Email	chad.hayes@dot.wi.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

**Green Epoxy,
Solid Stainless**

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

**Green Epoxy,
Solid Stainless,
Other (Please specify in Comments) ,**

Comments:
Stainless Clad

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	n/a
For Bridge Decks	Location and ADT
For Pavements	Location and ADT

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

N/A

Approved/Qualified List for Dowel Bars

1. High Performance Dowel Bars Special A Description
This special provision describes the optional use of high performance dowel bars for use in mainline pavement. **B Materials** Replace standard spec 505.2.6.2(1) with the following when using high performance dowel bars: For transverse joints in mainline concrete pavement, use non-corrosive high performance dowel bars. Use only one type of high performance bar for work under the contract. The following may be used: 1. Bars with 316L stainless steel cladding meeting ASTM A276 chemical requirements. Ensure that the bars have a smooth finished surface cladding 0.060 inches thick or thicker over ASTM A615 grade 60 or higher carbon steel. 2. Bars with 316L stainless steel tubes meeting ASTM A276 chemical requirements. Ensure that the tubes have a smooth finished surface, a wall thickness of 0.060 inches or more, and are press-filled with ASTM A615 grade 60 or higher carbon steel. Use an adhesive or epoxy between the tube and the carbon steel to fill any voids. 3. Solid 316L stainless steel bars conforming to ASTM A955 grade 60 or higher. 4. Bars with a rolled UNS Z41121 zinc alloy cladding conforming to ASTM B6. Ensure that the bars have a smooth finished surface cladding 0.040 inches thick or thicker over ASTM A615 grade 60 or higher carbon steel. 5. Bars with a fully bonded longitudinal glass fiber reinforced polymer (GFRP) corrosion shield conforming to the GFRP materials requirements of AASHTO LRFD Bridge Design Guide Specifications for GFRP Reinforced Concrete Bridge Decks and Traffic Railings. Ensure that the bars have a smooth finished GFRP surface coating 0.125 inches thick or thicker over ASTM A615 grade 60 or higher carbon steel. 6. Use bars with a minimum outside diameter of 1.5-inches and a length of 18-inches for all non-corrosive high performance dowel bars. Ensure that the bars are straight, round, smooth, and free from burrs or other deformations detrimental to the free movement of the bar in the concrete.

Approved List of Epoxy Coaters

Require CRSI certified plants

Approved List of Galvanizers

N/A

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

Yes,
If yes, please provide additional information regarding the research.:
A WHRP is just beginning on Textured Reinforcement

Q8 Do you use Mass Concrete?

Yes,
Comment:
Very rarely used

Q9 What dimensions are considered as mass concrete?

By special provision only.

Q10 What are the mix design requirements for mass concrete?

By special provision only.

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

I will email Maria Masten the SPV.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential **N/A**

Maximum Temperature **N/A**

Q15 Do you have any experience with self consolidated concrete?

Yes,
If yes, what types of applications:
Precast elements. Just started using on pre-stressed bridge girders this month.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Self Consolidating Concrete

I will email Maria Masten the SPV.

Drilled Shafts

I will email Maria Masten the SPV.

Dowel Bars

I will email Maria Masten the SPV.

Reinforcing Bars

I will email Maria Masten our std spec.

Q17 Any additional comments?

Respondent skipped this question



Qualified Products List

Standard Specification: 9-07.3

Product Name	Spec Title	Manufacturer
Steel Reinforcing Bar Epoxy Coating Facility	Reinforcing Steel - Epoxy Coating Facility - Epoxy Coated Steel Reinforcing Bar	Dayton Superior Corporation, Modesto-CA
Steel Reinforcing Bar Epoxy Coating Facility	Reinforcing Steel - Epoxy Coating Facility - Epoxy Coated Steel Reinforcing Bar	Harris Rebar , Auburn-WA
Steel Reinforcing Bar Epoxy Coating Facility	Reinforcing Steel - Epoxy Coating Facility - Epoxy Coated Steel Reinforcing Bar	Midwest Pipe Coating, Scherverville-IN
Steel Reinforcing Bar Epoxy Coating Facility	Reinforcing Steel - Epoxy Coating Facility - Epoxy Coated Steel Reinforcing Bar	Rebar Coating & Fabrication, Commerce City-CO
Steel Reinforcing Bar Epoxy Coating Facility	Reinforcing Steel - Epoxy Coating Facility - Epoxy Coated Steel Reinforcing Bar	Simcote, Inc., Newport-MN
Steel Reinforcing Bar Epoxy Coating Facility	Reinforcing Steel - Epoxy Coating Facility - Epoxy Coated Steel Reinforcing Bar	Western Coating Inc., Eugene-OR
Steel Reinforcing Bar Epoxy Coating Facility	Reinforcing Steel - Epoxy Coating Facility - Epoxy Coated Steel Reinforcing Bar	Western Coating Inc., Ogden-UT
Steel Reinforcing Bar Epoxy Coating Facility	Reinforcing Steel - Epoxy Coating Facility - Epoxy Coated Steel Reinforcing Bar	Western Coating Inc., Auburn-WA
Steel Reinforcing Bar Epoxy Coating Facility	Reinforcing Steel - Epoxy Coating Facility - Epoxy Coated Steel Reinforcing Bar	JC Supply & Manufacturing, Ontario-CA
Steel Reinforcing Bar Epoxy Coating Facility	Reinforcing Steel - Epoxy Coating Facility - Epoxy Coated Steel Reinforcing Bar	Fletcher Coating Company, Orange-CA
Steel Reinforcing Bar Epoxy Coating Facility	Reinforcing Steel - Epoxy Coating Facility - Epoxy Coated Steel Reinforcing Bar	CMC Steel Colorado, Brighton-CO

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Qualified Products List

Standard Specification: 9-07.2

Product Name	Spec Title	Manufacturer
Steel Reinforcing Bar	Reinforcing Steel - Deformed Steel Bars	Cascade Steel Rolling Mills, McMinnville-OR
Steel Reinforcing Bar	Reinforcing Steel - Deformed Steel Bars	Gerdau Ameristeel - Beaumont, Beaumont-TX
Steel Reinforcing Bar	Reinforcing Steel - Deformed Steel Bars	CMC Steel Arizona, Mesa-AZ
Steel Reinforcing Bar	Reinforcing Steel - Deformed Steel Bars	Gerdau Ameristeel - Rancho Cucamonga, Rancho Cucamonga-CA
Steel Reinforcing Bar	Reinforcing Steel - Deformed Steel Bars	Nucor Steel - Seattle, Seattle-WA
Steel Reinforcing Bar	Reinforcing Steel - Deformed Steel Bars	Nucor Steel - Plymouth, Plymouth-UT
Steel Reinforcing Bar	Reinforcing Steel - Deformed Steel Bars	Nucor Steel - Darlington, Darlington-SC
Steel Reinforcing Bar	Reinforcing Steel - Deformed Steel Bars	Nucor Steel - Kingman, Kingman-AZ
Coiled Rebar	Reinforcing Steel - Deformed Steel Bars	EVRAZ Rocky Mountain Steel, Pueblo-CO
Steel Reinforcing Bar	Reinforcing Steel - Deformed Steel Bars	CMC Steel South Carolina, Cayce-SC
Steel Reinforcing Bar	Reinforcing Steel - Deformed Steel Bars	CMC Steel Texas, Seguin-TX

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#14

COMPLETE

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Q1 State Representative

Name	Brian Ikehara
Agency	State of Hawaii, DOT-Highway Materials Testing and Research
State / Province	HI
Email	brian.ikehara@hawaii.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
GFRP,
Solid Stainless,
Other,
 Other (please specify):
 Green Epoxy - Abutments, Walls GFRP - Walls Solid Stainless Steels - Retaining Walls, Barriers Other - Standard rebars AASHTO M31 and/or ASTM 615 for normal applications

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

GFRP,
Other (Please Specify in Comments),
 Comments:
 Other - Standard rebars AASHTO M31 and/or ASTM 615 for standard applications.

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
ASTM 934 Epoxy,
Galvanized,
Other (Please specify in Comments)

Comments:
 Green Epoxy and/or ASTM 934 Epoxy for load transfer dowels and tie bars. Other - Standard rebars AASHTO M31 and/or ASTM 615 for special applications such as odd-shape slabs, pavement sections around structures, interior corners, miss-matched joints etc.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)

Corrosion potential

For Bridge Decks

Cover

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

NA

Approved/Qualified List for Dowel Bars

NA

Approved List of Epoxy Coaters

NA

Approved List of Galvanizers

NA

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

No

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

5-feet in smallest dimension

Q10 What are the mix design requirements for mass concrete?

Some Designers use analysis program

Q11 Do you have any exclusions for mass concrete?

Yes

Q12 Do you consider drilled shafts mass concrete?

Yes

Q13 What are the mix design requirements for drilled shafts?

A 4 inch slump is maintained after 4 hours.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential	35 degrees F.
Maximum Temperature	162 degrees F.

Q15 Do you have any experience with self consolidated concrete? **No**

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete	None
Self Consolidating Concrete	None
Drilled Shafts	http://hidot.hawaii.gov/highways/files/2013/01/511_Print.pdf
Dowel Bars	http://hidot.hawaii.gov/highways/files/2013/01/709_Print.pdf
Reinforcing Bars	http://hidot.hawaii.gov/highways/files/2013/01/709_Print.pdf

Q17 Any additional comments?

Feedback on mass concrete above is based on project specific plans and specifications and is not included in our State of Hawaii 2005 Standard Specifications

#15

COMPLETE

Collector: Web Link 1 (Web Link)
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Q1 State Representative

Name	Dan Miller
Agency	Ohio DOT
State / Province	Ohio
Email	daniel.miller@dot.ohio.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
FRP,
GFRP,
ASTM 934 Epoxy

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
FRP,
GFRP,
Solid Stainless

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
FRP,
GFRP

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	Cost, Specifications, Standard Drawings, Plan Notes
For Bridge Decks	Cost, Specifications, Standard Drawings, Plan Notes
For Pavements	Cost, Specifications, Standard Drawings, Plan Notes

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

<http://www.dot.state.oh.us/Divisions/ConstructionMgt/Materials/Pages/ReinforcingSteelandWireMeshCertified.aspx#>

Other (Please specify)

http://www.dot.state.oh.us/Divisions/ConstructionMgt/Specification%20Files/1068_01152010_for_2013.PDF

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

No

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

Least dimension greater than 5 feet.

Q10 What are the mix design requirements for mass concrete?

4000 psi at 28 or 56 days, or as per plan.

2000 Coulombs or less, or as per plan for permeability AASHTO T277 (accelerated cure)

470 minimum cementitious content, may increase slag or ash to 50%

Well graded aggregates.

Requires a thermal control plan from the contractor.

limit the maximum internal temperature of the placement to 160°F or less.

Limit the maximum differential between the internal temperature and surface temperature of the concrete to 36°F or less.

Q11 Do you have any exclusions for mass concrete?

No

Q12 Do you consider drilled shafts mass concrete?

Comment:

Yes, if the dimensional requirements are met for mass concrete.

Q13 What are the mix design requirements for drilled shafts?

1" or 3/8" nominal aggregate size, may be well graded.

4000 psi, 4500 psi or as per plan

no permeability requirement

may be mass concrete depending on dimensions (see question 10).

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

36 degrees F

Maximum Temperature

160 degrees F

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

Walls and decorative concrete. Increase super plasticizer or use viscosity modifying admixture. Currently have a plan note for use on projects. It is not yet a standard mix design. Typically is still well graded aggregates unless the decorative detail is to intricate, in which #8 stone is used.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

Item 499 and Item 511.04.A

http://www.dot.state.oh.us/Divisions/ConstructionMgt/OnlineDocs/Specifications/2016CMS/2016_CMS_01192018_for_web_letter_size_with_SS800_Included.pdf

Self Consolidating Concrete

See word document in separate email.

Drilled Shafts

Item 524

http://www.dot.state.oh.us/Divisions/ConstructionMgt/OnlineDocs/Specifications/2016CMS/2016_CMS_01192018_for_web_letter_size_with_SS800_Included.pdf

Dowel Bars

Item 709.13

http://www.dot.state.oh.us/Divisions/ConstructionMgt/OnlineDocs/Specifications/2016CMS/2016_CMS_01192018_for_web_letter_size_with_SS800_Included.pdf

Reinforcing Bars

Item 709

http://www.dot.state.oh.us/Divisions/ConstructionMgt/OnlineDocs/Specifications/2016CMS/2016_CMS_01192018_for_web_letter_size_with_SS800_Included.pdf

Q17 Any additional comments?

Respondent skipped this question

#16

COMPLETE

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Q1 State Representative

Name	Todd Hanson
Agency	Iowa DOT
State / Province	Iowa
Email	todd.hanson@iowadot.us

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
Solid Stainless

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
Comments:
Galvanized used on a couple bridges Louisa Co. IA 92 - 1976 & Buchanan Co. Bridge - 2017

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	https://iowadot.gov/bridge/policy/05-08-05RebarProtLRFD.pdf
For Bridge Decks	https://iowadot.gov/bridge/policy/05-08-05RebarProtLRFD.pdf
For Pavements	https://iowadot.gov/erl/current/GS/content/4151.htm

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

<https://maple.iowadot.gov/Viewer.aspx?MaterialID=510&IncludeHistory=0&FromDate=&ToDate>

Approved/Qualified List for Dowel Bars

<https://maple.iowadot.gov/Viewer.aspx?MaterialID=510E9999&IncludeHistory=0&FromDate=&ToDate>

Approved List of Epoxy Coaters

<https://maple.iowadot.gov/Viewer.aspx?MaterialID=510EPWDR&IncludeHistory=0&FromDate=&ToDate>

Approved List of Galvanizers

<https://maple.iowadot.gov/Viewer.aspx?MaterialID=510G9999&IncludeHistory=0&FromDate=&ToDate>

Other (Please specify)

Stainless Steel

Other (Please specify)

<https://maple.iowadot.gov/Viewer.aspx?MaterialID=510SS&IncludeHistory=0&FromDate=&ToDate>

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

Yes,

If yes, please provide additional information regarding the research.:

MMFX

http://www.intrans.iastate.edu/reports/corrosion_resistant_steel.pdf Galvanized

http://www.intrans.iastate.edu/research/documents/research-reports/galvanized_steel_bridge_w_cvr1.pdf

https://iowadot.gov/bridge/ibrc_projects/IA%2092%20Galvanized%20Bars%20WJE%20Final%20report.pdf Looking at fiberglass reinforcement also

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

any concrete footing with a least dimension greater than 5 feet or other concrete placements with a least dimension greater than 4 feet. Additional constraints are required on placements with a least dimension greater than 6.5 feet.

Q10 What are the mix design requirements for mass concrete?

- A. Cement shall be Type I, II, IP, or IS.
- B. Use any combination of Ground Granulated Blast Furnace Slag or Class F fly ash. Class C fly ash may also be used with a maximum substitution of 20%. The maximum total substitution of Portland cement shall not exceed 50%, including the amount in the blended cement.
- C. Cementitious content shall be a minimum of 560 pounds per cubic yard.
- D. Maximum water to cementitious ratio shall be 0.45.

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **Comment:**
Although some are getting large enough we may reconsider.

Q13 What are the mix design requirements for drilled shafts?

- 2. Water/cement ratio: not to exceed 0.45.
- 3. Drilled shaft construction: use Class D PCC mixture with a slump of 8 inches \pm 1.5 inches.
- 4. Portland cement: meet the requirements of ASTM C 150 Type I or II and Section 4101.
- 5. Air entrainment: apply Section 2403.
- 6. Mid-range or high-range water reducer is required according to Materials I.M. 403.
- 7. Retarder is required according to Materials I.M. 403 to maintain workable concrete.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential	<24 hrs 20F, 24-48 hr 30F, 48-72 hr 40F, >72hr 50F
Maximum Temperature	160F

Q15 Do you have any experience with self consolidated concrete? **Yes,**
If yes, what types of applications:
Used in precast operations, aesthetic elements in field, and I74 bridge all piers

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete	https://iowadot.gov/specifications/dev_specs/2015/DS-15032.pdf
Self Consolidating Concrete	https://iowadot.gov/erl/current/IM/content/445ad.htm
Drilled Shafts	https://iowadot.gov/erl/current/GS/content/2433.htm
Dowel Bars	https://iowadot.gov/erl/current/GS/content/4151.htm
Reinforcing Bars	https://iowadot.gov/erl/current/GS/content/4151.htm

Q17 Any additional comments?

Field SCC
<https://iowadot.gov/erl/current/IM/content/529aa.htm>

#17

COMPLETE

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Page 1

Q1 State Representative

Name	Lieska Halsey
Agency	Nebraska Department of Transportation
State / Province	Nebraska
Email	Lieska.Halsey@nebraska.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply? **Green Epoxy**

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)? **Green Epoxy**

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)? **Other (Please specify in Comments)**

Comments:
Tie bars & Dowels are green epoxy

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	AASHTO
For Bridge Decks	AASHTO
For Pavements	NA

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	NA
Approved/Qualified List for Dowel Bars	NA
Approved List of Epoxy Coaters	NA
Approved List of Galvanizers	NA

Q7 Is there any research on reinforcement being performed/sponsored by your DOT? **No**

Q8 Do you use Mass Concrete? **No**

Q9 What dimensions are considered as mass concrete?

NA

Q10 What are the mix design requirements for mass concrete?

NA

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

4000 psi at 28 days

Depending of the water table; for wet condition the slump is 7 to 9 inches and for dry conditions 6 to 8 inches

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential **NA**

Maximum Temperature **NA**

Q15 Do you have any experience with self consolidated concrete? **Yes,**
If yes, what types of applications:
Prestress, abutments and Pier repairs

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Self Consolidating Concrete **no link, will share per request**

Drilled Shafts **no link, will share per request**

Q17 Any additional comments? **Respondent skipped this question**

#18

COMPLETE

Collector: Web Link 1 (Web Link)
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Last Modified: Wednesday, March 21, 2018 9:18:47 AM
Time Spent: 00:21:19
IP Address: 204.62.25.101

Page 1

Q1 State Representative

Name	Kenny Seward
Agency	Oklahoma DOT
State / Province	OK
Email	kseward@odot.org

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
Other,
 Other (please specify):
 We still use some black bar.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
Other (Please Specify in Comments),
 Comments:
 We still use black bar on low volume roads

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
Other (Please specify in Comments),
 Comments:
 Green epoxy coated dowels in jointed and black bar in CRCP.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	State highway vs local road
For Bridge Decks	State highway vs local road
For Pavements	Type of pavement. Jointed or CRCP.

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	http://www.odot.org/materials/htm-smap/11062p-RST.html
Approved/Qualified List for Dowel Bars	http://www.odot.org/materials/htm-smap/11062p-RST.html
Approved List of Epoxy Coaters	http://www.odot.org/materials/htm-smap/11062p-RST.html

Q7 Is there any research on reinforcement being performed/sponsored by your DOT? **Yes**

Q8 Do you use Mass Concrete? **Yes,**
Comment:
Rarely, mostly just for pier protection in navigable waterways.

Q9 What dimensions are considered as mass concrete?

We do it so rarely we don't have any rule of thumb for dimensions.

Q10 What are the mix design requirements for mass concrete?

Project by project only specifications. Usually has something to do with using F ash or slag to slow down the heat gain.

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

4,000psi, limit the maximum aggregate size to 3/4", w/c ratio 0.44 or less, 6'-8" slump using HRWR, and temperature below 85 degrees.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential	varies
Maximum Temperature	varies

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

We've only used it a little bit in large prestressed concrete u-beams.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

Do not have

Self Consolidating Concrete

Do not have

Drilled Shafts

https://ok.gov/odot/Doing_Business/Construction/Construction_Engineering_-_Standards,_Specifications,_Materials_and_Testing/index.html

Dowel Bars

https://ok.gov/odot/Doing_Business/Construction/Construction_Engineering_-_Standards,_Specifications,_Materials_and_Testing/index.html

Reinforcing Bars

https://ok.gov/odot/Doing_Business/Construction/Construction_Engineering_-_Standards,_Specifications,_Materials_and_Testing/index.html

Q17 Any additional comments?

Respondent skipped this question

#19

COMPLETE

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Page 1

Q1 State Representative

Name	Brett Trautman
Agency	Department of Transportation
State / Province	Missouri
Email	Brett.Trautman@modot.mo.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
Other,
 Other (please specify):
 Do allow black steel in areas not exposed to deicing agents such as footings and pier caps.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
Other (Please Specify in Comments),
 Comments:
 Have constructed a few bridge decks utilizing FRP and solid stainless steel for experimental purposes.

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	Exposure to deicing agents and initial cost
For Bridge Decks	Achieve satisfactory performance and initial cost
For Pavements	Achieve satisfactory performance and initial cost

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	www.modot.org/business/materials/pdf/PAL/Reinforcing%20Steel.pdf
Approved/Qualified List for Dowel Bars	www.modot.org/business/materials/pdf/PAL/Dowel%20Bars.pdf
Approved List of Epoxy Coaters	www.modot.org/business/materials/pdf/PAL/Epoxy%20Reinforcing%20Steel.pdf
Approved List of Galvanizers	n/a

Q7 Is there any research on reinforcement being performed/sponsored by your DOT? **No**

Q8 Do you use Mass Concrete? **Yes**

Q9 What dimensions are considered as mass concrete?

MoDOT does not specify a dimension.

Depends on the structures dimensions, shape and, location.

Q10 What are the mix design requirements for mass concrete?

MoDOT does not have any mix design requirements. The contractor is required to submit a Thermal Control Plan for the mass concrete. The plan specifies a maximum initial concrete temperature, maximum temperature differential, and maximum in-place temperature. The plans also outlines how these temperatures will be monitored. We typically see low cementitious contents and 50 to 70% of the cement replaced with supplementary cementitious materials such as fly ash and slag.

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

Standard Specifications - Sections 701 & 501
Minimum cementitious content = 600 lbs/CY
Max. w/cm Ratio = 0.45
Air Content = 4.5 to 7.5%
Cement = Type I or II
Fly Ash Replacement = Max. 25%
Slag Replacement = Max. 30%
Design Strength = 4000psi
Allow HRWR and retarders

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

Depends on the Thermal Control Plan submitted. Typically see the maximum temperature differential around 35 to 40 deg. F

Maximum Temperature

Depends on the Thermal Control Plan submitted. Typically see the maximum initial temperature around 80 to 85 deg. F

Q15 Do you have any experience with self consolidated concrete?

Yes,
If yes, what types of applications:
Have used on precast drainage items (i.e. drop inlets & manholes), drilled shafts, and structural repairs.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

n/a

Self Consolidating Concrete

n/a

Drilled Shafts

Section 701: [www.modot.org/business/standards_and_specs/2017%20Missouri%20Standard%20Specific%20-%20MHTC%20\(Jul%202017\).pdf](http://www.modot.org/business/standards_and_specs/2017%20Missouri%20Standard%20Specific%20-%20MHTC%20(Jul%202017).pdf)

Dowel Bars

Section 1057: [www.modot.org/business/standards_and_specs/2017%20Missouri%20Standard%20Specific%20-%20MHTC%20\(Jul%202017\).pdf](http://www.modot.org/business/standards_and_specs/2017%20Missouri%20Standard%20Specific%20-%20MHTC%20(Jul%202017).pdf)

Reinforcing Bars

Section 1036: [www.modot.org/business/standards_and_specs/2017%20Missouri%20Standard%20Specific%20-%20MHTC%20\(Jul%202017\).pdf](http://www.modot.org/business/standards_and_specs/2017%20Missouri%20Standard%20Specific%20-%20MHTC%20(Jul%202017).pdf)

Q17 Any additional comments?

Respondent skipped this question

#20

COMPLETE

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Q1 State Representative

Name	Michael Mance
Agency	WVDOH
State / Province	West Virginia
Email	mike.a.mance@wv.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
 Other (please specify):
 uncoated ("black") steel also.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
 Comments:
 Only epoxy coated dowel bars are currently used in our pavement.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	WVDOH Design Directives
For Bridge Decks	WVDOH Design Directives
For Pavements	WVDOH Design Directives

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

See Link:

<http://transportation.wv.gov/highways/mcst/Pages/Structures.aspx>

Approved/Qualified List for Dowel Bars

See Link:

<http://transportation.wv.gov/highways/mcst/Pages/Structures.aspx>

Approved List of Epoxy Coaters

We don't have a list of approved epoxy coaters, only approved bar fabricators

Approved List of Galvanizers

n/a

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

No

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

Current SP defines it as any element with a least dimension greater than 48.0 inches.

Q10 What are the mix design requirements for mass concrete?

Strength requirements are the same but 56-day strengths are acceptable in the field. More supplementary cementitious materials are allowed. Our SP is more performance based and puts the emphasis on the thermal control plan. Contractor can use various mix options provided he can show, in his thermal control plan, that they will work.

Q11 Do you have any exclusions for mass concrete?

Comment:

Drilled shafts and tremie seals.

Q12 Do you consider drilled shafts mass concrete?

No

Q13 What are the mix design requirements for drilled shafts?

4500 psi, 705 lb/cy min cement factor, 0.44 max w/c, 6% air content, #7, 78, or 8 size coarse aggregate.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

Current SP requires 40 degrees F max.

Maximum Temperature

Current SP requires 160 degrees F max.

Q15 Do you have any experience with self consolidated concrete?

Yes,
If yes, what types of applications:
Prestressed beams, various precast, drilled shafts.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

We currently only have a SP for mass concrete. A standard spec is being developed as part of a current research project.

Self Consolidating Concrete

See Section 603:
https://transportation.wv.gov/highways/contractadmin/specifications/2017StandSpec/Documents/2017_Standard.pdf

Drilled Shafts

See Section 625:
https://transportation.wv.gov/highways/contractadmin/specifications/2017StandSpec/Documents/2017_Standard.pdf

Dowel Bars

See Section 709.15:
https://transportation.wv.gov/highways/contractadmin/specifications/2017StandSpec/Documents/2017_Standard.pdf

Reinforcing Bars

See Section 709.1:
https://transportation.wv.gov/highways/contractadmin/specifications/2017StandSpec/Documents/2017_Standard.pdf

Q17 Any additional comments?

Respondent skipped this question

#21

COMPLETE

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Page 1

Q1 State Representative

Name	James Krstulovich
Agency	Illinois Department of Transportation
State / Province	Illinois
Email	James.Krstulovich@illinois.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
Other (Please specify in Comments)

Comments:
 'Black' bar is sometimes used in CRCP and for tie bars in longitudinal joints.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	n/a (only one type of reinforcement used)
For Bridge Decks	n/a (only one type of reinforcement used)
For Pavements	n/a (District preference may require 'green' bar where 'black' is allowed)

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

<http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Specialty-Lists/Highways/Materials/Materials-&-Physical-Research/Metals/rebardowelproducers.pdf>

Approved/Qualified List for Dowel Bars

<http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Specialty-Lists/Highways/Materials/Materials-&-Physical-Research/Metals/rebardowelproducers.pdf>

Approved List of Epoxy Coaters

<http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Specialty-Lists/Highways/Materials/Materials-&-Physical-Research/Metals/epoxycoatingproducers.pdf>

Approved List of Galvanizers

n/a

Other (Please specify)

Textured Epoxy Powder Systems:

<http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Specialty-Lists/Highways/Materials/Materials-&-Physical-Research/Metals/texturedepoxypowersystems.pdf>

Other (Please specify)

Certified Welded Wire Reinforcement:

<http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Specialty-Lists/Highways/Materials/Materials-&-Physical-Research/Metals/wirefabricproducers.pdf>;
Reinforcing Bar Splicer Assemblies & Mechanical Splicers:
<http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Specialty-Lists/Highways/Materials/Materials-&-Physical-Research/Metals/barsplacers-coupler.pdf>

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

Yes,

If yes, please provide additional information regarding the research.:

Behavior of Epoxy Coated Textured Reinforcement Bars:

The aim of this project is to study the bond and flexural behavior of a new type of epoxy coated reinforcement bar, which has a second coating provided to add texture with the intent to improve bond behavior,. The primary goals of the study are: 1) Compare the bond behavior of the new textured bars with conventional black steel rebar. 2) Determine the impact of adding texture to the surface of the epoxy coated rebars on their development length.

<https://apps.ict.illinois.edu/projects/view.asp?id=345>

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

Least dimension exceeds 5.0 ft

Q10 What are the mix design requirements for mass concrete?

The mix design requirements in Articles 1020.04 and 1020.05 shall be revised to include the following additional requirements to control the heat of hydration.

- a. The concrete mixture should be uniformly graded and preference for larger size aggregate should be used in the mix design. Article 1004.02(d)(2) shall apply and information in the "Portland Cement Concrete Level III Technician Course – Manual of Instructions for Design of Concrete Mixtures" may be used to develop the uniformly graded mixture.
- b. The following shall apply to all concrete except Class DS concrete or when self-consolidating concrete is desired. For central-mixed concrete, the Contractor shall have the option to develop a mixture with a minimum of 520 lbs/cu yd (309 kg/cu m) of cement and finely divided minerals summed together. For truck-mixed or shrink-mixed concrete, the Contractor shall have the option to develop a mixture with a minimum of 550 lbs/cu yd (326 kg/cu m) of cement and finely divided minerals summed together. A water-reducing or high range water-reducing admixture shall be used in the central mixed, truck-mixed or shrink-mixed concrete mixture. For any mixture to be placed underwater, the minimum cement and finely divided minerals shall be 550 lbs/cu yd (326 kg/cu m) for central-mixed concrete, and 580 lbs/cu yd (344 kg/cu m) for truck-mixed or shrink-mixed concrete.

For Class DS concrete, CA 11 may be used. If CA 11 is used, the Contractor shall have the option to develop a mixture with a minimum cement and finely divided minerals of 605 lbs/cu yd (360 kg/cu m) summed together. If CA 11 is used and either Class DS concrete is placed underwater or a self-consolidating concrete mixture is desired, the Contractor shall have the option to develop a mixture with a minimum cement and finely divided minerals of 635 lbs/cu yd (378 kg/cu m) summed together.

- c. The minimum portland cement content in the mixture shall be 375 lbs/cu yd (222 kg/cu m). When the total of organic processing additions, inorganic processing additions, and limestone addition exceed 5.0 percent in the cement, the minimum portland cement content in the mixture shall be 400 lbs/cu yd (237 kg/cu m). For a drilled shaft, foundation, footing, or substructure, the minimum portland cement may be reduced to as low as 330 lbs/cu yd (196 kg/cu m) if the concrete has adequate freeze/thaw durability. The Contractor shall provide freeze/thaw test results according to AASHTO T 161, and the relative dynamic modulus of elasticity of the mix design shall be a minimum of 80 percent. Testing shall be performed by an independent laboratory accredited by the AASHTO Materials Reference Laboratory (AMRL) for Portland Cement Concrete. Freeze/thaw testing will not be required for concrete that will not be exposed to freezing and thawing conditions as determined by the Engineer.

- d. The maximum cement replacement with fly ash shall be 40.0 percent. The maximum cement replacement with ground granulated blast-furnace slag shall be 65.0 percent. When cement replacement with ground granulated blast-furnace slag exceeds 35.0 percent, only Grade 100 shall be used.

- e. The mixture may contain a maximum of two finely divided minerals. The finely divided mineral in portland-pozzolan cement or portland blast-furnace slag cement shall count toward the total number of finely divided minerals allowed. The finely divided minerals shall constitute a maximum of 65.0 percent of the total cement plus finely divided minerals. The fly ash portion shall not exceed 40.0 percent. The ground granulated blast-furnace slag portion shall not exceed 65.0 percent. The microsilica or high reactivity metakaolin portion used together or separately shall not exceed 5.0 percent.

- f. The time to obtain the specified strength may be increased to a maximum 56 days, provided the curing period specified in Article 1020.13 is increased to a minimum of 14 days.

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **Yes**

Q13 What are the mix design requirements for drilled shafts?

In general,

Cement Factor: 665 - 705 pcy

w/c: 0.32 - 0.44

Air content: 5.0 -8.0%

Slump: 6 - 8 in.

Strength (@ 14 days): 4000 psi compressive or 675 psi flexural

Slump shall be 8 - 10 in. if the concrete is to displace drilling fluid or placed against temporary casing; or 2 - 4 in. if a Type A water reducer is used in lieu of a Type F.

Also, the mix shall be designed to remain fluid throughout the anticipated duration of the pour plus 1 hr.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

35 °F, or up to 50 °F if mathematically verified

Maximum Temperature

150 °F

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

Precast-prestressed PCC beams, precast items such as deck beams, walls with decorative facades

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

Refer to Article 1020.15 of our Standard Specifications:
<http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Construction/Standard-Specifications/Standard%20Specifications%20for%20Road%20and%20Bridge%20Construction%202016.pdf>

Self Consolidating Concrete

Refer to Article 1020.04 of our Standard Specifications:
<http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Construction/Standard-Specifications/Standard%20Specifications%20for%20Road%20and%20Bridge%20Construction%202016.pdf>

Drilled Shafts

<http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Bridges/Bridge-Special-Provisions/GBSP86.pdf>

Dowel Bars

Refer to Article 1006.11 of our Standard Specifications:
<http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Construction/Standard-Specifications/Standard%20Specifications%20for%20Road%20and%20Bridge%20Construction%202016.pdf>

Reinforcing Bars

Refer to Article 1006.10 of our Standard Specifications:
<http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Construction/Standard-Specifications/Standard%20Specifications%20for%20Road%20and%20Bridge%20Construction%202016.pdf>

Q17 Any additional comments?

Respondent skipped this question

#22

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Page 1

Q1 State Representative

Name	Dulce Rufino Feldman; Jeff Goronea
Agency	Caltrans
State / Province	CA
Email	dulce.rufino@dot.ca.gov ; jeff.goronea@dot.ca.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
ASTM 934 Epoxy,
Other,
 Other (please specify):
 ASTM A1035 (MMFX) and ASTM A1055 (Z-Bar)

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
Solid Stainless,
ASTM 934 Epoxy ,
Other (Please Specify in Comments),
 Comments:
 ASTM A1035 (MMFX) and ASTM A1055 (Z-Bar)

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
Solid Stainless,
ASTM 934 Epoxy,
Other (Please specify in Comments) ,
 Comments:
 ASTM A1035

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	Corrosive Environment (Chlorides, Sulfates, Ph)
For Bridge Decks	Corrosive Environment (Chlorides, Sulfates, Ph)
For Pavements	Climate Region (high desert or any mountain)

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	N/A
Approved/Qualified List for Dowel Bars	N/A
Approved List of Epoxy Coaters	N/A
Approved List of Galvanizers	N/A

Q7 Is there any research on reinforcement being performed/sponsored by your DOT? **No**

Q8 Do you use Mass Concrete? **Yes**

Q9 What dimensions are considered as mass concrete?

7 ft or greater in least dimension or anything that causes high heat of hydration

Q10 What are the mix design requirements for mass concrete?

Only have requirements to cool

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **Yes**

Q13 What are the mix design requirements for drilled shafts?

Add additional flyash and cap cement content

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential	Contractor determines and submits in their Thermal Control Plan
Maximum Temperature	160 degree

Q15 Do you have any experience with self consolidated concrete?

Yes,
If yes, what types of applications:
Precast concrete work and drilled shafts

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

Section 51-6 @
<http://www.dot.ca.gov/des/oe/construction-contract-standards.html>

Self Consolidating Concrete

Sections 90-3 and 90-4 @
<http://www.dot.ca.gov/des/oe/construction-contract-standards.html>

Drilled Shafts

Section 49 @ <http://www.dot.ca.gov/des/oe/construction-contract-standards.html>

Dowel Bars

Section 40 @ <http://www.dot.ca.gov/des/oe/construction-contract-standards.html>

Reinforcing Bars

Section 52 @ <http://www.dot.ca.gov/des/oe/construction-contract-standards.html>

Q17 Any additional comments?

Most questions were answered by Jeff Goronea who is with Structures, whereas Dulce Rufino Feldman is with Pavements.

#23

COMPLETE

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Page 1

Q1 State Representative

Name	Cindy Williams
Agency	Illinois Tollway
State / Province	IL
Email	cmwilliams@getipass.com

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

**Green Epoxy,
Solid Stainless**

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
 Comments:
 Green epoxy reinforcement follows ASTM A 706 & ASTM A 775

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	Green epoxy unless otherwise specified
For Bridge Decks	Green epoxy unless stainless is specified
For Pavements	Green epoxy unless otherwise specified

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

<http://idot.illinois.gov/Assets/uploads/files/Doing-Business/Specialty-Lists/Highways/Materials/Materials-&-Physical-Research/Metals/rebardowelproducers.pdf>

Approved/Qualified List for Dowel Bars

<http://idot.illinois.gov/Assets/uploads/files/Doing-Business/Specialty-Lists/Highways/Materials/Materials-&-Physical-Research/Metals/rebardowelproducers.pdf>

Approved List of Epoxy Coaters

<http://idot.illinois.gov/Assets/uploads/files/Doing-Business/Specialty-Lists/Highways/Materials/Materials-&-Physical-Research/Metals/epoxycoatingproducers.pdf>

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

Yes,

If yes, please provide additional information regarding the research.:

The Tollway is funding a research project on CRCP. The use of non-coated longitudinal reinforcement is part of that work.

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

The minimum dimension of the concrete structure exceeds 5 ft.

Q10 What are the mix design requirements for mass concrete?

We have a performance related spec. Materials must be IDOT approved .

1. The estimated temperature rise of the proposed concrete mixture shall be less than 80°F when calculated according to the following equation :
Temperature Rise = $0.16 \times C_{eq}$, where C_{eq} is the equivalent cement content given by
 $C_{eq} = C + 0.5 \times F_{ClassF} + 0.8 \times (F_{ClassC} + S100) + 0.9 \times S120 + 1.25 \times (SF + MK)$,
and C represents portland cement, F_{ClassF} is Class F fly ash, F_{ClassC} is Class C fly ash, S100 is Grade 100 slag, S120 is Grade 120 slag, SF is silica fume, and MK is metakaolin. These values are in pounds per cubic yard of concrete
2. The equivalent w/ceq shall not be greater than 0.45 when calculated using the equivalent cement content used for calculation of temperature rise.
3. Unless otherwise approved by the Illinois Tollway, the initial slump (measured within 10 minutes after the addition of water) shall be between 3 and 8 inches. The slump shall be no less than 3 inches for at least 45 minutes after the addition of water as measured by AASHTO T 119. The change in slump shall be no greater than 2 inches in 20 minutes and 4 inches from the initial measurement (measured within 10 minutes after the addition of water). The concrete temperature during testing shall be greater than 70°F.
4. Compressive strength measured in accordance with AASHTO T 22 shall not be less than 1,000 psi at 48 hours, 3,500 psi at 14 days, 6,000 psi at 28 days, and 7,000 psi at 56 days. Test cylinders shall be made and cured in accordance with AASHTO T 23. The 28-day compressive strength determined in the laboratory shall be designated as f'_{target} for future acceptance of the mixture.
5. Measured shrinkage shall not be greater than 0.040 percent after 21 days of air drying when determined in accordance with AASHTO T 160. Specimens shall be wet cured for 7 days prior to air-drying. The initial reading for calculation of shrinkage shall be taken at the initiation of drying.
6. Durability factor shall be no less than 80 percent after 300 cycles of freezing and thawing as determined in accordance with AASHTO T 161 (Procedure A) with the following modifications: the 14-day curing period prior to freeze-thaw cycling shall consist of 7 days immersion, in saturated lime water at $73.4 \pm 3.0^\circ\text{F}$ followed by 7 days of storage in air at $73.4 \pm 2.0^\circ\text{F}$ and at a relative humidity of $50 \pm 4.0\%$.
The concrete will possess an air-void system having the following characteristics as determined by ASTM C457 (Method B):
 - Spacing factor not exceeding 0.008-in.
 - Specific surface not less than 600 in²/in³
 - Total air content not less than 4.0 percentThe air-void system requirements will be waived if testing in accordance with AASHTO T 161 (Tollway-modified) results in a durability factor equal to or greater than 90 percent after 300 cycles of freezing and thawing.
Freeze-thaw testing in accordance with AASHTO T 161 (Tollway-modified) may be waived at the discretion of the Illinois Tollway if the air-void system parameters are met.
7. Each aggregate shall be evaluated individually in accordance with AASHTO T 303 and must have a measured expansion no greater than 0.10 percent after 16 days. Each aggregate shall be evaluated separately. Each aggregate that does not meet this limit when tested with portland cement alone may demonstrate acceptance using a blended cement or a combination of portland cement and supplementary cementitious materials proposed for the mixture. The supplementary cementitious replacement content needed to pass the AASHTO T 303 requirement shall become the minimum required replacement percentage of the concrete mixture.
This test shall be waived if the concrete is proportioned such that the maximum total alkali content (Na_2O_{eq}) contributed by portland cement (as determined in accordance with AASHTO T 105) does not exceed 4.0 lb/yd³.
The test shall also be waived if the aggregate has been evaluated in accordance with ASTM C1293 within the last 12 months and has an average expansion of three concrete specimens equal to or less than 0.040 % at one year.

Q11 Do you have any exclusions for mass concrete?

Comment:

1. Caissons (such as a footing, column, cap, etc.) 2. When a concrete structure is constructed in two or more smaller adjoining concrete placements and a minimum period of 7 days is provided between the smaller adjoining placements.

Q12 Do you consider drilled shafts mass concrete?

No

Q13 What are the mix design requirements for drilled shafts?

We follow IDOT's requirements. Cement factor 6.65-7.05, w/cm ratio 0.32-0.44, 14 day compressive strength of 4,000 psi.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

35

Maximum Temperature

160

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

Yes, it is commonly used for precast items. It has also been used for retaining walls and barriers.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Respondent skipped this question

Q17 Any additional comments?

The Tollway uses many of the IDOT specifications, but we have our own for mass concrete and stainless steel reinforcement. Those specifications are not posed online, but can be provided upon request.

#24

COMPLETE

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Page 1

Q1 State Representative

Name	Derek Gaw
Agency	Tennessee DOT
State / Province	TN
Email	derek.gaw@tn.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
ASTM 934 Epoxy,
Other,
 Other (please specify):
 A615 "black" steel reinforcement

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
ASTM 934 Epoxy

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
ASTM 934 Epoxy,
Other (Please specify in Comments)
 Comments:
 Painted dowels and plastic coated dowels

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)

"Black" steel bars are specified with the exception of the following: Any steel projecting into the deck, bridge parapets, and the mat of steel on the fill side of retaining walls.

For Bridge Decks

All steel is specified to be epoxy coated.

For Pavements

All options mentioned above can be used in any concrete pavement.

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

<https://www.tn.gov/content/dam/tn/tdot/hq-materials-tests/producer-list/Steel%20Bar%20Reinforcement%20Procedures.pdf>

Approved/Qualified List for Dowel Bars

<https://www.tn.gov/content/dam/tn/tdot/hq-materials-tests/producer-list/Steel%20Bar%20Reinforcement%20Procedures.pdf>

Approved List of Epoxy Coaters

https://www.tn.gov/content/dam/tn/tdot/hq-materials-tests/qpl/QPL_19.pdf

Approved List of Galvanizers

N/A

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

No

Q8 Do you use Mass Concrete?

No,

Comment:

No specifications have been implemented for handling mass concrete at this time.

Q9 What dimensions are considered as mass concrete?

N/A

Q10 What are the mix design requirements for mass concrete?

N/A

Q11 Do you have any exclusions for mass concrete?

No

Q12 Do you consider drilled shafts mass concrete?

Comment:

When mass concrete specifications are developed, large drilled shafts will most likely be considered "mas concrete".

Q13 What are the mix design requirements for drilled shafts?

SCC with a minimum strength requirement of 4500 psi.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

N/A

Maximum Temperature

N/A

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

We have used it in a couple of drilled shafts so far. It has also been used in precast facilities.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

N/A

Self Consolidating Concrete

https://www.tn.gov/content/dam/tn/tdot/construction/old_web_page/Const_2015_600SS.pdf

Drilled Shafts

<https://www.tn.gov/content/dam/tn/tdot/construction/special-provisions/Const-625.pdf>

Dowel Bars

https://www.tn.gov/content/dam/tn/tdot/construction/old_web_page/TDOT_2015_Spec_Book_FINAL_pdf.pdf

****See Section 907****

Reinforcing Bars

https://www.tn.gov/content/dam/tn/tdot/construction/old_web_page/TDOT_2015_Spec_Book_FINAL_pdf.pdf

****See Section 907****

Q17 Any additional comments?

Respondent skipped this question

#25

COMPLETE

Collector: Web Link 1 (Web Link)
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Last Modified: Monday, March 26, 2018 4:13:49 PM
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Page 1

Q1 State Representative

Name	Paul Bushnell
Agency	Montana Department of Transportation
State / Province	Montana
Email	pbushnell@mt.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
ASTM 934 Epoxy,
Other,
 Other (please specify):
 Bar Reinforcing in accordance with AASHTO M 31

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
Solid Stainless,
ASTM 934 Epoxy ,
Other (Please Specify in Comments),
 Comments:
 ASTM A1035 (MMFX)

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
ASTM 934 Epoxy

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	design life criteria
For Bridge Decks	design life criteria/development lengths
For Pavements	design life criteria

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	https://app.mdt.mt.gov/QPL/QPL/search
Approved/Qualified List for Dowel Bars	https://app.mdt.mt.gov/QPL/QPL/search
Approved List of Epoxy Coaters	https://app.mdt.mt.gov/QPL/QPL/search
Approved List of Galvanizers	https://app.mdt.mt.gov/QPL/QPL/search

Q7 Is there any research on reinforcement being performed/sponsored by your DOT? **No**

Q8 Do you use Mass Concrete? **Yes**

Q9 What dimensions are considered as mass concrete?

not defined or defined on a project specific level

Q10 What are the mix design requirements for mass concrete?

not defined or defined on a project specific level

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

http://www.mdt.mt.gov/other/webdata/external/const/specifications/2014/2014_stand_specs.pdf
see Table 551-3 and Section 551.03.2 (A) and Section 551.03.2 (C)

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential	not defined
Maximum Temperature	not defined

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

Precast, Prestressed, some Structural components and Drilled Shaft concrete.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

n/a

Self Consolidating Concrete

http://www.mdt.mt.gov/other/webdata/external/const/specifications/2014/2014_stand_specs.pdf (See section 551.03.2 (F))

Drilled Shafts

http://www.mdt.mt.gov/other/webdata/external/const/specifications/2014/2014_stand_specs.pdf (See Section 551.03.2 C)

Dowel Bars

http://www.mdt.mt.gov/other/webdata/external/const/specifications/2014/2014_stand_specs.pdf (See Sections 501.02.3)

Reinforcing Bars

http://www.mdt.mt.gov/other/webdata/external/const/specifications/2014/2014_stand_specs.pdf (See Section 555)

Q17 Any additional comments?

Respondent skipped this question

#26

COMPLETE

Collector: Web Link 1 (Web Link)
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IP Address: 164.165.251.4

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Q1 State Representative

Name	Clint Hoops
Agency	Idaho Transportation Dept.
State / Province	Idaho
Email	Clint.hoops@itd.idaho.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply? **Green Epoxy**

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)? **Green Epoxy**

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)? **Green Epoxy, GFRP**

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	tradition
For Bridge Decks	tradition
For Pavements	allow GFRP as an option to epoxy

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved List of Epoxy Coaters	CRSI Certified
--------------------------------	-----------------------

Q7 Is there any research on reinforcement being performed/sponsored by your DOT? **No**

Q8 Do you use Mass Concrete? **Yes**

Q9 What dimensions are considered as mass concrete?

4 feet thick

Q10 What are the mix design requirements for mass concrete?

same as structural concrete

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **No**

Q13 What are the mix design requirements for drilled shafts?

Standard 4000 psi concrete w/ high range water reducer and slump 7" to 9".

Q14 What is the maximum temperature differential and maximum temperature for mass concrete? **Respondent skipped this question**

Q15 Do you have any experience with self consolidated concrete? **Yes,**
If yes, what types of applications:
Used extensively in MSE wall panels and some pre-stress girder applications

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete	http://apps.itd.idaho.gov/apps/manuals/SpecBook.pdf section 502.03.F.4
Self Consolidating Concrete	SP currently, will be in the 2018 Standard Specifications
Drilled Shafts	SP currently, will be in 2018 Standard Specifications
Dowel Bars	http://apps.itd.idaho.gov/apps/manuals/SpecBook.pdf section 708.032
Reinforcing Bars	http://apps.itd.idaho.gov/apps/manuals/SpecBook.pdf section 708.02

Q17 Any additional comments? **Respondent skipped this question**

#27

COMPLETE

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Page 1

Q1 State Representative

Name	Ethan Bahmer
Agency	Michigan Department of Transportation
State / Province	Michigan
Email	bahmert1@michigan.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Other,
Green Epoxy,
Other (please specify):
Michigan DOT has experimented with FRP, GFRP, Composite, Galvanized, Basalt, and Textured Green Epoxy. We have also piloted FRP and GFRP on a few projects. Green Epoxy remains our primary material due to the cost increase and insufficient benefits provided by the other products.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
Solid Stainless,
Other (Please Specify in Comments),
Comments:
Michigan DOT has experimented with FRP, GFRP, Stainless Clad (composite), Galvanized, and Basalt. We have also used Solid Stainless reinforcement on a few projects. We have a frequently used special provision allowing the use of Solid Stainless reinforcement, however it hardly ever gets used do to cost.

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,

ASTM 934 Epoxy,

Other (Please specify in Comments)

Comments:

Michigan DOT no longer uses reinforcement in our pavements, we only use dowel bars. Our standard pavements are JPCP and the selected answers above only apply to the dowel bars. Michigan DOT has experimented with FRP, stainless clad, and nickel coating for dowel bars. The nickel coated bars have shown promise. We have specified ASTM 934 Epoxy on our long-life pavements (30 and 50 year designs) for the dowel bar coating.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)

Michigan DOT's Standard Specifications for Construction determines the reinforcement specified (calls for Green Epoxy), unless there is something unique occurring in a specific project. If something unique in a project a Project Specific Special Provision would be created to callout the deviations in materials from the standard specifications.

For Bridge Decks

Michigan DOT's Standard Specifications for Construction determines the reinforcement specified (calls for Green Epoxy), unless there is something unique occurring in a specific project. If something unique in a project a Project Specific Special Provision would be created to callout the deviations in materials from the standard specifications.

For Pavements

Michigan DOT's Standard Specifications for Construction determines the reinforcement specified (calls for Green Epoxy on dowels and no reinforcement), unless there is something unique occurring in a specific project. If there is something unique in a project a Project Specific Special Provision would be created to callout the deviations in materials from the standard specifications.

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

https://www.michigan.gov/documents/MDOT-Material_Source_Guide_Approved_Manufact_84760_7.pdf

Approved/Qualified List for Dowel Bars

https://www.michigan.gov/documents/MDOT-Material_Source_Guide_Approved_Manufact_84760_7.pdf

Approved List of Epoxy Coaters

https://www.michigan.gov/documents/MDOT-Material_Source_Guide_Approved_Manufact_84760_7.pdf

Approved List of Galvanizers

NA

Other (Please specify)

Solid Stainless Steel:
https://mdotcf.state.mi.us/public/dessssp/spss_source/12SP-706A-02.pdf

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

No

Q8 Do you use Mass Concrete?

Yes,

Comment:

Michigan DOT requires the Contractor to create and submit a Thermal Management Plan which QC must implement and follow.

Q9 What dimensions are considered as mass concrete?

Mass concrete structures are defined as having a minimum dimension of 7 feet or greater.

Q10 What are the mix design requirements for mass concrete?

Provide concrete meeting the slump and strength requirements for Michigan DOT's structural concrete (28 day strength: 3,500 psi and a maximum slump of 7 inches when a type F admixture is used). For more details look at the S2 mix in Tables 701-1A and B of the Standard Specifications for Construction.

Provide a mass concrete containing a minimum of 500 lbs of cementitious material per cubic yard of concrete. The slag cement must be no more than 75 percent by mass of the total cementitious material.

Q11 Do you have any exclusions for mass concrete?

Comment:

No, but Michigan DOT may test elements with smaller dimensions as mass pours if they use the ternary cementitious blend (silica fume, slag cement, and Portland cement). This typically occurs when a ternary blend is used for pier capes. If Michigan DOT has a concern, a thermal analysis is required to determine if there's a need to treat the member as a mass pour.

Q12 Do you consider drilled shafts mass concrete?

No

Q13 What are the mix design requirements for drilled shafts?

Michigan DOT has two different mix design requirements for drilled shafts.

The first mix design requires the use of our Substructure mix (526-564 lbs of cement per cubic yard, the use of a water-reducing admixture, 28-day compressive strength of 3,500 psi, and a modified slump range of 6 to 8 inches) for placements NOT underwater. The second mix design requires the use of our Tremie mix (611 lbs of cement per cubic yard, the use of a water-reducing admixture, 28-day compressive strength of 3,500 psi, and a modified slump range of 7 to 9 inches) for underwater placements.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

35°F

Maximum Temperature

150°F

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

Michigan DOT has performed a research project where we tried to pour box beams with SCC. We have also cast precast foundations for sound walls using SCC. Michigan DOT has performed three pilot projects using Composite Arch Bridges (Bridge in a Backpack) which required SCC to be placed inside the FRP composite arch tubes. Michigan DOT has used SCC for maintenance repairs to the Zilwaukee Bridge (segmental concrete bridge spanning approximately 5 miles and with a maximum height of 125 feet). These repairs consisted of a heavily reinforced concrete pour with minimum clear space between the reinforcement bars. The shape of the pour was an inverted 'U'.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete	https://mdotjboss.state.mi.us/SpecProv/getDocumentById.htm?docGuid=ceeb2b03-a6b8-4d6d-bb38-7291ba861bb7&fileName=%22Mass Concrete Structures-12DS701(C830).doc%22
Self Consolidating Concrete	NA
Drilled Shafts	https://mdotcf.state.mi.us/public/specbook/2012/
Dowel Bars	https://mdotcf.state.mi.us/public/specbook/2012/
Reinforcing Bars	https://mdotcf.state.mi.us/public/specbook/2012/

Q17 Any additional comments?

Question 6:

Approved/Qualified List for reinforcement bars: Michigan DOT does not have a QPL for these products we have an Approved Manufactures List. To view this list, click on the link provided in question 6 and go to sections 905.03 and 905.03C (page 3 and 4).

Approved/Qualified List for Dowel Bars: Michigan DOT does not have a QPL for these products we have an Approved Manufactures List. To view this list, click on the link provided in question 6 and go to sections 914.07 for dowel bars (located on page 9) and 914.07 for dowel baskets (located on page 9). 914.07 for Dowel baskets provides the companies which are approved to manufacture the basket assembly. However, they must incorporate the dowel bars from 914.07 for dowel bars.

Approved/Qualified List for Epoxy Coaters: Michigan DOT does not have a QPL for these coaters we have an Approved Manufactures List. To view this list, click on the link provided in question 6 and go to section 905.03C Epoxy Coating Companies (located on page 4). However, these coaters must use dowels/reinforcement bars produced by a manufacture which is approved for this item of work. Epoxy coaters must also use only epoxy which is present on Michigan DOT's Qualified Products List. To view Michigan DOT's epoxy coating QPL please select the following link and go to section 905.03C Bar Reinforcement (Epoxy Coating) (located on page 15):
https://www.michigan.gov/documents/MDOT-Material_Source_Guide_Qualified_Products_84764_7.pdf

Question 16:

For drilled shafts specifications click on the link provided in question 16 and go to division 7 section 718 of Michigan DOT's 2012 Standard Specifications for Construction.

For Dowel Bar specifications click on the link provided in question 16 and go to division 9 section 914.07 of Michigan DOT's 2012 Standard Specifications for Construction.

For Reinforcing Bar specifications click on the link provided in question 16 and go to division 9 section 905 of Michigan DOT's 2012 Standard Specifications for Construction.

#28

COMPLETE

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Last Modified: Wednesday, March 28, 2018 8:31:22 AM
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Page 1

Q1 State Representative

Name	Michael Nelson
Agency	INDOT
State / Province	IN
Email	mnelson@indot.in.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Other,
Other (please specify):
INDOT uses plain Gr 60 deformed billet steel (ASTM A615)

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
Comments:
INDOT used epoxy coated reinforcement in CRC pavement on I-65 near downtown Indianapolis. It was used to ensure a long life pavement and to reduce maintenance. INDOT uses minimal CRC pavement and epoxy coated rebar would not necessarily be used in all situations. Depending on environment, location and application plain deformed billet steel may be used.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	INDOT uses only plain billet steel
For Bridge Decks	INDOT uses only epoxy coated steel
For Pavements	Environment, location and application

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

www.in.gov/indot/div/mt/appmat/pubs/apl08.pdf

Approved/Qualified List for Dowel Bars

same as epoxy coater list

Approved List of Epoxy Coaters

www.in.gov/indot/div/mt/appmat/pubs/apl07.pdf

Approved List of Galvanizers

none

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

Yes,

If yes, please provide additional information regarding the research.:

SPR-3422 was published in 2014. The research was conducted by the Joint Transportation Research Program and Dr. Robert Frosch at Purdue University

Q8 Do you use Mass Concrete?

Yes,

Comment:

INDOT has conducted mass concrete pours for structural applications, but all contracts have been built under unique special provisions and INDOT does not currently have a standard specification for mass pour.

Q9 What dimensions are considered as mass concrete?

Any structural element with a smallest dimension greater than 5 feet

Q10 What are the mix design requirements for mass concrete?

No standard spec

Q11 Do you have any exclusions for mass concrete?

No

Q12 Do you consider drilled shafts mass concrete?

Comment:

Yes, if the diameter is greater than 5 feet

Q13 What are the mix design requirements for drilled shafts?

W/C ratio < 0.450, total cementitious from 650 #/cyd to 800 #/cyd, must include class F ash @ 25% to 35% of total cementitious or class C ash @ 35% to 40% of total cementitious or GGBFS @ 35% to 45% of total cementitious. Air entrainment @ 6.5%. Top size coarse aggregate is 1 inch.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential	36 deg F
Maximum Temperature	160 deg F

Q15 Do you have any experience with self consolidated concrete?

Yes,
If yes, what types of applications:
In general construction experience is minimal. It was used to place a jacket around an existing column with thin narrow spacing. It is used frequently by the precast industry.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete	No standard spec. USP can be provided if requested
Self Consolidating Concrete	No standard spec
Drilled Shafts	www.in.gov/dot/div/contracts/standards/rsp/sep17/700/728-B-203%20150901.pdf
Dowel Bars	www.in.gov/dot/div/contracts/standards/book/sep17/sep.htm
Reinforcing Bars	www.in.gov/dot/div/contracts/standards/book/sep17/7-2018.pdf

Q17 Any additional comments?

Dowel bars: standard spec 503.04 & 910.01(b)10
Reinforcing bars: standard spec section 703

#29

COMPLETE

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Last Modified: Wednesday, March 28, 2018 11:32:44 AM
Time Spent: 03:16:53
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Page 1

Q1 State Representative

Name	Gary Wood
Agency	Georgia Dept of Transportation
State / Province	GA
Email	gwood@dot.ga.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
Other,
 Other (please specify):
 Black Steel, Green Epoxy for dowel bars

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
Other (Please Specify in Comments),
 Comments:
 Black Steel also used. in North GA, top layer is epoxy coated, bottom layer black steel. In South GA, both layers of steel are black steel.

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
Other (Please specify in Comments),
 Comments:
 Green Epoxy for dowel bars, tie bars black steel

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	structural material criteria
For Bridge Decks	location within state
For Pavements	load transfer device

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	QPL-12/ QPL-61
Approved/Qualified List for Dowel Bars	QPL-12/QPL-61
Approved List of Epoxy Coaters	QPL-43
Approved List of Galvanizers	QPL-53

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

Yes,
If yes, please provide additional information regarding the research.:
Georgia Tech-HPC pile with Stainless Steel rebar. The overall purpose of this research was to determine methods which may be applied economically to mitigate corrosion of reinforcement in precast prestressed concrete piles in Georgia's marine environments

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

block with dimension greater than 5 feet. caisson 6 feet or greater in dimension

Q10 What are the mix design requirements for mass concrete?

Thermal Control Plan (TCP) to meet temperature requirements. mix, 85 degrees, max temp. 158 degrees, temperature differential no more than 35 degrees.

Q11 Do you have any exclusions for mass concrete?

Comment:
Thermal Control Plan (TCP) to meet temperature requirements. mix, 85 degrees, max temp. 158 degrees, temperature differential no more than 35 degrees.

Q12 Do you consider drilled shafts mass concrete?

Comment:
Greater than 6 feet in diameter

Q13 What are the mix design requirements for drilled shafts?

additional 10% cement

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential	35
Maximum Temperature	158

Q15 Do you have any experience with self consolidated concrete?	Yes, If yes, what types of applications: for use in concrete wall panels, Special Provision
--	--

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete	http://www.dot.ga.gov/PartnerSmart/Business/Source/specs/DOT2013.pdf
Self Consolidating Concrete	Special Provision
Drilled Shafts	Section 524
Dowel Bars	Section 514
Reinforcing Bars	Section 853

Q17 Any additional comments?	Respondent skipped this question
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#30

COMPLETE

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Last Modified: Wednesday, March 28, 2018 2:49:56 PM
Time Spent: 00:30:15
IP Address: 199.168.151.121

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Q1 State Representative

Name	Don Streeter
Agency	NYSDOT
State / Province	NY
Email	donald.streeter@dot.ny.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
Galvanized,
Other,
 Other (please specify):
 Stainless clad

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
Solid Stainless,
Galvanized,
Other (Please Specify in Comments),
 Comments:
 stainless clad

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,
 Comments:
 N/A - dowel bars are typically epoxy coated, NY does not reinforce concrete pavements

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)

Epoxy and Galv considered equal so designers choice, SS used in rare instances where long life w/o maintenance is desired in extremely high volume locations

For Bridge Decks

Same as for structures

For Pavements

N/A

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

**https://www.dot.ny.gov/divisions/engineering/technical-services/technical-services-repository/alme/rei_ste.html
and
https://www.dot.ny.gov/divisions/engineering/technical-services/technical-services-repository/alme/sl_rei_ste.html**

Approved/Qualified List for Dowel Bars

<https://www.dot.ny.gov/divisions/engineering/technical-services/technical-services-repository/alme/pages/70514-1.html>

Approved List of Epoxy Coaters

<https://www.dot.ny.gov/divisions/engineering/technical-services/technical-services-repository/alme/pages/890-1.html>

Approved List of Galvanizers

no list - product supplied with certification

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

No

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

>5' in all dimensions

Q10 What are the mix design requirements for mass concrete?

varies - combination of contractor designed mix and thermal control plan analysis - mixes contain up to 50% Class F ash or 70% GGBFS

Q11 Do you have any exclusions for mass concrete?

No

Q12 Do you consider drilled shafts mass concrete?

Comment:

only those of large dimension require use of mass concrete protections

Q13 What are the mix design requirements for drilled shafts?

same as structural mass concrete above - varies

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

generally 35F, with analysis have allowed up to 50F after 48 hrs when coarse aggs have low coefficient of thermal expansion

Maximum Temperature

generally 160F

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

substructure repairs typically, some new construction of substructures. SCC basically allowed by a special note in plans.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

see "Concrete for Structures Class MP" at <https://www.dot.ny.gov/pic>

Self Consolidating Concrete

see "Self Consolidating Concrete" at <https://www.dot.ny.gov/pic>

Drilled Shafts

see special specs 551.9949XXXX at <https://www.dot.ny.gov/pic>

Dowel Bars

see Section 705-14 of standard specs at <https://www.dot.ny.gov/main/business-center/engineering/specifications/updated-standard-specifications-us>

Reinforcing Bars

see Section 556 of standard specs at <https://www.dot.ny.gov/main/business-center/engineering/specifications/updated-standard-specifications-us>

Q17 Any additional comments?

Respondent skipped this question

#31

COMPLETE

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Q1 State Representative

Name	Darin Hodges
Agency	SDDOT
State / Province	SD
Email	darin.hodges@state.sd.us

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

**Green Epoxy,
Solid Stainless**

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)	Green Epoxy is our standard ucoated Steel is still used in some applications
For Bridge Decks	For Critical decks Stainless Steel is used
For Pavements	Epoxy coated is the standard for Jointed Pavements

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars	http://apps.sd.gov/HC60ApprovedProducts/main.aspx
Approved/Qualified List for Dowel Bars	NA
Approved List of Epoxy Coaters	NA
Approved List of Galvanizers	NA
Other (Please specify)	Epoxy Coating: http://apps.sd.gov/HC60ApprovedProducts/Main.aspx

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

Yes,
If yes, please provide additional information regarding the research.:
SDDOT is waiting for the final report on a study done by SDSU on Tie Bar Placement Tolerances.

Q8 Do you use Mass Concrete?

No

Q9 What dimensions are considered as mass concrete?

Respondent skipped this question

Q10 What are the mix design requirements for mass concrete?

Respondent skipped this question

Q11 Do you have any exclusions for mass concrete?

Respondent skipped this question

Q12 Do you consider drilled shafts mass concrete?

No

Q13 What are the mix design requirements for drilled shafts?

The SDDOT still supplies Drilled shaft mix designs meeting:

1. Minimum cement content of 780 pounds per cubic yard of Type II cement conforming to Section 750;
 2. Minimum 28 day compressive strength of 4500 psi;
 3. Slump at time of placement shall be between 6 and 8 inches for concrete that is placed by the free-fall or tremie method. The slump at the time of placement shall be between 7 and 9 inches for concrete that is pumped through a tremie. In addition, the slump shall be maintained above 4 inches for 4 hours from the time of batching regardless of the placement method. Slump loss shall be tested in accordance with SD 423.
 4. Entrained air content of 6.5% with an allowable tolerance of +1% to -1.5%.
 5. The mix design shall establish a maximum water cementitious material ratio for the concrete mix (never to exceed 0.44).
- The use of a water reducer will be required to achieve the above properties. Water reducers conforming to AASHTO M 194 Type C (Accelerating) and Type E (Water-Reducing and Accelerating) will not be permitted.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Respondent skipped this question

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

Precast, Prestressed, Cast in Place: Columns, Box Culvert Walls, & Abutments.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Self Consolidating Concrete

Special Provision

Drilled Shafts

Section 465:

http://www.sddot.com/business/contractors/specs/2015s pecbook/2015_SDDOT_SpecBook.pdf

Dowel Bars

Section 1010:

http://www.sddot.com/business/contractors/specs/2015s pecbook/2015_SDDOT_SpecBook.pdf

Reinforcing Bars

Section 1010:

http://www.sddot.com/business/contractors/specs/2015s pecbook/2015_SDDOT_SpecBook.pdf

Q17 Any additional comments?

Respondent skipped this question

#32

COMPLETE

Collector: Web Link 1 (Web Link)
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Last Modified: Wednesday, March 28, 2018 6:22:49 PM
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Q1 State Representative

Name	Andy Naranjo
Agency	TxDOT
State / Province	TX
Email	andy.naranjo@txdot.gov

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
Galvanized,
Other,
 Other (please specify):
 Uncoated reinforcement is typically used. We are starting to use galvanized instead of epoxy coated bars.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
GFRP,
Galvanized,
 Comments:
 Only a few decks with the upper mat of reinforcement used GFRP. Starting to use galvanized instead of epoxy coated bars.

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

Green Epoxy,

GFRP,

Other (Please specify in Comments)

Comments:

GFRP dowel bars and tie bars only used at toll plazas.

Reinforcement in JCP is usually specified as epoxy coated by plan note.

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)

corrosion potential

For Bridge Decks

corrosion potential

For Pavements

none

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

<http://ftp.dot.state.tx.us/pub/txdot-info/cmd/mpl/steelmil.pdf>

Approved/Qualified List for Dowel Bars

no approved list

Approved List of Epoxy Coaters

<http://ftp.dot.state.tx.us/pub/txdot-info/cmd/mpl/epoxyaps.pdf>

Approved List of Galvanizers

No approved list, just a standard spec for galvanizing - See Item 445 - <ftp://ftp.dot.state.tx.us/pub/txdot-info/des/spec-book-1114.pdf>

Other (Please specify)

Epoxy Powder Coating Sources - <http://ftp.dot.state.tx.us/pub/txdot-info/cmd/mpl/grnepxy.pdf>

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

No

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

By plan note. typically 5ft or greater.

Q10 What are the mix design requirements for mass concrete?

No mix design requirements. Temperature limits dictate mix design.

Q11 Do you have any exclusions for mass concrete? **No**

Q12 Do you consider drilled shafts mass concrete? **Comment:**
Yes, drilled shafts can be considered mass concrete, but only the core temperature limits apply.

Q13 What are the mix design requirements for drilled shafts?

No requirements unless slurry is used, which will then require the use of a minimum of 658lb of cementitious material per CY.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential	35F
Maximum Temperature	160F

Q15 Do you have any experience with self consolidated concrete? **Yes,**
If yes, what types of applications:
Precast concrete bridge beams

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete	See Item 420 - ftp://ftp.dot.state.tx.us/pub/txdot-info/des/spec-book-1114.pdf
Self Consolidating Concrete	See Item 421 - ftp://ftp.dot.state.tx.us/pub/txdot-info/des/spec-book-1114.pdf
Drilled Shafts	See Item 416 - ftp://ftp.dot.state.tx.us/pub/txdot-info/des/spec-book-1114.pdf
Dowel Bars	See Item 440 - ftp://ftp.dot.state.tx.us/pub/txdot-info/des/spec-book-1114.pdf
Reinforcing Bars	See Item 440 - ftp://ftp.dot.state.tx.us/pub/txdot-info/des/spec-book-1114.pdf

Q17 Any additional comments? **Respondent skipped this question**

#33

COMPLETE

Collector: Web Link 1 (Web Link)
Started: Friday, March 30, 2018 3:00:16 PM
Last Modified: Friday, March 30, 2018 3:19:40 PM
Time Spent: 00:19:24
IP Address: 108.171.131.160

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Q1 State Representative

Name	Maria Masten
Agency	Minnesota DOT
State / Province	MN
Email	maria.masten@state.mn.us

Q2 What type of reinforcement does your DOT install in structures (excluding bridge decks) - Select all that apply?

Green Epoxy,
Other,
 Other (please specify):
 Black bars used if completely encased in the footing.

Q3 What type of reinforcement does your DOT install in bridge decks (Select all that apply)?

Green Epoxy,
GFRP,
Solid Stainless,
 Comments:
 Default is green epoxy. Use solid stainless when cost of bridge exceeds \$25 or has superstructure that cannot be removed without shoring, such as box girders. Have built 2 experimental bridges using GFRP, will likely build 2-3 more in next 5 years.

Q4 What type of reinforcement does your DOT install in pavements (Select all that apply)?

- Green Epoxy,**
- GFRP,**
- Solid Stainless,**
- Composite,**
- ASTM 934 Epoxy,**
- Galvanized,**
- Other (Please specify in Comments)**

Comments:

Green epoxy for tie bars and supplemental reinforcement. Glass Fiber Reinforced Polymer (GFRP) Coated Steel Bars, ASTM 934 Epoxy Coated Carbon Bar, 316L Stainless Steel Schedule 40 Pipe, 316L Stainless Steel Tube with Carbon Steel Core, Rolled Zinc Alloy Sleeve over Carbon Steel Bar, Grade 60 Carbon Steel Tube, produced to ASTM A513 and with a G90 Galvanizing on both the inside and the outside of the tube and then epoxy coated

Q5 What criteria determine the type of reinforcement specified?

For Structures (excluding Bridge Decks)

Existing Policy - Use green.

For Bridge Decks

Use solid stainless when cost of bridge exceeds \$25 or has superstructure that cannot be removed without shoring, such as box girders. Have built 2 experimental bridges using GFRP, will likely build 2-3 more in next 5 years.

For Pavements

Metro District considers the use of HP Dowel Bars due to traffic on and inside the 494/694 Loop. Have also chose not to seal joints since using HPC Dowel Bars

Q6 Please provide your approved/qualified lists for the following, if applicable.

Approved/Qualified List for Reinforcement Bars

No list, must be CRSI Certified

Approved/Qualified List for Dowel Bars

No list for epoxy, HPC Dowel Bar list link <http://www.dot.state.mn.us/products/concrete/highperformancedowelbar.html>

Approved List of Epoxy Coaters

No list, must be CRSI Certified

Q7 Is there any research on reinforcement being performed/sponsored by your DOT?

Yes,

If yes, please provide additional information regarding the research.:

Currently have small project in progress to survey bridge decks built in 1970's using galvanized bars. Also comparing performance of decks with top mat epoxy/bottom mat black to decks with epoxy top and bottom mat. Also studying GFRP bars in 2 deck installations.

Q8 Do you use Mass Concrete?

Yes

Q9 What dimensions are considered as mass concrete?

60" for buried footings, 4 feet for everything else

Q10 What are the mix design requirements for mass concrete?

Contractor Designed to meet maximum temperature requirements.

Q11 Do you have any exclusions for mass concrete?

Comment:

Tremie Concrete and precast beams

Q12 Do you consider drilled shafts mass concrete?

Yes

Q13 What are the mix design requirements for drilled shafts?

Contractor Designed to meet maximum temperature requirements.

Q14 What is the maximum temperature differential and maximum temperature for mass concrete?

Maximum Temperature Differential

45 F at 48 hours, 50 F from 3 to 7 days, 60 F > than 8 days

Maximum Temperature

160 F

Q15 Do you have any experience with self consolidated concrete?

Yes,

If yes, what types of applications:

Drilled shafts, column repairs. In elements with highly congested rebar applications. Some precast fabricators are approved for SCC.

Q16 Please attach a link to your specifications for the following types of concrete/materials:

Mass Concrete

<http://www.dot.state.mn.us/bridge/pdf/SB2018.pdf>

Self Consolidating Concrete

Special Provision Only - Will provide if requested

Drilled Shafts

Special Provision Only - Will provide if requested

Dowel Bars

<http://www.dot.state.mn.us/products/concrete/pdf/MnDOTApprovedHighPerformanceDowelBarProcedures.pdf>

Q17 Any additional comments?

Respondent skipped this question
