

Concrete Construction Special Inspector Certification

*This is a review course lead by Karin T. O'Brien, P.E, LEED AP
Tentative schedule only, subject to change based on pace of review.*

<u>Part 1</u> • Paperwork review • Success in ACI certifications • Concrete fundamentals • Terminology • Moisture corrections • Fineness Modulus	<u>Part 3</u> • Hot and Cold weather • Tolerances • Plans Reading <u>Part 3 (CTCI Only)</u> • Roller Compacted Concrete • Drilled Piers & Piles • Soil Cement • Highway Bridge Deck & Pavement Bases
<u>Part 2</u> • Manual of Concrete Inspection • Measuring, mixing, transporting • Vibration • Consolidation • Pumping • Curing procedures	<u>Part 4</u> • Formwork • CRSI Steel Manual • Lightweight Aggregate • Floors and Slabs (<i>CCSI Only</i>)
	<u>Part 5</u> • CRSI Steel Manual • Specifications and design codes • Review of Questions and Assignments

Bio of Karin T. O'Brien

[Karin T. O'Brien](#) is a concrete materials engineer who has served the concrete industry for over 25 years, specializing in sustainability, materials (admixtures, cement and aggregate production) and concrete materials testing in the USA, México and abroad. She works to further quality, integrity, and specification within the concrete industry through certification and education. Karin delivers engaging educational reviews for many ACI Certifications, including Flatwork Finisher and Concrete Special Inspector programs, across the globe.

Karin currently is a Project Engineer for Terracon Consultants, LLC. Nationally she serves as a voting member of American Concrete Institute's (ACI) Certification Programs Committee and as an officer of E702, Designing Concrete Structures; and 120, History of Concrete. She currently is Chair of C630, Concrete Special Inspector. She was previously active in various local chapters of American Concrete Institute, including Centro Mexico y Sur, Greater Michigan, Illinois, Missouri and Rocky Mountain chapters.

She currently serves as President of the [Carbon Zero Youth Initiative](#), dedicated to educating and empowering youth about the effect building materials has on the carbon load of the built environment. She is a licensed Professional Engineer in Illinois and a proud graduate of the University of Michigan. Karin appreciates the vast beauty of the great outdoors, Missouri native plants and America's National Parks, is a voracious parent volunteer supporting her kids' high school marching band and various sports endeavors.

Transportation Inspector – Sample Questions

1. The maximum size of aggregates must be not more than:

- A. One- fifth narrowest dimension between sides of forms
- B. One - third depth of slab
- C. three fourth the minimum clear distance between reinforcing bars
- D. All of the above

2. The design of the formwork is the responsibility of the:

- A. Contractor
- B. Engineer
- C. Architect
- D. Structural Engineer

3. The proper way to fix a rock pocket is to:

- A. Shovel mortar on top of it
- B. Shovel soft or very fluid concrete into it
- C. Shovel rocks from the rock pocket into softer sand areas and vibrate
- D. Vibrate area until rock pocket is no longer visible

4. Aggregates should be placed as close to the concrete batch operations as possible. (T or F) _____

5. During hot weather it is advisable to:

- A. Keep aggregates cool
- B. Have stand by vibrators available
- C. Place concrete in shallow lifts
- D. All of the above

6. When placing concrete in cold weather

- A. Use 8-12 % air content
- B. Have higher slump
- C. Increase the amount of Retarders
- D. Have lower slump

7. _____ 6" X 12" and _____ 4" X 8 cylinders are needed for acceptance testing.

8. _____ 3" X 6" and _____ Splitting cylinders are needed for acceptance testing.

9. The grade mark on steel or minimum yield is in what location on the bar? _____

10. Concrete bar supports are made from how many materials? _____

11. Concrete surfaces are to be cured for at least _____ days.

12. The radius of action of a 2" vibrator is 12". What is the distance between insertions? _____

13. Record of concrete inspections must be kept for _____ years

14. Reinforcement embedded in concrete should be bent:

- A. After permission by the engineer
- B. After the concrete has 80% of its design strength
- C. Before the concrete obtain 80% of its design strength
- D. After heating the reinforcement to 1500 F

15. The _____ method can be used to determine concrete strength by using the time and temperature.

16. When pumping concrete

- A. There is a significant loss in strength
- B. Ok in hot weather but never in cold weather
- C. Allows the contractor to reduce the amount of chemical admixtures in the mixture
- D. Can be used to pump concrete with angular coarse aggregates

17. A change in aggregate gradations will require an adjustment to the amount of air entraining admixtures (T or F) _____

18. The contractor has concrete paste splattered onto the reinforcing bar from a previous placement. Attempts to remove it were unsuccessful.

What should the contractor do? _____

19. The mass of water to the mass of cement is called? _____

20. Scaling is a result of:

- A. Under vibration**
- B. Excessive entrained air in the concrete**
- C. Finishing the concrete with bleed water on the surface**
- D. All the above**

21. What is the primary reason we entrain air in concrete? _____

22. The criteria for removing formwork is based on what strength test? _____

23. Which statement is NOT true for concrete in hot weather?

- A. Develop higher early strength**
- B. Has increased durability**
- C. Has lower 28 day strength**
- D. Demands more water when placed**

24. Acceptance cylinders in hot weather shall require:

- A. Special attention to curing and protection**
- B. Kept in the field for 7 days**
- C. Kept wet periodically**
- D. Placed in a special container**

25. Cold weather concreting requires:

- A. Keeping the cylinder from freezing**
- B. Limiting rapid concrete temperature changes**
- C. Keeping the cylinders at 60-80 F while in the field**
- D. All the above**

26. The criteria form removal can be based on:

- A. An arbitrary time duration**
- B. 3 day lab cured cylinders**
- C. 7 day lab cured cylinders**
- D. In-situ strength as determined by field cured cylinders**

27. The air temperature is 95 F, concrete temperature is 60 F, wind velocity is 5mph and relative humidity is 30%.

- a. Determine the evaporation rate_____.**
- b. Is plastic shrinkage expected? _____**

28. Cover of the reinforcement for a footing cast against earth is _____

29. The total volume of concrete in a concrete mixer is _____.

30. When consolidating concrete, the vibration pattern should be determined by:

- A. Concrete Superintendent**
- B. Project Engineer**
- C. Radius of action**
- D. Length Of the vibrator head**

31. A complete record of concrete inspection is to be kept by _____

32. Pour lines are caused by:

- A. Bleeding**
- B. Honeycombing**
- C. Leaky forms**
- D. Vibrator not inserted far enough in the previous layer**

33. A concrete mixture was submitted to you. It has a specified w/cm of 0.40 and f'_c of 3500 psi. The concrete will be exposed to sea water.

Does this mixture meet ACI 318 criteria? _____

34. Field concrete cylinders should be taken at what interval? _____

35. Three cores from a project were 3720 psi, 3190 psi and 3640 psi. The design strength was 4000 psi. The concrete should be:

- A. Accepted based on the average and individual reading**
- B. Rejected because of the average value was lower than 4000 psi**
- C. Accepted because no strength was lower than 3000 psi**
- D. Rejected because of the highest and lowest value**

36. The footing thickness is specified to be 30 inches, however it is only 28 Inches.

- a. Is the footing OK as placed? _____**
- b. What do we need to do (if anything)? _____.**

37. Whom is responsible for determining when shoring is to be removed? _____

38. A #14 reinforcement with a _____ shape was fabricated 2" short.

- a. Is it OK? _____**

b. Would your answer change if it was a #10 reinforcement? _____

39. In cold weather, the surface temperature of the deck or soil must be:

- A. 25 F B. 40 F C. above freezing D. within 5 F of the concrete temperature**

40. Plastic Shrinkage Cracks results from:

- A. Temperature of the air over 95 F**
B. Temperature of the concrete over 95 F
C. Bleed rate exceeding the rate of evaporation
D. Evaporation rate exceeding the bleed rate

41. How much calcium chloride can be used in prestressed concrete? _____

42. Can I use aluminum pipelines for a pumping project? _____

43. I am doing a project and need to develop concrete strength as soon as possible.

What cement should I use? _____

44. HRWR can be used to increase slump during hot weather concreting?

Yes or No? _____

45. Aggregates make up about what % of a total mixture?

- A. 30% B. 50% C. 70% D. 90%**

46. Concrete needs to obtain what strength before a single freeze- thaw cycle?

- A. Design strength B. Design strength - 500 psi C. 500 psi D. 1000 psi**

47. What is the minimum design strength for concrete?

- a. According to ACI 318 _____ b. According to ICC _____**

48. How does grading of lightweight aggregates differ from normal weight aggregates? _____

**49. What level does concrete need to be maintained above the bottom of a caisson?
_____**

50 What tolerance must be maintained when driving a pile in uniform soil? _____

51. What is the minimum thickness for a bridge deck? _____

52. What must you do if using cotton mats or burlap for curing? _____

**53. What are the 2 ways of determining the amount of cement in Soil Cement?
_____**

TRANSPORTATION Inspector

Assignment # 1

Determine the Fineness Modulus (FM) of this fine aggregate

Sieve	% Passing	
3/8"	100	
#4	96	
#8	87	
#16	69	
#30	50	
#50	25	
#100	5	

a. The FM is _____

b. If the FM increases, is the material finer or coarser?

c. How is the FM used for mixture design?

Assignment # 2

Given the following Mixture Design (in pounds)

Cement	400
Fly ash	100
Water	200
Fine aggregates	1300
Coarse aggregates	2000

Lab test show the absorption (SSD) to be 1%

Today we measured the moisture in the fine aggregate stockpile to be 5%

- a. Adjust the mixture to account for the “wet fine aggregates”**
- b. What is the unit weight of this mixture design in pcf?**
- c. Is this concrete an air entrained concrete (explain your answer)?**

Assignment # 3

a. If we have a one hour haul distance and the required jobsite temperature is 50 F, the air temperature is 25 F and we are delivering the concrete in an open dump truck:

1. What is the temperature loss?

2. What temperature must be the concrete be batched at?

b. Why must snow and ice be removed from the forms prior to placement/ Give one method to do this?

c. Would I use Type II for construction of a sewage placement plant?

d. I am reviewing a 4500 psi mixture design provide by the batch plant. They do not have a standard deviation for this particular mixture. What average strength will be required before I can send it off to the engineer for his/her approval?

e. What is re-tempering? Should it be allowed on my project?

Assignment # 4

- a. What is the tolerance for the top surface of a foundation?**
- b. What is the tolerance for a door (opening) in a wall?**
- c. What is the tolerance for fine graded material immediately below a slab on ground?**
- d. what is the absolute volume of the cement and fine aggregates in a lab mixture:**
 - 1. 80 pounds of cement, specific gravity 3.15**
 - 2. 175 pounds of fine aggregates, specific gravity 2.4**
- e. Who determines when shoring and formwork can be removed?**
- f. What is the vertical design load for formwork if a motorized cart is used?**

Assignment # 5

- a. What is the definition of hot weather concreting?**
- b. What is the definition of cold weather concreting?**
- c. What do we do when the temperature is below 40 F or above 95 F?**
- d. When can Calcium chloride not be used according to ACI 318?**
- e. What is the contractor supposed to do when the reinforcement must be moved more than specified tolerance?**
- f. What is the tolerance for:**
 - 1. Batch water?**
 - 2. Aggregates?**
 - 3. Reinforcement location?**
 - 4. Water stops?**

Plans Reading - Concrete Transportation Special Inspector

- 1. What are the details of the strands?**
- 2. How many feet of wire stands are needed?**
- 3. How wide is the bottom of the beam?**
- 4. How wide is the mid-depth of the beam?**
- 5. How wide is the top of the beam?**
- 6. How strong is the concrete required to be at “transfer of prestressing”**
- 7. What is the length of steel of 4B4?**
- 8. What load should the steel be at pretensioned?**
- 9. How much concrete is needed per beam?**
- 10. What type of finish should the top surface have?**