

NCC Fall 2022 State Reports on Concrete Specifications

Tuesday, September 27, 2022

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36

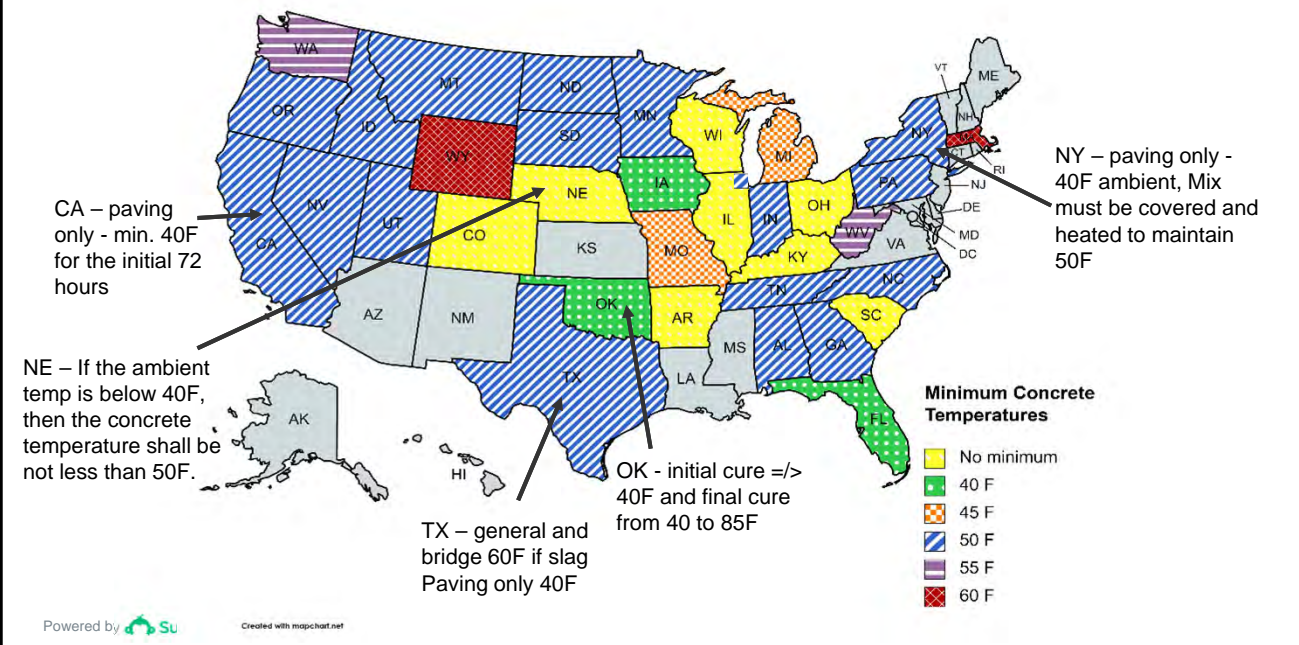
Total Responses

Date Created: Wednesday, August 17, 2022

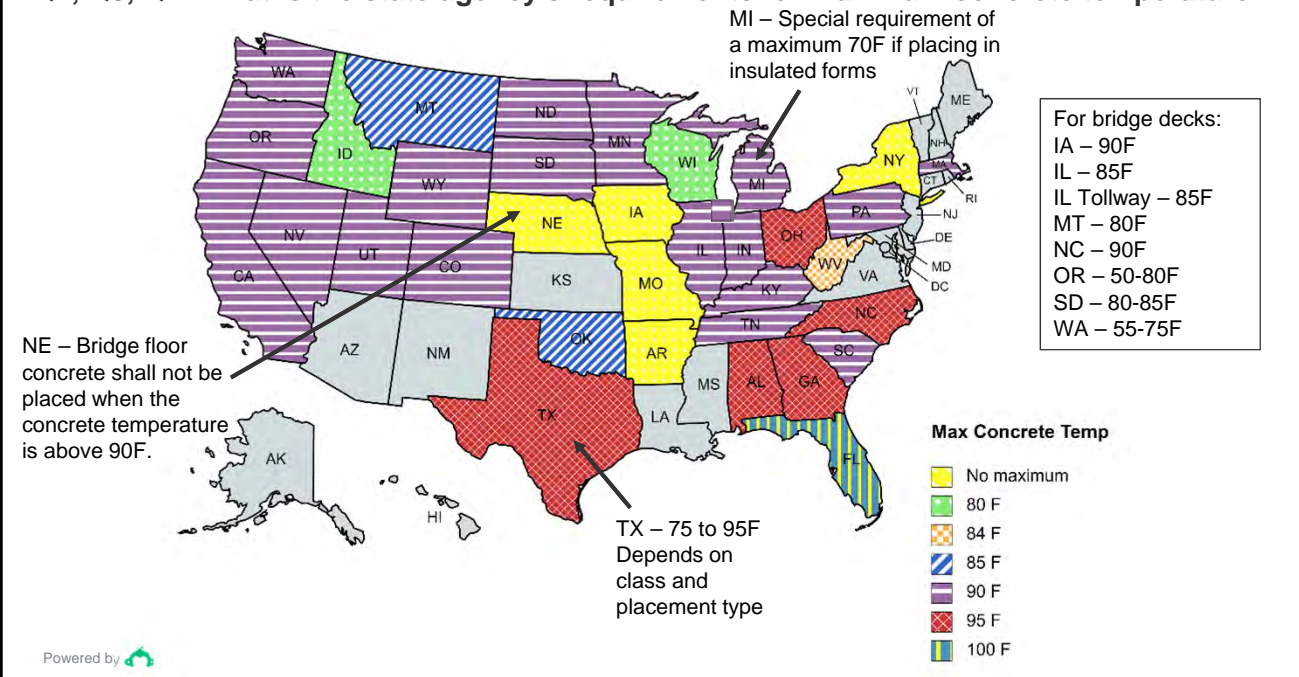
Complete Responses: 35

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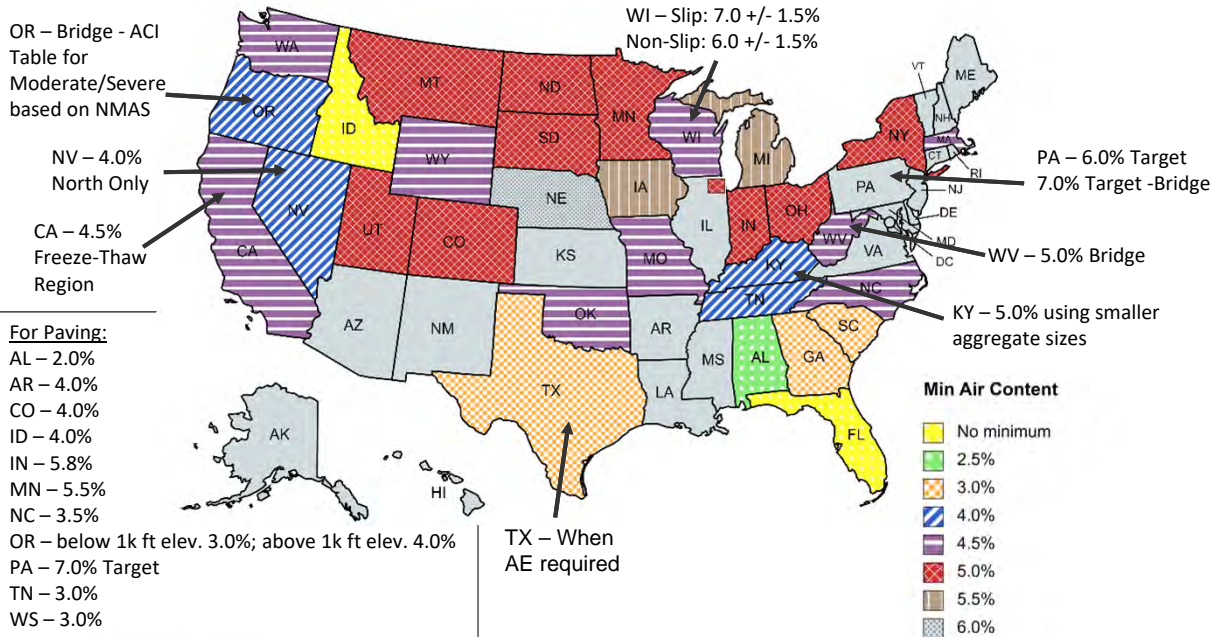
Q2, Q3, Q4: What is the state agency's requirements for minimum concrete temperature?



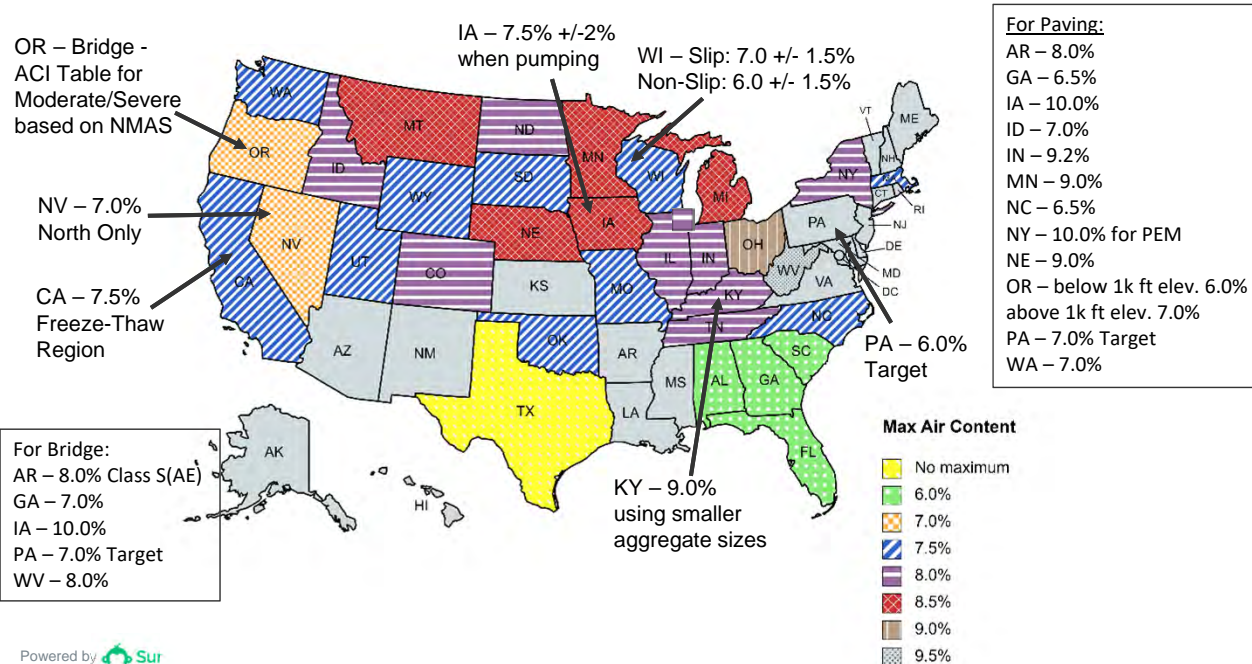
Q2, Q3, Q4: What is the state agency's requirements for maximum concrete temperature?



Q2, Q3, Q4: What is the state agency's requirements for minimum air content?



Q2, Q3, Q4: What is the state agency's requirements for maximum air content?



Q2, Q3, Q4: What is the state agency's requirements for slump for general concrete?

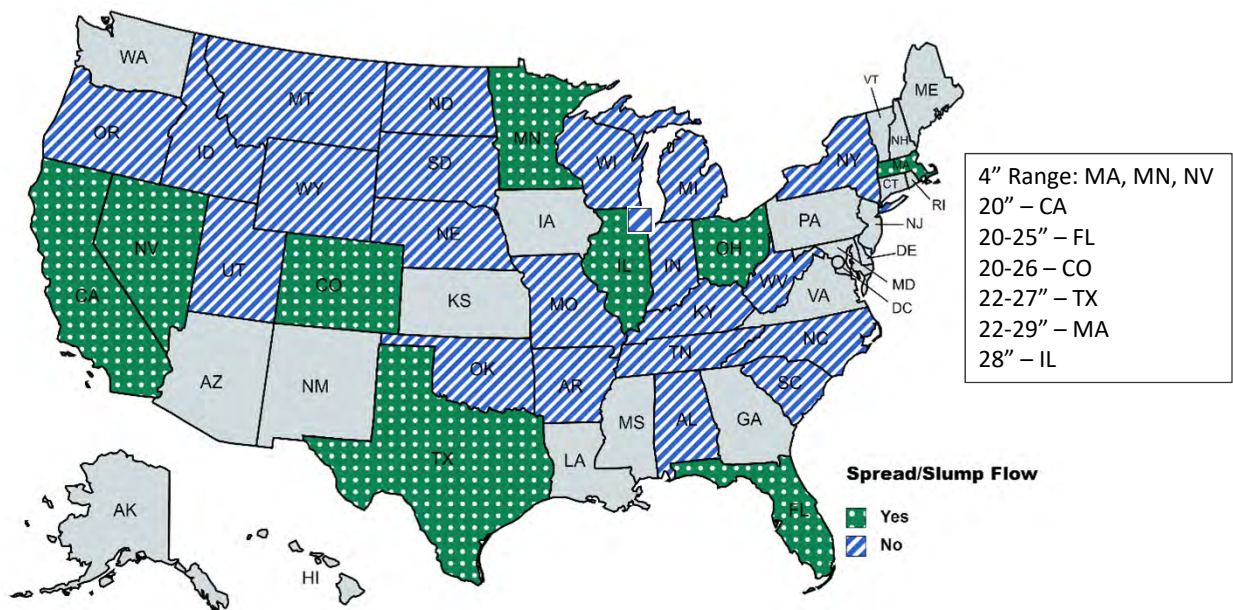
Results varied quite a lot for almost every state.

- No requirements
- Maximum Slump
- Slump Ranges
- Increased Maximum Slump with Admixtures
 - 6" with Type F – AL, MO
 - 6" with Type F or G - OH
 - 7" with Type F – IL, IL Tollway, KY, NV
 - 8.5" with Type F or G - FL
 - 9" with Type F – CA, SC
 - Depends on Admixture Used – PA

Review individual state responses for additional information.

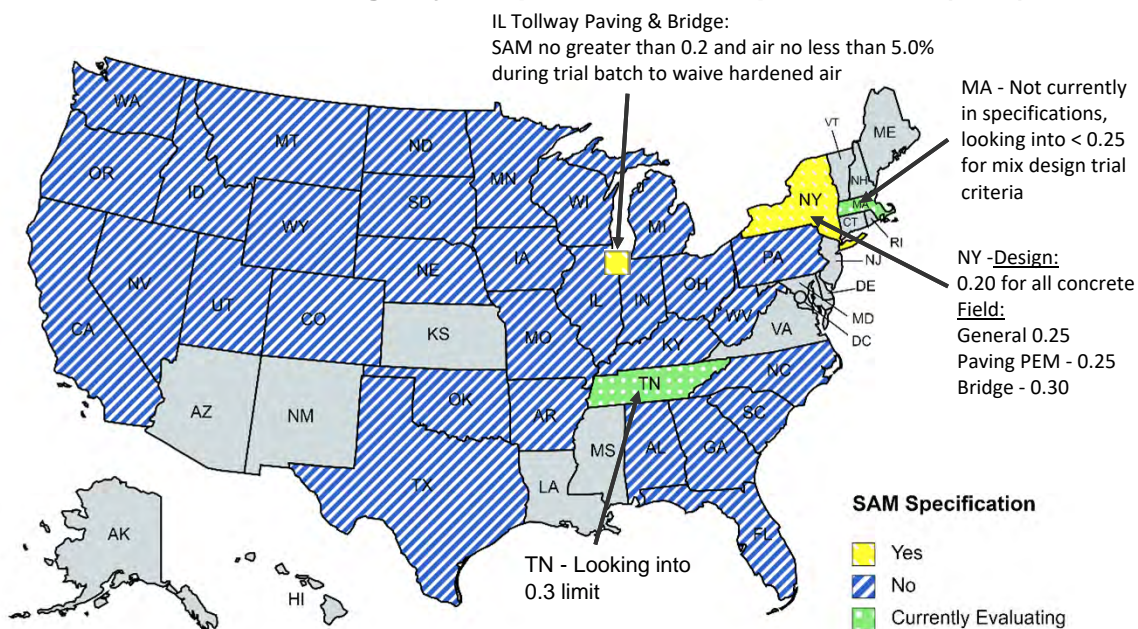
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Q2, Q3, Q4: What is the state agency's requirements for spread/slump flow?



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Q2, Q3, Q4: What is the state agency's requirements for Super Air Meter (SAM)?



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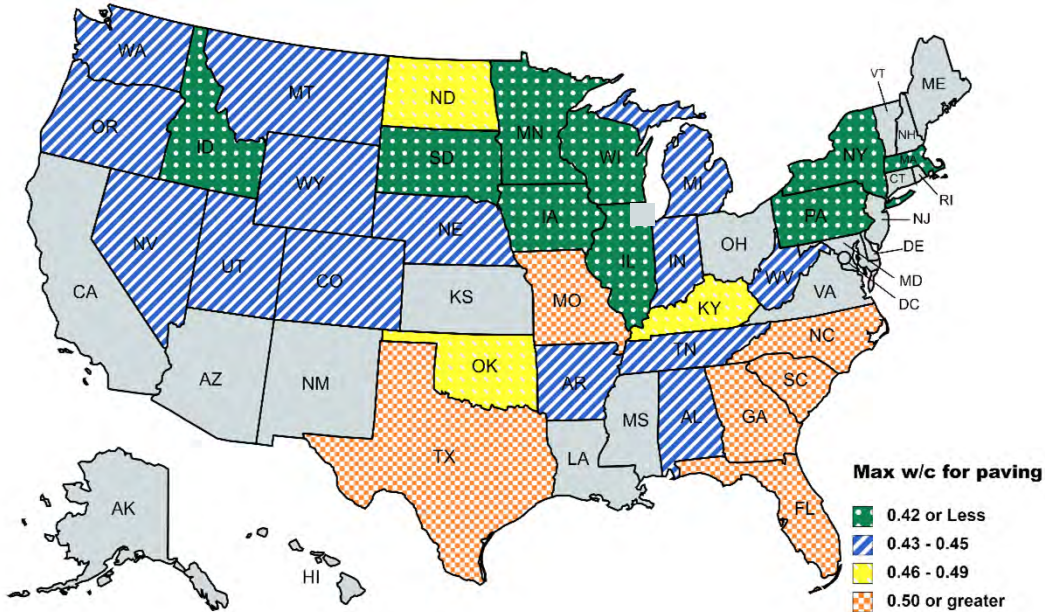
Q2, Q3, Q4: What is the state agency's requirements for w/c ratio for general concrete

Results varied quite a lot for almost every state.

Review individual state responses for additional information.

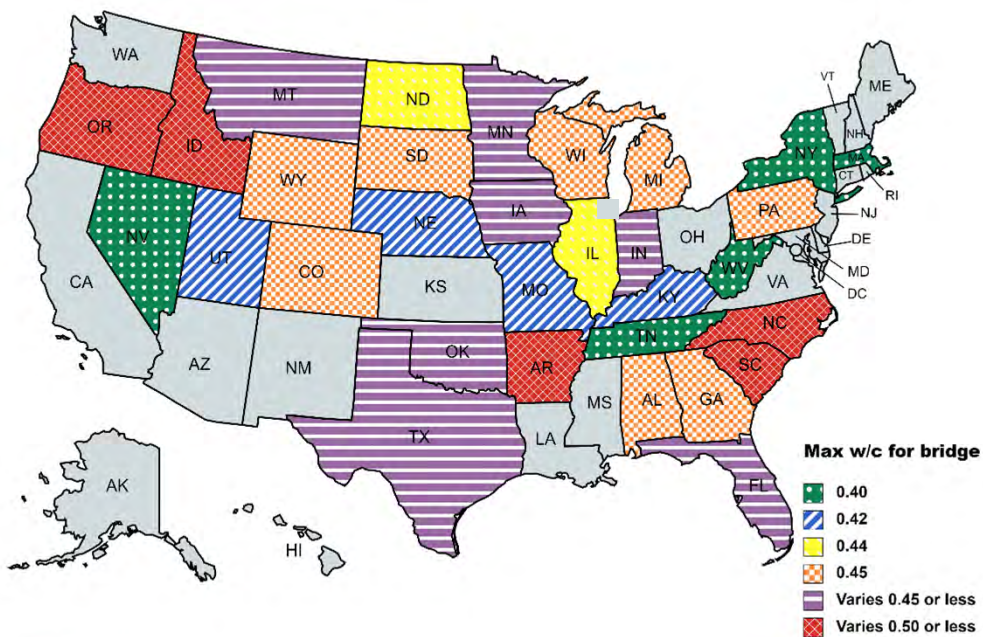
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Q2, Q3, Q4: What is the state agency's requirements for w/c ratio for concrete paving?



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Q2, Q3, Q4: What is the state agency's requirements for w/c ratio for bridge?



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Q2, Q3, Q4: What is the state agency's requirements for minimum strength?

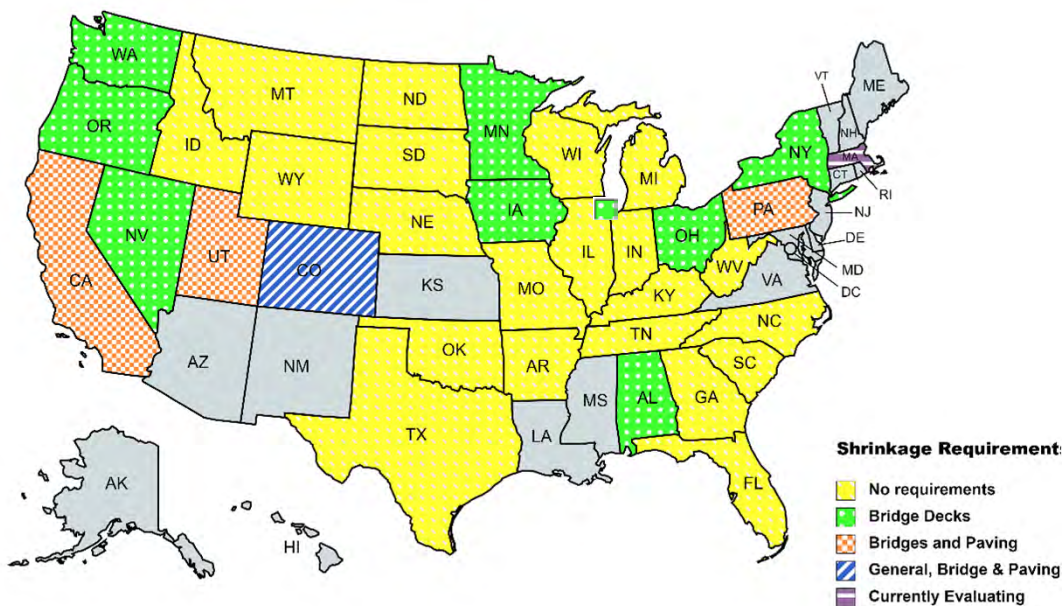
Results varied quite a lot for almost every state.

- Age: 7 – 56 days, No requirements, information only, opening to traffic
- General Concrete
 - Compressive Strength Range: N/A, 2100 – 4500 psi
 - Flexural Strength Range: N/A, 450 – 700 psi
- Paving Concrete
 - Compressive Strength Range: N/A, 3000 – 4500 psi
 - Flexural Strength Range: N/A, 450 – 650 psi
- Bridge Concrete
 - Compressive Strength: 3000 – 6000 psi
 - Flexural Strength Range: N/A, 450 – 675 psi

Review individual state responses for additional information.

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Q2, Q3, Q4: What is the state agency's requirements for shrinkage?



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Q2, Q3, Q4: What is the state agency's requirements for shrinkage?

For General:

CO - 0.050% @ 28
 MA - Not in spec yet, only certain applications.
 Conducted only at mix design trials. T 160 at 28
 Days: <=420 ue; C1581 at 28 Days: No Cracking
 (No sudden jump > 30 ue); T 363: 7 Days <=0.6T
 TN - Looking into this

For Paving:

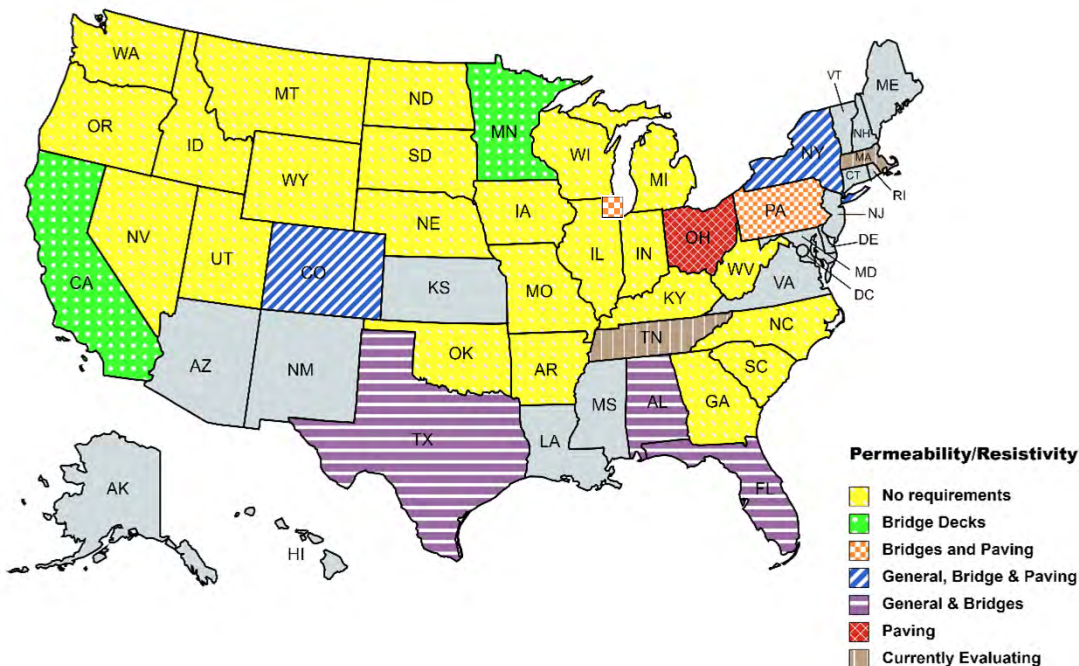
CA - 0.05% per AASHTO T 160 for concrete
 pavements with conventional concrete 0.04%
 per Modified AASHTO T 160 for concrete
 pavements with rapid strength concrete
 CO - 0.050% @ 28
 MA - same as general
 PA - 0.05% @ 28
 UT - 0.042

For Bridge:

AL - 0.04%
 CA - 0.032% @ 28 days
 CO - 0.030 or 0.050% at 28
 IL Tollway - Less than 0.03% at 28 days for
 AASHTO T 160 with 7-day wet cure followed by
 21-day drying. Net time to cracking no less than
 28 days for ASTM C1581 (this test is waived if
 cementitious and SRA meet limits)
 MA - same as general
 MN - 0.040% @ 28 days for bridge decks
 NV - 0.030% at 28 days
 OR - 0.045% at 56 days (T160) for bridge decks
 PA - 0.05% at 28 days
 UT - 0.035
 WA - Bridge Decks -less than or equal to 0.032%
 at 20 days

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Q2, Q3, Q4: What is the state agency's requirements for permeability/resistivity?



Q2, Q3, Q4: What is the state agency's requirements for permeability/resistivity?

For General:

CO - 2500 Coulombs @56 or 12 kΩ-cm at 28
 MA - Not in spec yet. T 358 at 28 Days:
 >=21; TP 119: >=10
 TN – Looking into this

For Paving:

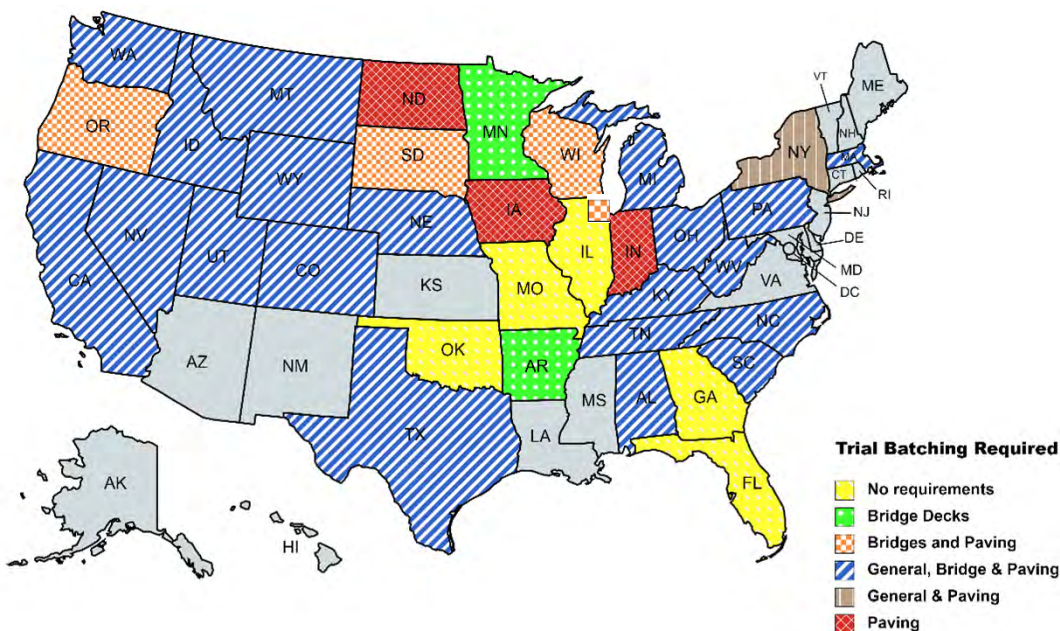
CO - 2500 Coulombs @56 or 12 kΩ-cm at 28
 IL Tollway - None yet, but planning on
 surface resistivity of 14k-ohm-cm at 28 days
 MA - Not in spec yet. T 358 at 28 Days:
 >=21; TP 119: >=10
 NY – 16.5 at 56 days for pavements
 OH - T277 Accelerated 2000 Coulombs or
 less
 PA – low at 56 days
 TN – Looking into this

For Bridge:

AL - 2,000 coulombs when required or on plans
 CA - 2500 coulombs max at 28, 1500 max at 56
 days
 CO - 2500 Coulombs @56 or 12 kΩ-cm at 28
 FL - 29 kΩ•cm at 28 days containing highly reactive
 pozzolans in extremely aggressive exposures.
 MA - Not in spec yet. T 358 at 28 Days: >=21; TP
 119: >=10
 MN –1500 coulombs @ 28-days
 MT - 15 kilohm-centimeters at 28 days
 NY – 30 at 56 days for structural
 PA – low at 56 days
 TN – Looking into this
 TX - 1,500 Coulombs when HPC required & <20%
 SCM
 WV - 750 Coulombs (Maximum) at 90 days

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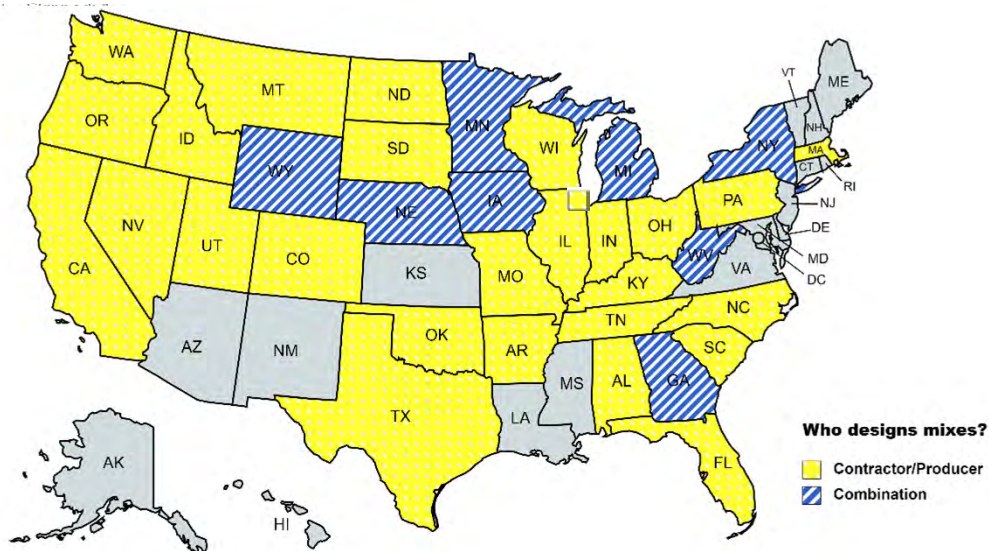
Q2, Q3, Q4: Does your State Agency require trial batching?



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Q5: Who designs the concrete mix designs for your state agency?

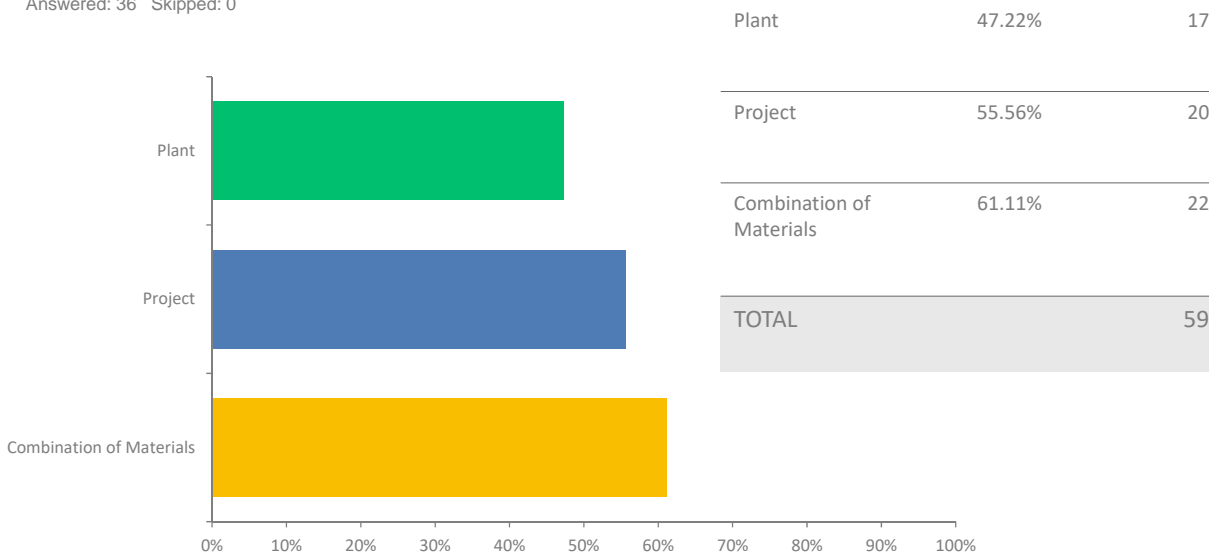
Answered:



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Q6: Does your state agency approve mix designs by plant, by project, or by combination of materials? (Check all that apply)

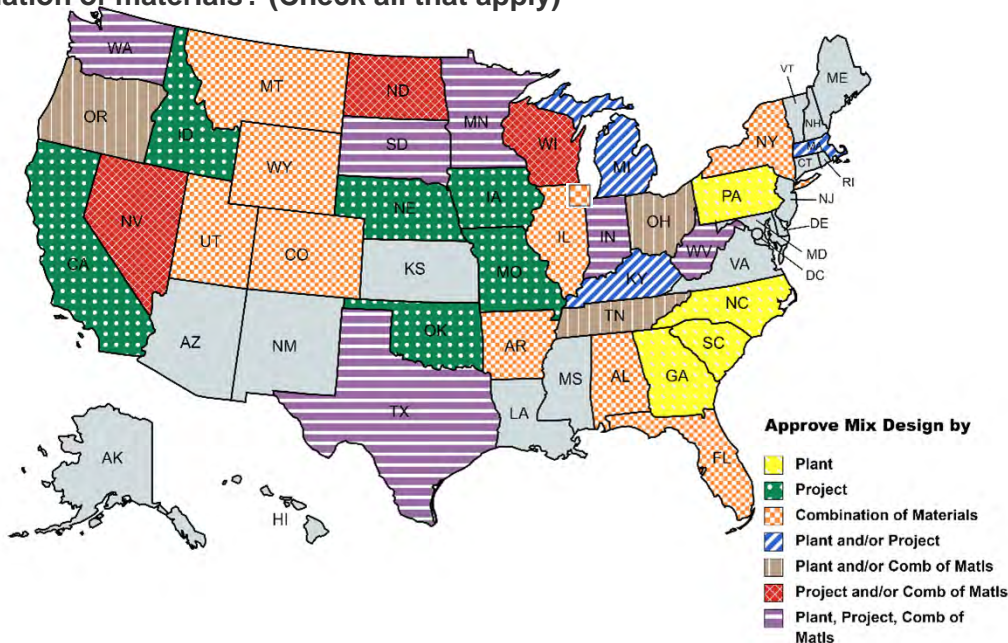
Answered: 36 Skipped: 0



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Q6: Does your state agency approve mix designs by plant, by project, or by combination of materials? (Check all that apply)

Answered:



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Q6: Does your state agency approve mix designs by plant, by project, or by combination of materials? (Check all that apply)

Answered: 36 Skipped: 0

- AL All materials used must be listed on an approved list in ALDOT's Materials, Sources, and Devices with Special Acceptance Requirements (MSDSAR) Manual
- CO Mix designs are approved for each supplier on their materials. The same mix can be batched at multiple plants by the same supplier if all source materials are the same. Few suppliers have the same mix batched at multiple plant because plants generally use on-site pits for fines.
- FL They are approved by producer, for use at any plant and any project.
- KY Primary approval is by plant but there will be project specific applications requiring mix design approval. Addressed by special note included in the project proposals.
- MI Concrete mix designs are project and plant specific. However, if a plant wants to use the same materials and mix design for multiple projects MDOT has a simplified mix design review process. Method 2 or 4 in the answer for question 7 can be used.
- MN MnDOT General Concrete and general bridge mix designs are approved by the individual ready-mix plant per a unique combination of aggregates. MnDOT only specifies to use cementitious and admixtures from the APL/QPL lists. MnDOT paving and high performance bridge mix designs are approved by project and combination of materials. Precast mixes are by combination of plant and materials.

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Q6: Does your state agency approve mix designs by plant, by project, or by combination of materials? (Check all that apply)

Answered: 36 Skipped: 0

- MT MDT approves mix designs per class of concrete, per supplier
Mix designs must be submitted for each project, even if same mix was approved for previous project
- NV Mix designs are by Producer and provided the plant can logistically hold the aggregates, the mix design can be used at multiple facilities.
- OH Each structural mix design is reviewed for the project, application, materials used and plant/source of materials. An approved design is published and distributed to the RE office and Contractor. The published design is used to verify what is delivered onsite and as a reference for the testing technician.
- OR Mix designs are reviewed by plant and are good for any project for 3 years.
- SC Mix designs are submitted and reviewed for every project. Each plant (supplier) has to develop mix designs for each aggregate combination they use. On future projects it is only a paper submittal if the previous mix design is re-used by the supplier.
- SD A material change warrants a new design. Designs are specific to the plant, but not necessarily the project.
- TN

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Q6: Does your state agency approve mix designs by plant, by project, or by combination of materials? (Check all that apply)

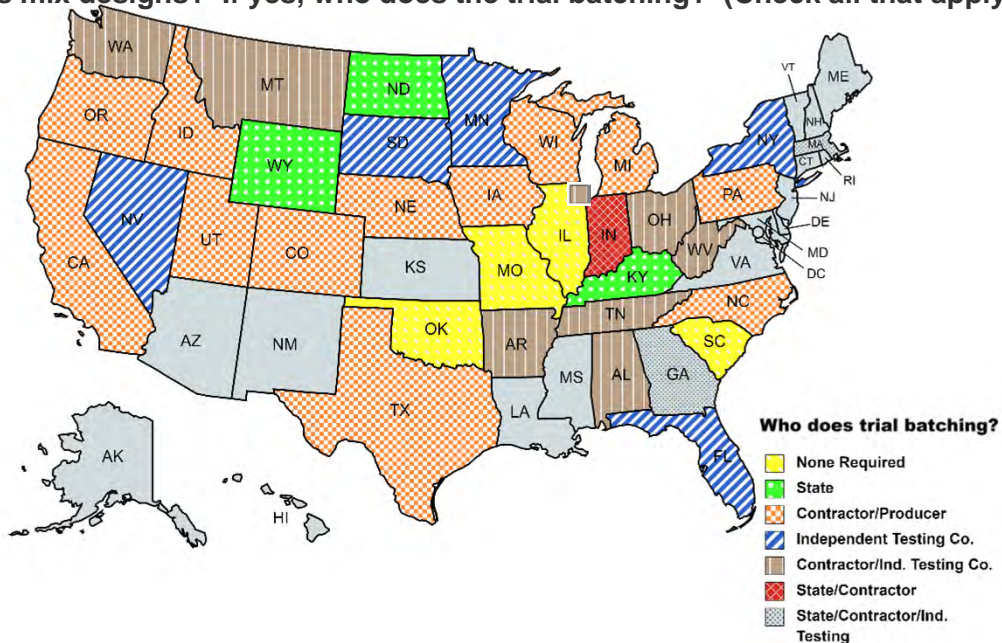
Answered: 36 Skipped: 0

- TX In general, designs are approved by plant, for a given set of materials. New material sources require new mix designs. Designs from permanent plants may be used over a number of projects. Designs from mobile plants are likely to be for a single project.
- UT 2.4 TRIAL BATCHES A. Use the same components in the trial batches that will be used in the project. 1. Accelerators and site-added air-entrainment can be incorporated in the trial batch but are not required. B. Use Department certified TTQP Concrete and Concrete Strength Testing personnel to perform trial batches and strength tests. C. The Department or its certified representative may witness the trial batch. D. Mix concrete trial batches according to the UDOT Materials Manual of Instruction 974: Guidelines for Portland Cement Concrete Mix Design Trial Batches. E. Use a Department qualified laboratory to verify trial batch compressive and flexural strength testing.
- WA A unique identification for the mix design is comprised of the combination of the Mix Design Number and the Plant Number.
- WI Project reviews the mix designs to ensure that the materials are on the approved list and within spec requirements.

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Q7: Does your state agency require preliminary testing/trial batching for the various mix designs? If yes, who does the trial batching? (Check all that apply)

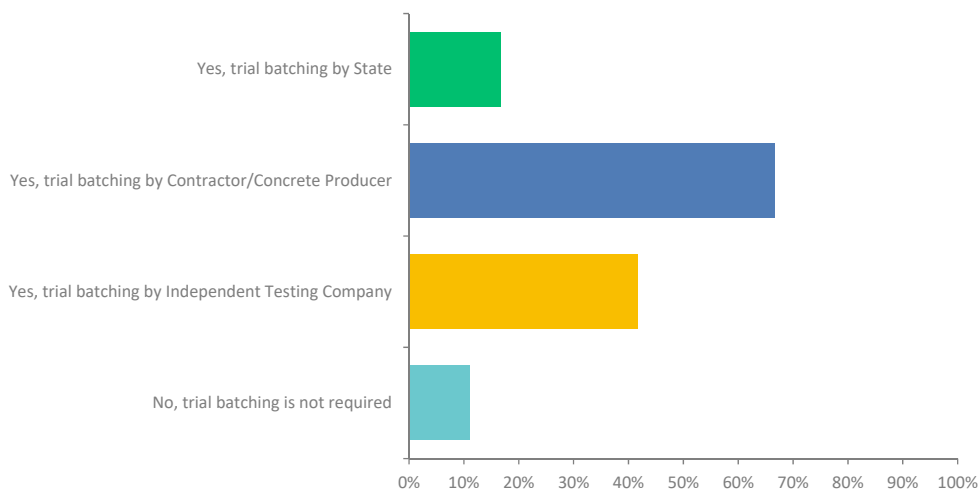
Answered:



Powered

Q7: Does your state agency require preliminary testing/trial batching for the various mix designs? If yes, who does the trial batching? (Check all that apply)

Answered: 36 Skipped: 0



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Q7: Does your state agency require preliminary testing/trial batching for the various mix designs? If yes, who does the trial batching? (Check all that apply)

Answered: 36 Skipped: 0

- AL Labs where trial batching/testing is performed must be either AASHTO certified or ALDOT qualified.
- AR The contractor may produce trial batches with the Department's Resident Engineer present for all batching and testing. The contractor may have an approved independent laboratory or a Registered Professional Engineer produce trial batches with no Department personnel required to be present. <https://www.ardot.gov/wp-content/uploads/2020/10/Division-800.pdf> - Section 802.05(c) lays out trial batch requirements
- CA In addition to trial batch State accepted certified test results for 20 consecutive tests
- CO Trial batching is done by the supplier's lab. These labs need to be AASHTO accredited and the mixes required PE review and stamping.
- FL The preparation and testing of the trial batch mixes shall be performed by a laboratory that is inspected and meets the requirements of ASTM C1077. Personnel performing plastic or hardened concrete testing shall be qualified as described in Specifications Section 105-7 Lab Qualification Program. FDOT Standard Specifications
- GA All paving mixes are verified in-house. All specialty mixes are verified by the producer or an independent testing company of their choice.
- IA Paving- only when reduced cement using PEM Structure - trial batching when new materials or fibers are used.

Q7: Does your state agency require preliminary testing/trial batching for the various mix designs? If yes, who does the trial batching? (Check all that apply)

Answered: 36 Skipped: 0

- ID for projects with 2500 CY or more, both the State and Contractor run trial batches
- IL If a trial batch is asked for by the District, it is conducted according to Chapter 10 of the PCC Level III Technician course manual: <https://www.lakelandcollege.edu/wp-content/laker-documents/as/idt/CET%20039%20PCC%20Level%20III%20Course%20Manual.pdf>
- MI Full Trial batching (Method 1) is what the Contractor typically submits. However, if the mix design is the same (Method 2 or 4) or similar (Method 3) as a previously approved mix design full trial batching is not required. Below is MDOT's mix design approval methods: Method 1 – Trial Batches. Method 2 – Same Mixture. Method 3 – Similar Mixture. Method 4 – Annual Verification. Here is the link to MDOT's Standard Specifications for Construction: <https://www.michigan.gov/mdot/business/construction/mdot-standard-specifications-and-reference-publications> Division 10 section 1003.03.C.2 is where mix design review is located.
- MN For HPC bridge decks, SCC and MC trial batching is required. https://edocs-public.dot.state.mn.us/edocs_public/DMResultSet/download?docId=12292457 MnDOT Spec 2401.2K.7, Concrete Mix Design
- MO Trial batches are encouraged but not required. For some specialty mixes such as fiber reinforced concrete (FRC), trial batches are required.

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Q7: Does your state agency require preliminary testing/trial batching for the various mix designs? If yes, who does the trial batching? (Check all that apply)

Answered: 36 Skipped: 0

NC Section 1000-4(A) Spec Book

OH Ready mix supplier either uses an AASHTO Accredited lab or their own staff to produce mix designs. Must meet overdress requirements for respective mixes that require that information.

OR For all structural applications we require trial batching or equivalent field test data showing the design meets specifications.

TX Concrete producer/contractor is required to provide trial batch data. TxDOT must be given opportunity to witness final trial batches. Contractor has option to perform trial batch in conjunction with placement at their own risk. Previous satisfactory field data may be accepted in lieu of trial batch.

WA 5-05.3(1) Concrete Mix Design for Paving Mix designs submitted by the Contractor shall provide a unique identification for each proposal and shall include test data confirming that concrete made in accordance with the proposed design will meet the requirements of these Specifications and the 28-day compressive strength result. Test data shall be from an independent testing lab or from a commercial concrete producer's lab. If the test data is developed at a producer's lab, the Engineer or a representative may witness all testing.

<https://www.wsdot.wa.gov/publications/manuals/fulltext/M41-10/SS.pdf>

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Q8: What adjustments to the mix design does your state agency allow without submitting new testing data?

Answered: 36 Skipped: 0

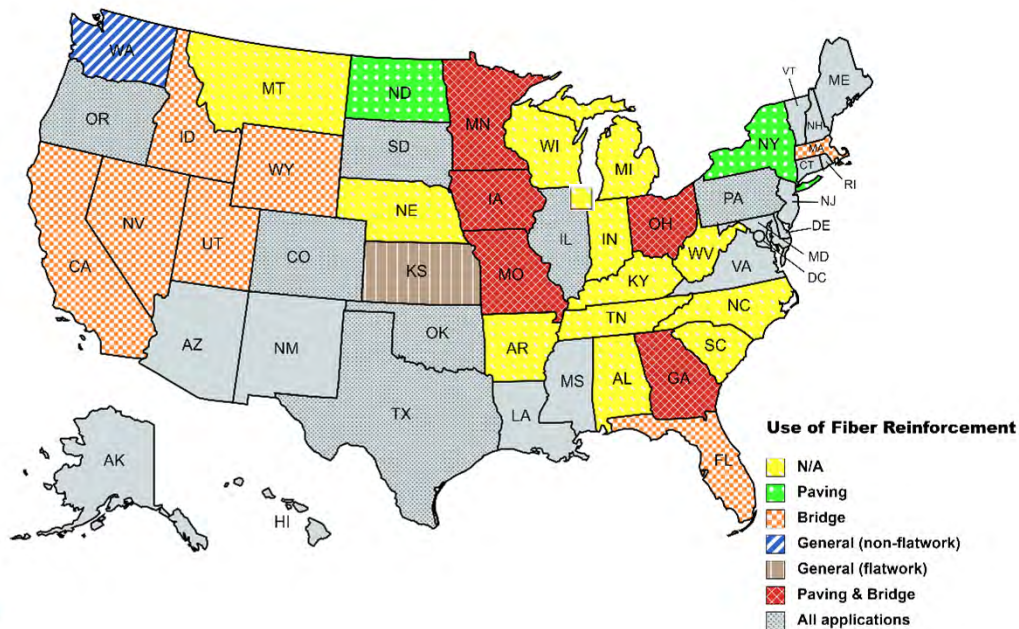
- Aggregate Source
- Aggregate Type
- Aggregate Proportions
- Cementitious Source
- Cementitious Proportions
- Admixture Source
- Admixture Proportions

Review individual state responses for additional information.

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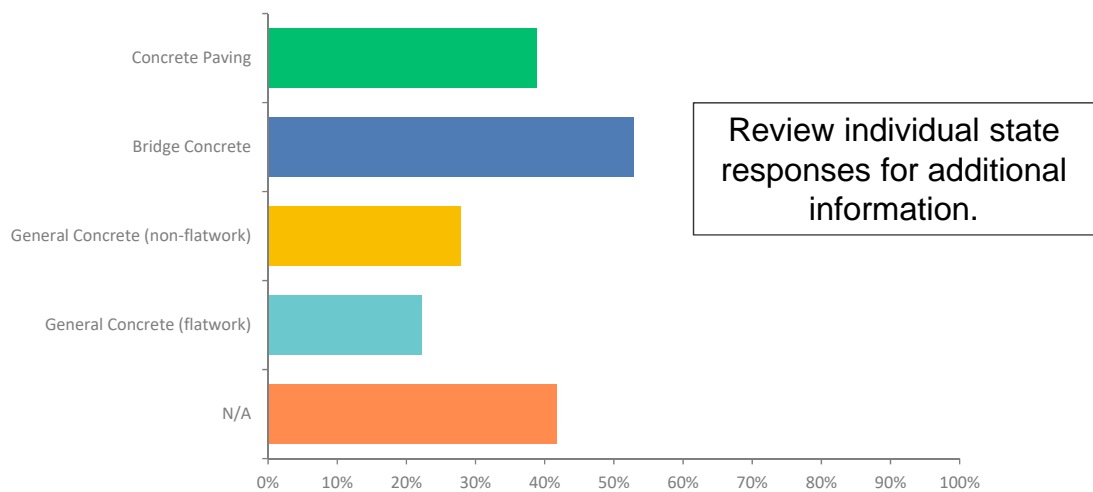
Q9: Do you allow/use fiber reinforcement in any of the following applications? (Check all that apply)

Answered: 36



Q9: Do you allow/use fiber reinforcement in any of the following applications? (Check all that apply)

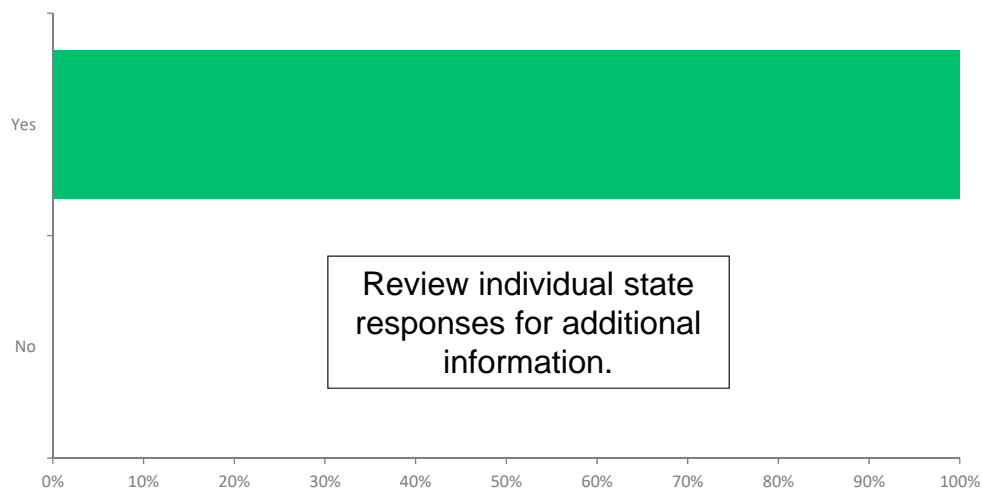
Answered: 36 Skipped: 0



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Q10: Does your state agency have any cold weather placement requirements/restrictions?

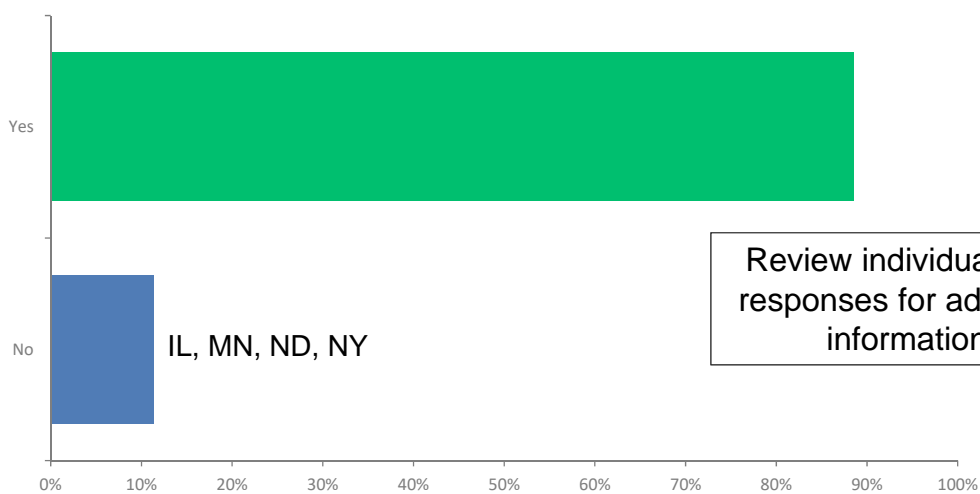
Answered: 36 Skipped: 0



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Q11: Does your state agency have any hot weather placement requirements/restrictions?

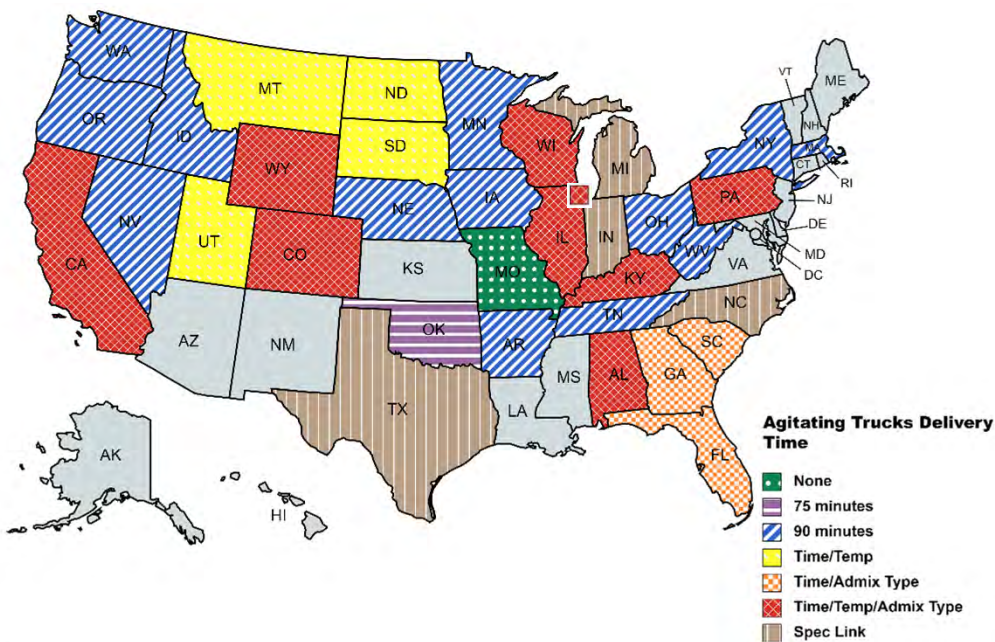
Answered: 35 Skipped: 1



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Q12: Does your state agency have delivery time placement limits?

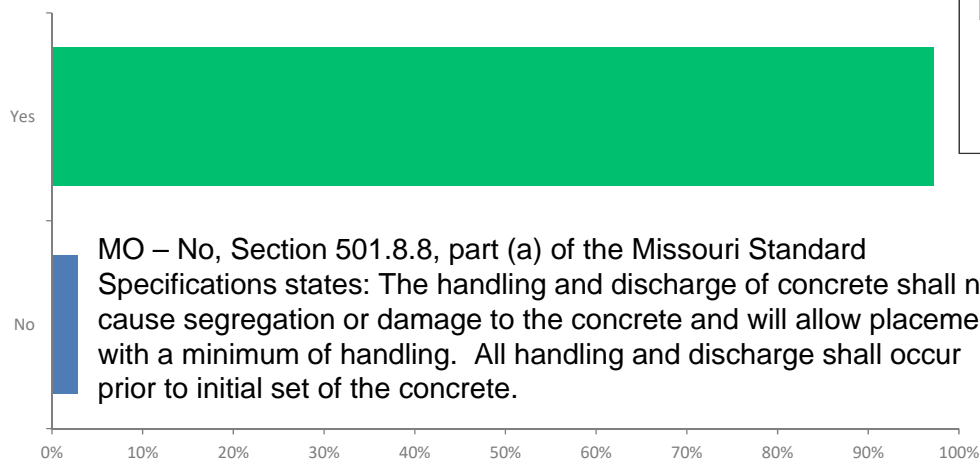
Answered



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Q12: Does your state agency have delivery time placement limits?

Answered: 36 Skipped: 0



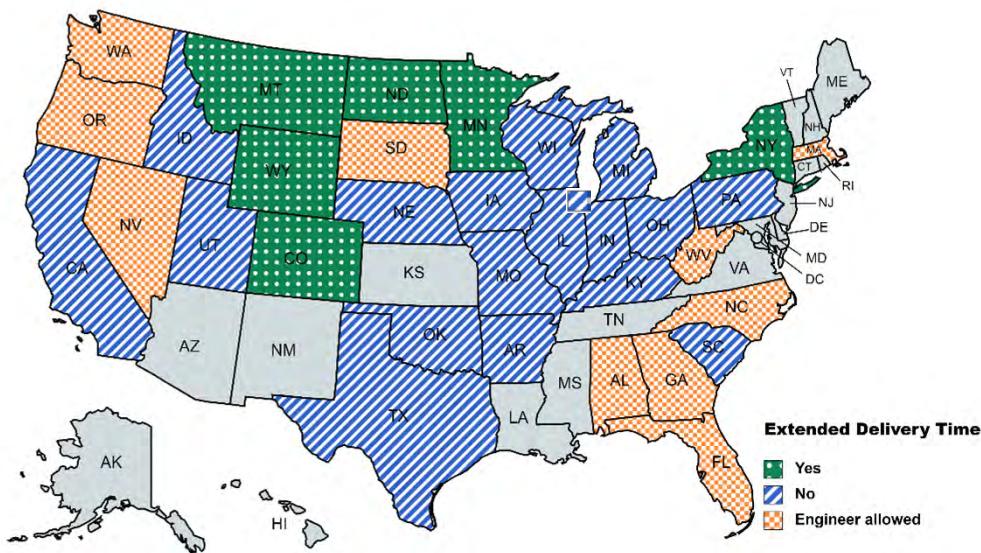
Review individual state responses for additional information.

MO – No, Section 501.8.8, part (a) of the Missouri Standard Specifications states: The handling and discharge of concrete shall not cause segregation or damage to the concrete and will allow placement with a minimum of handling. All handling and discharge shall occur prior to initial set of the concrete.

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Q13: Does your state agency have any requirements that allow extended delivery time beyond standard specifications?

Answered: 35



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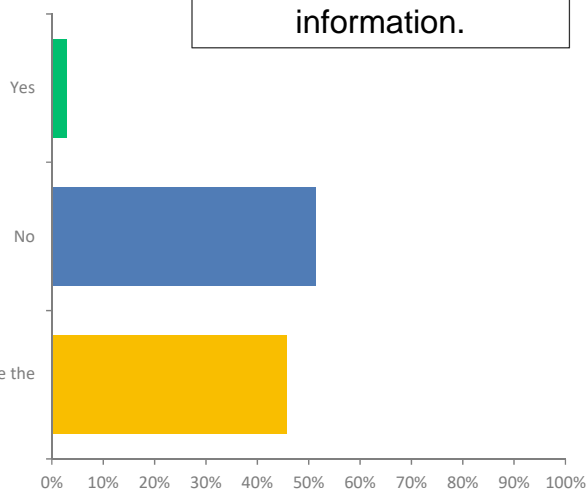
Q13: Does your state agency have any requirements that allow extended delivery time beyond standard specifications?

Answered: 35 Skipped: 1

Review individual state responses for additional information.

ANSWER CHOICES	RESPONSES	
Yes	2.86%	1
No	51.43%	18
If yes, what is the delivery time extended to? Include the specification or provide a link.	45.71%	16
TOTAL		35

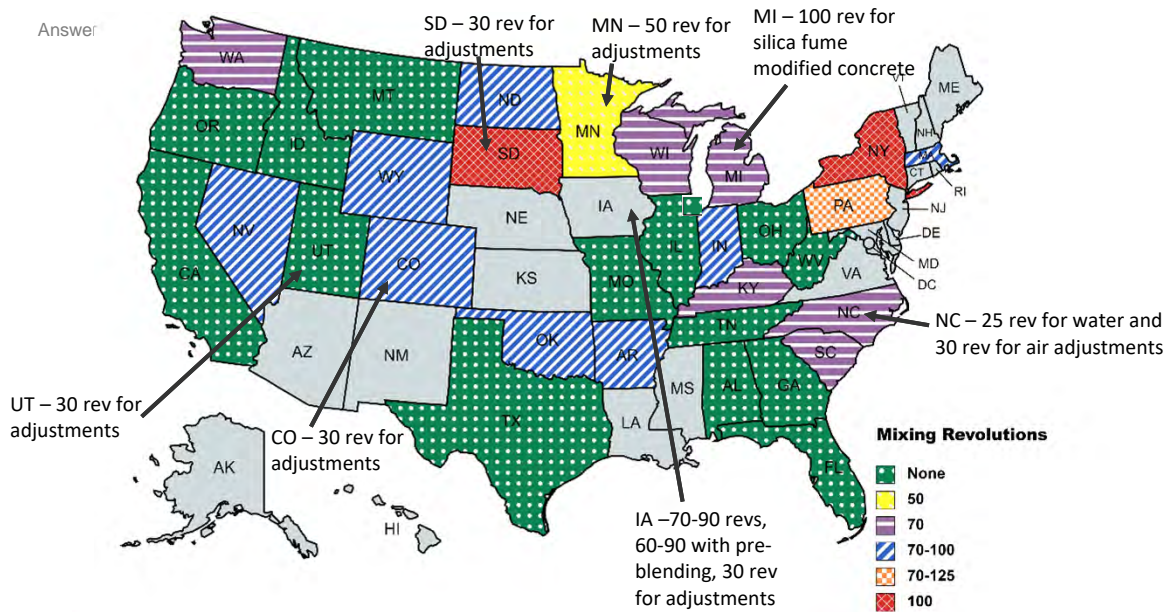
If yes, what is the delivery time extended to? Include the specification or provide a link.



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Q14: Does your state agency have a mixing revolution specification?

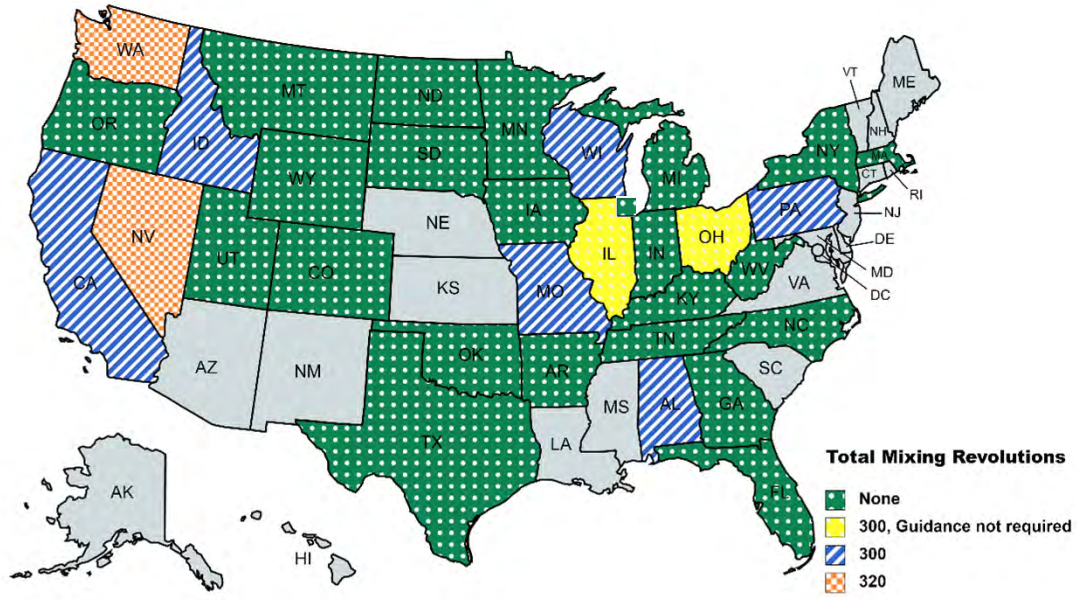
Answer:



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Q14: Does your state agency have a TOTAL mixing revolution specification?

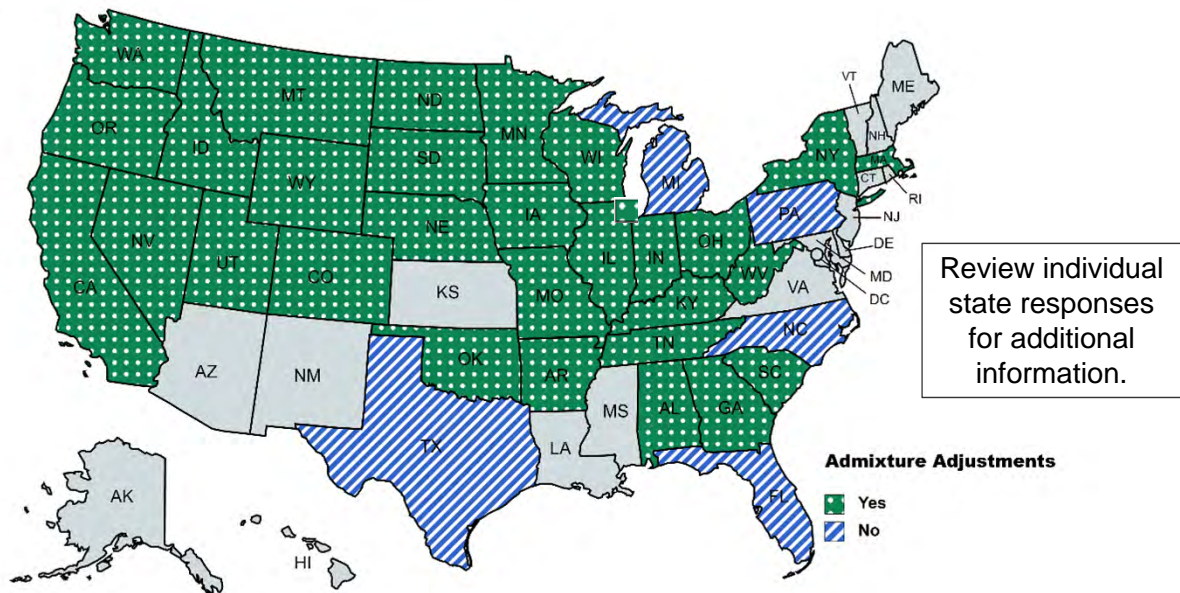
Answered: 33 Skipped: 3



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Q15: Does your state agency allow admixture adjustments in the field?

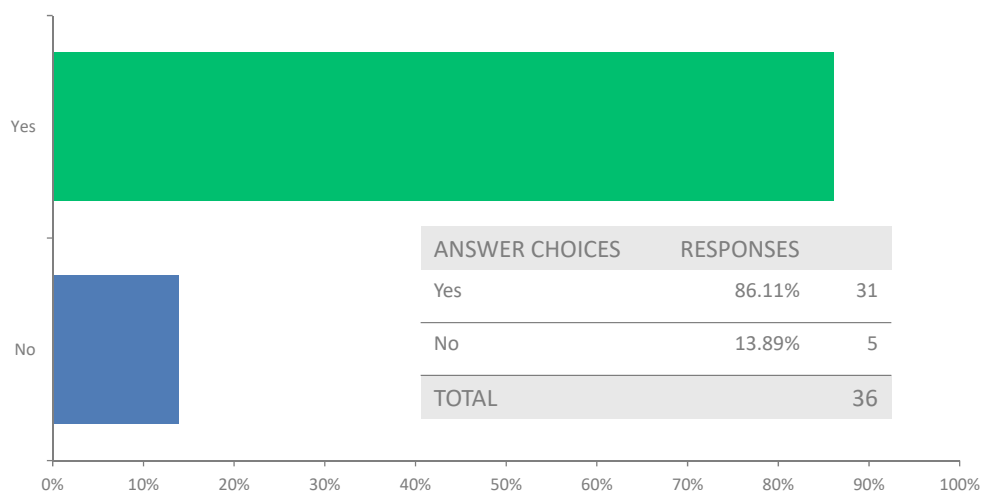
Answer



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Q15: Does your state agency allow admixture adjustments in the field?

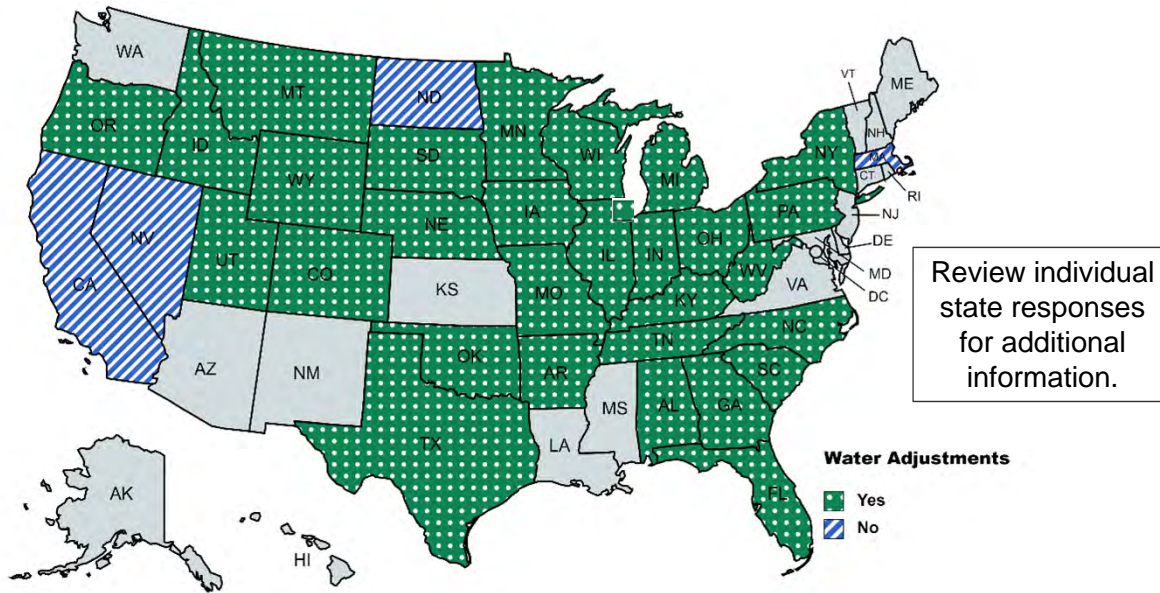
Answered: 36 Skipped: 0



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Q16: Does your state agency allow water adjustments in the field?

Answers

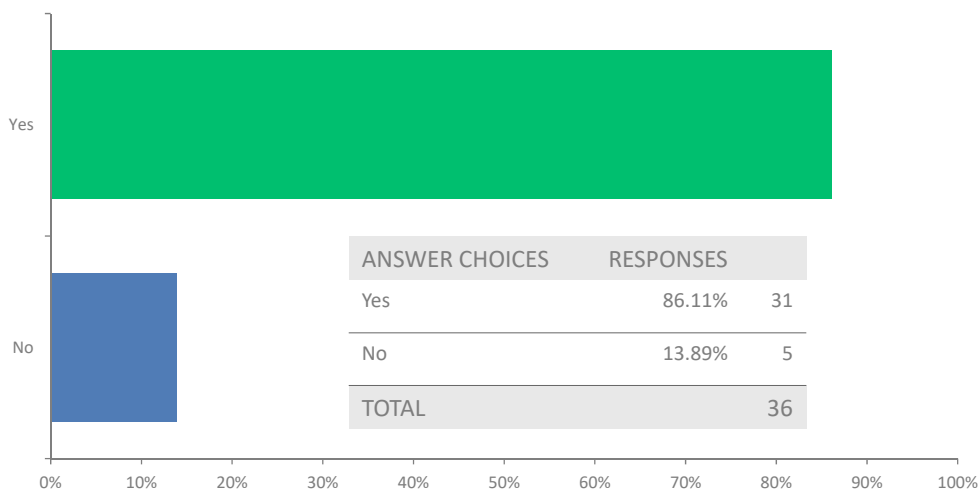


Review individual state responses for additional information.

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Q16: Does your state agency allow water adjustments in the field?

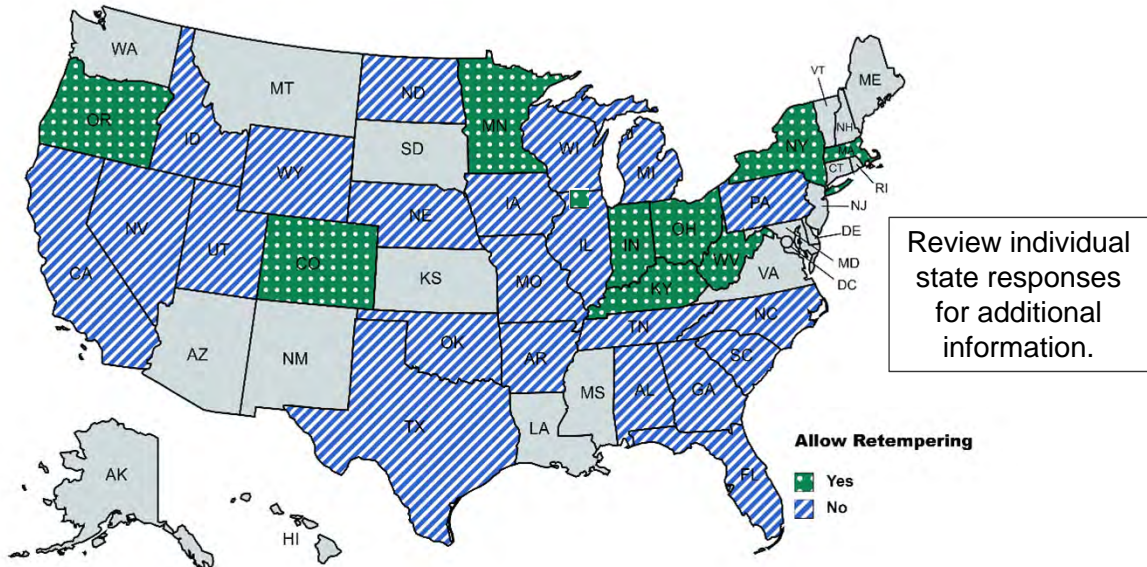
Answered: 36 Skipped: 0



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Q17: Does your state agency allow retempering of the concrete?

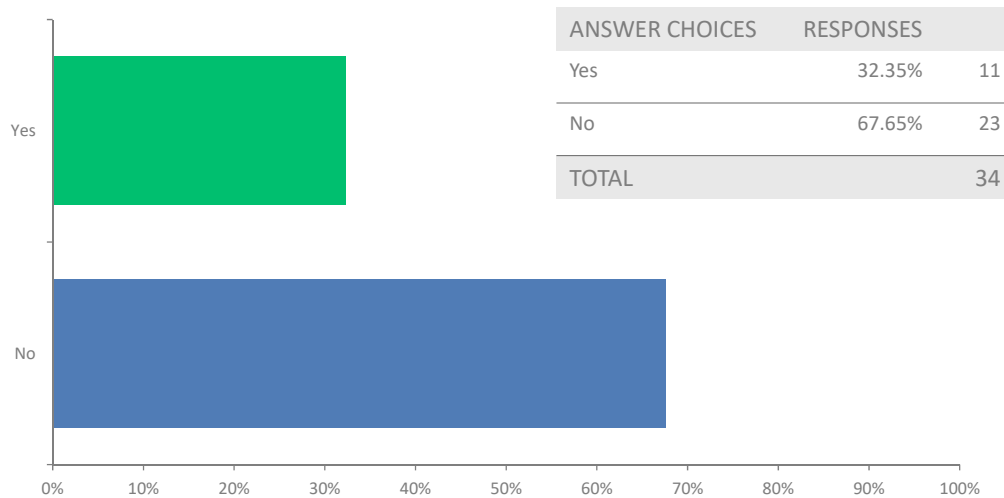
Answered:



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Q17: Does your state agency allow retempering of the concrete?

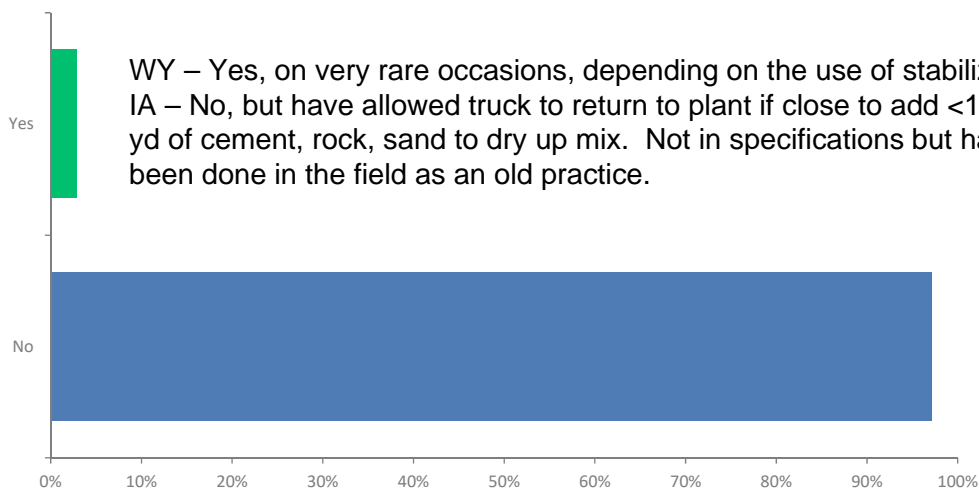
Answered: 34 Skipped: 2



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Q18: Does your state agency allow bagged cement to be added to a load of concrete in the field?

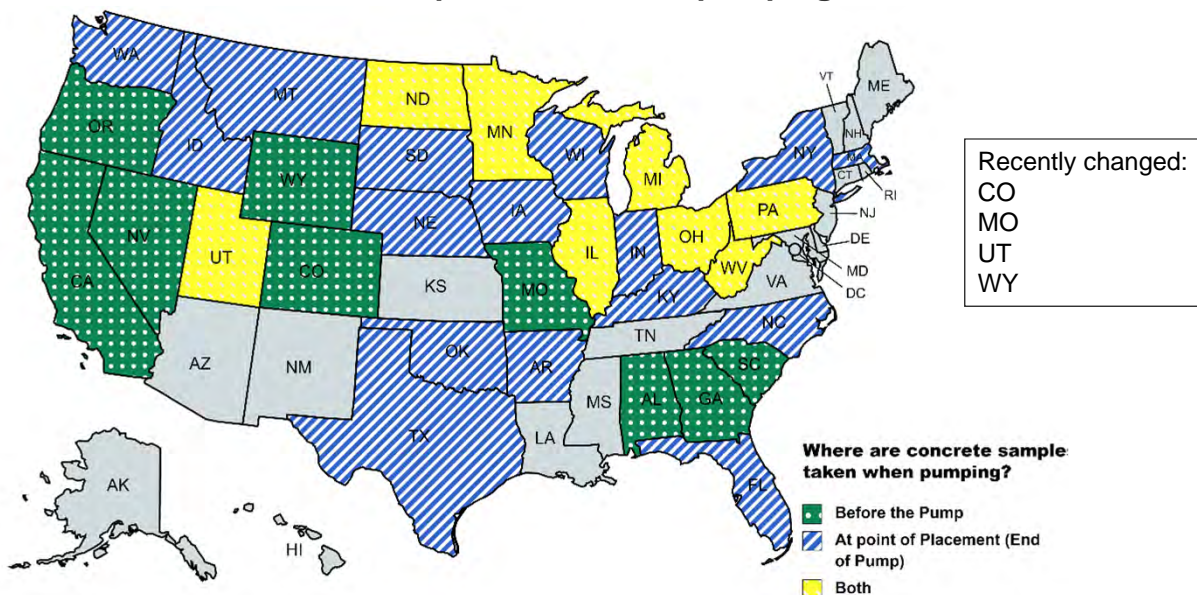
Answered: 35 Skipped: 1



WY – Yes, on very rare occasions, depending on the use of stabilizers.
 IA – No, but have allowed truck to return to plant if close to add <1/4 yd of cement, rock, sand to dry up mix. Not in specifications but has been done in the field as an old practice.

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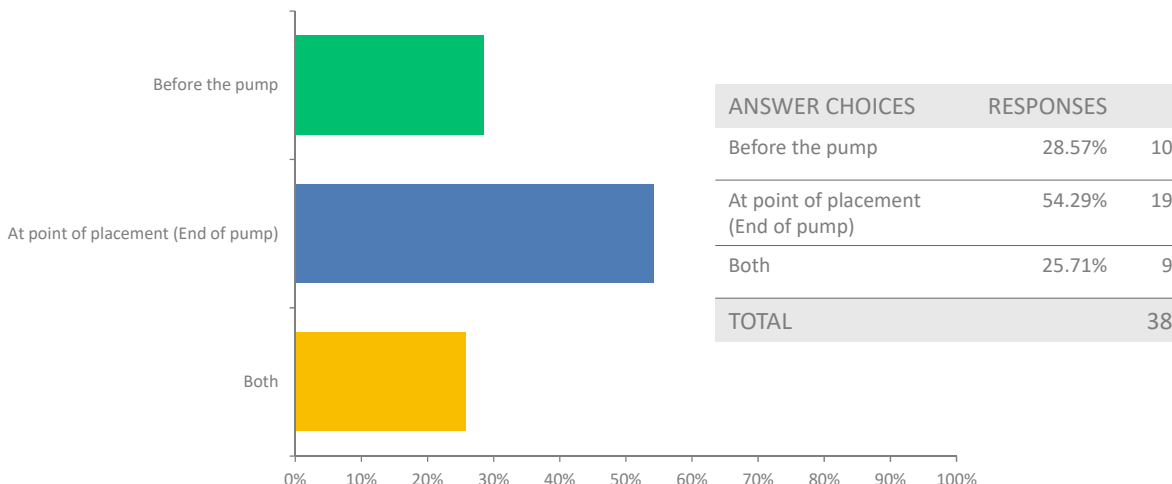
Q19: Where are concrete samples taken when pumping?



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Q19: Where are concrete samples taken when pumping?

Answered: 35 Skipped: 1



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Q19: Where are concrete samples taken when pumping?

Answered: 36 Skipped: 0

- CA Both the Department and Contractor usually sample this from the chute of the concrete mixer truck and not from the concrete pump. Caltrans usually asks the contractor to redirect the chute so we can sample directly from the truck during discharge. ASTM C172 (via CT539) has this note regarding where to sample: NOTE 2—Sampling should normally be performed as the concrete is delivered from the mixer to the conveying vehicle used to transport the concrete to the forms; however, specifications may require other points of sampling, such as the discharge of a concrete pump. Neither the Standard Specifications or CT539 make mention of sampling at the discharge of the pump.
- CO No different than non-pumped concrete. Use to require point of placement, but safety and logistical issues, plus the SAM research showing air returns after pumping had CDOT revise the spec to point of delivery (end of ready mixed truck chute)

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Q19: Where are concrete samples taken when pumping?

Answered: 36 Skipped: 0

- IL** Also, we use 'correction factors' for air content when pumping or conveying concrete: If a pump or conveyor is used for placement, a correction factor shall be established to allow for a loss of air content during transport. The first three truck loads delivered shall be tested, before and after transport by the pump or conveyor, to establish the correction factor. Once the correction is determined, it shall be re-checked after an additional 50 cu yd is pumped, or an additional 100 cu yd is transported by conveyor. This shall continue throughout the pour. If the re-check indicates the correction factor has changed, a minimum of two truckloads is required to reestablish the correction factor. The correction factor shall also be reestablished when significant changes in temperature, distance, pump or conveyor arrangement, and other factors have occurred. If the correction factor is greater than 3.0 percent, the Contractor shall take corrective action to reduce the loss of air content during transport by the pump or conveyor. The Contractor shall record all air content test results, correction factors, and corrected air contents.
- MA** Initial target slumps are allowed to be higher to compensate for slump loss at end of the hose. Acceptance criteria is still the same.

Powered by  SurveyMonkey**Q19: Where are concrete samples taken when pumping?**

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- MI** All Quality Assurance (QA) Acceptance testing samples are taken from the point of discharge from the haul unit (per 1003.03.H) prior to the pump. MDOT also requires both QA and Quality Control (QC) to perform a loss/gain of air check through the pump, per 1003.03.H (QA) and 1003.03.F (QC). This test requires a sample off the haul unit prior to the pump and a sample after the pump. The measured air between the two locations cannot differ by more than 1.5%. This test is performed at initial startup, anytime the pump truck is moved and anytime the Engineer deems the angle of the pump truck boom has significantly changed (such as going from an A frame shape to flat).
- MN** MnDOT acceptance is at the point of placement so acceptance would be at the end of the pump, but do allow correlation testing to be performed before and after the pump and then use testing results from before the pump if sampling and testing is impractical at the point of placement. We recommend correlation testing at least twice a day when that method is used.
- MO** Recently starting testing before pumping based on work done by Oklahoma State University.
- UT** We're moving towards samples taken before the pump based on work done by Tyler Ley. State funded jobs, yes. Federal funded jobs no.

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- WA 6-02.3(5)E Point of Acceptance Determination of concrete properties for acceptance will be made based on samples taken as follows: Bridge decks, overlays, bridge approach slabs, and barriers at the discharge of the placement system. All other placements at the truck discharge. It shall be the Contractor's responsibility to provide adequate and representative samples of the fresh concrete to a location designated by the Engineer for the testing of concrete properties and making of cylinder specimens. Samples shall be provided as directed in Sections 1-06.1 and 1-06.2. Once the Contractor has turned over the concrete for acceptance testing, no more mix adjustment will be allowed. The concrete will either be accepted or rejected.
- WY Recently changed from taking samples at end of pump to taking samples before the pump.

Powered by  SurveyMonkey**Q20: Any Additional Comments?**

CA - Caltrans is working with industry to move towards performance-based specifications as part of Caltrans-industry goals.

MA - MassDOT is currently in the midst of a complete re-write of our materials and construction specifications for cement concrete with the goal of incorporating the latest methods, techniques, materials, and technologies. **The National Concrete Consortium has been an unbelievable resource for us during the development of this new concrete specification and we appreciate it!**

NC - Link to NCDOT Specifications:
<https://connect.ncdot.gov/resources/Specifications/StandSpecLibrary/2018%20Standard%20Specifications%20for%20Roads%20and%20Structures.pdf>

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