Registration form

Basic Concrete CEU Course $50.00

48 HOUR RUSH ORDER PROCESSING FEE ADDITIONAL $25.00

Start and Finish Dates: _____
You will have 90 days from this date in order to complete this course

Name_____Signature_____
I have read and understood the disclaimer notice on page 2. Digitally sign XXX

Address: _____

City_____State_____Zip_____

Email_____ Fax (____) _____

Phone:
Home (____) _____ Work (____) _____

Operator ID #_____Exp. Date_____

Class/Grade_____

Please circle/check which certification you are applying the course CEU's.
Water Treatment___ Distribution ___ Collection___ Wastewater Treatment ___

Onsite_____ CCB $50_____ Other _____

Technical Learning College PO Box 3060, Chino Valley, AZ 86323
Toll Free (866) 557-1746 Fax (928) 272-0747 info@tlch2o.com

If you've paid on the Internet, please write your Customer#_____

Please invoice me, my PO#_____

Please pay with your credit card on our website under Bookstore or Buy Now. Or call us and provide your credit card information.

We will stop mailing the certificate of completion so we need either your fax number or e-mail address. We will e-mail the certificate to you, if no e-mail address; we will fax it to you.

DISCLAIMER NOTICE

I understand that it is my responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. I understand State laws and rules change on a frequent basis and I believe this course is currently accepted in my State for CEU or contact hour credit, if it is not, I will not hold Technical Learning College responsible. I fully understand that this type of study program deals with dangerous, changing conditions and various laws and that I will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable in any fashion for any errors, omissions, advice, suggestions or neglect contained in this CEU education training course or for any violation or injury, death, neglect, damage or loss of your license or certification caused in any fashion by this CEU education training or course material suggestion or error or my lack of submitting paperwork. It is my responsibility to call or contact TLC if I need help or assistance and double-check to ensure my registration page and assignment has been received and graded. It is my responsibility to ensure all information is correct and to abide with all rules and regulations.

State Approval Listing Link, check to see if your State accepts or has pre-approved this course. Not all States are listed. Not all courses are listed.

Professional Engineers; Most states will accept our courses for credit but we do not officially list the States or Agencies. Please check your State for approval.

You can obtain a printed version of the course manual from TLC for an additional $89.95 plus shipping charges.

AFFIDAVIT OF EXAM COMPLETION

I affirm that I personally completed the entire text of the course. I also affirm that I completed the exam without assistance from any outside source. I understand that it is my responsibility to file or maintain my certificate of completion as required by the state or by the designation organization.

Grading Information

In order to maintain the integrity of our courses we do not distribute test scores, percentages or questions missed. Our exams are based upon pass/fail criteria with the benchmark for successful completion set at 70%. Once you pass the exam, your record will reflect a successful completion and a certificate will be issued to you.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we have received your assignment and to confirm your identity. Thank you…

All downloads are electronically tracked and monitored for security purposes.

Some States and many employers require the final exam to be proctored.
http://www.abctlc.com/downloads/PDF/PROCTORFORM.pdf

Basic Concrete Course Answer Key

Name_____

Phone #_____

You are solely responsible to ensure that your State will accept this course for credit. Did you check with your State agency to ensure this course is accepted for credit? <u>No refunds</u>.

Method of Course acceptance confirmation. Please fill this section

Website __ Telephone Call___ Email____ Spoke to_____

Did you receive the approval number if Applicable? _____

What is the approval number if Applicable? _____

Multiple Choice. Pick only one answer per question. Select answer according to text, exactly as in text. Circle, Mark off, underline or Bold the answer.

1. A B C D E F	19. A B C D E F	37. A B C D E F
2. A B C D E F	20. A B C D E F	38. A B C D E F
3. A B C D E F	21. A B C D E F	39. A B C D E F
4. A B C D E F	22. A B C D E F	40. A B C D E F
5. A B C D E F	23. A B C D E F	41. A B C D E F
6. A B C D E F	24. A B C D E F	42. A B C D E F
7. A B C D E F	25. A B C D E F	43. A B C D E F
8. A B C D E F	26. A B C D E F	44. A B C D E F
9. A B C D E F	27. A B C D E F	45. A B C D E F
10. A B C D E F	28. A B C D E F	46. A B C D E F
11. A B C D E F	29. A B C D E F	47. A B C D E F
12. A B C D E F	30. A B C D E F	48. A B C D E F
13. A B C D E F	31. A B C D E F	49. A B C D E F
14. A B C D E F	32. A B C D E F	50. A B C D E F
15. A B C D E F	33. A B C D E F	51. A B C D E F
16. A B C D E F	34. A B C D E F	52. A B C D E F
17. A B C D E F	35. A B C D E F	53. A B C D E F
18. A B C D E F	36. A B C D E F	54. A B C D E F

55. A B C D E F
56. A B C D E F
57. A B C D E F
58. A B C D E F
59. A B C D E F
60. A B C D E F
61. A B C D E F
62. A B C D E F
63. A B C D E F
64. A B C D E F
65. A B C D E F
66. A B C D E F
67. A B C D E F
68. A B C D E F
69. A B C D E F
70. A B C D E F
71. A B C D E F
72. A B C D E F
73. A B C D E F
74. A B C D E F
75. A B C D E F
76. A B C D E F
77. A B C D E F
78. A B C D E F
79. A B C D E F
80. A B C D E F
81. A B C D E F
82. A B C D E F
83. A B C D E F
84. A B C D E F
85. A B C D E F
86. A B C D E F
87. A B C D E F
88. A B C D E F
89. A B C D E F
90. A B C D E F
91. A B C D E F
92. A B C D E F
93. A B C D E F
94. A B C D E F
95. A B C D E F
96. A B C D E F
97. A B C D E F
98. A B C D E F
99. A B C D E F
100. A B C D E F

Additional certificate for another Agency – additional fee $25

Please fax or e-mail the answer key to TLC
Western Campus Fax (928) 272-0747.

Rush Grading Service
If you need this assignment graded and the results mailed to you within a 48-hour period, prepare to pay an additional rush service handling fee of $50.00. This fee may not cover postage costs. If you need this service, simply write RUSH on the top of your Registration Form. We will place you in the front of the grading and processing line.

For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we have received your assignment and to confirm your identity. Thank you…

Please e-mail or fax this survey with your final exam

BASIC CONCRETE CEU COURSE
CUSTOMER SERVICE RESPONSE CARD

NAME: _____

E-MAIL_____PHONE_____

PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.

1. Please rate the difficulty of your course.
   Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.
   Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.
   Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? _____

5. What would you do to improve the Course?

How about the price of the course-

Poor_____ Fair ____ Average ____ Good____ Great_____

How was your customer service-

Poor___ Fair ____ Average ____ Good _____ Great_____

Any other concerns or comments.

Basic Concrete Training Course Assignment

The Assignment (Exam) is also available in Word on the Internet for your Convenience, please visit www.ABCTLC.com and download the assignment and e- mail it back to TLC.

You'll have 90 days from the start of this course to complete in order to receive your Professional Development Hours (**PDHs**) or Continuing Education Unit (**CEU**). A score of 70 % is necessary to pass this course. We prefer if this exam is proctored. No intentional trick questions. If you should need any assistance, please email all concerns and the completed manual to info@tlch2o.com.

We would prefer that you utilize the enclosed answer sheet in the front, but if you are unable to do so, type out your own answer key. Please include your name and address on your manual and make copy for yourself. You can e-mail or fax your Answer Key along with the Registration Form to TLC. **(S) Means answer may be plural or singular**. **Multiple Choice Section, One answer per question and please use the answer key.**

What is Concrete?

1. Concrete is a _____composed mainly of water, aggregate, and cement. Often, additives and reinforcements are included in the mixture to achieve the desired physical properties of the finished material. When these ingredients are mixed together, they form a fluid mass that is easily molded into shape.

A. Rock-like substance
B. Electrical conductivity
C. Composite material
D. Hard matrix
E. Raw material
F. None of the Above

2. Over time, the cement forms a _____ which binds the rest of the ingredients together into a durable stone-like material with many uses.

A. Rock-like substance
B. All industry specifications
C. Concrete
D. Naturally occurring stone
E. Hard matrix
F. None of the Above

Modern Concrete Additives

3. In modern times, researchers have experimented with the addition of other materials to create concrete with_____ , such as higher strength, electrical conductivity, or resistance to damages through spillage.

A. Rock-like substance
B. Electrical conductivity
C. Concrete
D. Steel, wood, plastics, and aluminum
E. Improved properties
F. None of the Above

Modern Concrete Use

4. Concrete is widely used for making architectural structures, foundations, brick/block walls, pavements, bridges/overpasses, highways, runways, parking structures, dams, pools/reservoirs, pipes, footings for gates, fences and poles and even boats. Concrete is used in large quantities almost everywhere mankind has a need for_____.

A. Cement
B. All industry specifications
C. Concrete
D. Infrastructure
E. Hard matrix
F. None of the Above

5. _____used worldwide, ton for ton, is twice that of steel, wood, plastics, and aluminum combined.

A. Rock-like substance
B. Electrical conductivity
C. Concrete
D. The amount of concrete
E. The finely ground raw material
F. None of the Above

6. _____ in the modern world is exceeded only by that of naturally occurring water.

A. Cement
B. All industry specifications
C. Concrete
D. Concrete's use
E. Hard matrix
F. None of the Above

Portland Cement

7. Portland cement is the basic ingredient of concrete. Concrete is formed when Portland cement creates a paste with water that binds with _____ to harden.

A. Rock-like substance
B. Sand and rock
C. Concrete
D. Steel, wood, plastics, and aluminum
E. The finely ground raw material
F. None of the Above

8. Cement is manufactured through a closely controlled chemical combination of calcium, silicon, aluminum, iron and_____.

A. Cement
B. Other ingredients
C. Concrete
D. Common materials
E. Hard matrix
F. None of the Above

9. _____used to manufacture cement include limestone, shells, and chalk or marl combined with shale, clay, slate, blast furnace slag, silica sand, and iron ore. These ingredients, when heated at high temperatures form a rock-like substance that is ground into the fine powder that we commonly think of as cement.

A. Rock-like substance
B. Portland cement
C. Concrete
D. Common materials
E. The finely ground raw material
F. None of the Above

10. Cement plant laboratories check each step in the manufacture of _____by frequent chemical and physical tests. The labs also analyze and test the finished product to ensure that it complies with all industry specifications. The most common way to manufacture Portland cement is through a dry method.

A. Cement
B. All industry specifications
C. Concrete
D. Portland cement
E. Hard matrix
F. None of the Above

11. The first step is to quarry the_____, mainly limestone, clay, and other materials. After quarrying the rock is crushed. This involves several stages. The first crushing reduces the rock to a maximum size of about 6 inches.

A. Rock-like substance
B. Cement
C. Concrete
D. Principal raw materials
E. The finely ground raw material
F. None of the Above

12. The _____ then goes to secondary crushers or hammer mills for reduction to about 3 inches or smaller. The crushed rock is combined with other ingredients such as iron ore or fly ash and ground, mixed, and fed to a cement kiln.

A. Cement
B. All industry specifications
C. Concrete
D. Rock
E. Hard matrix
F. None of the Above

13. The large kilns are mounted with the axis inclined slightly from the horizontal. _____ or the slurry is fed into the higher end. At the lower end is a roaring blast of flame, produced by precisely controlled burning of powdered coal, oil, alternative fuels, or gas under forced draft.

A. Rock-like substance
B. Electrical conductivity
C. Concrete
D. Clinker
E. The finely ground raw material
F. None of the Above

14. As the material moves through the kiln, certain elements are driven off in the form of gases. The remaining elements unite to form a new substance called _____.

A. Clinker
B. Limestone
C. Wet process
D. Form of gases
E. Cement
F. None of the Above

15. _____ comes out of the kiln as grey balls, about the size of marbles.

A. Clinker
B. Limestone
C. Wet process
D. Form of gases
E. Cement
F. None of the Above

16. _____ is discharged red-hot from the lower end of the kiln and generally is brought down to handling temperature in various types of coolers. The heated air from the coolers is returned to the kilns, a process that saves fuel and increases burning efficiency.

A. Clinker
B. Limestone
C. Wet process
D. Form of gases
E. Cement
F. None of the Above

17. After the clinker is cooled, cement plants grind it and mix it with small amounts of_____ . Cement is so fine that 1 pound of cement contains 150 billion grains.

A. Clinker
B. Limestone
C. Wet process
D. Form of gases
E. Gypsum and limestone
F. None of the Above

18. The _____ is now ready for transport to ready-mix concrete companies to be used in a variety of construction projects.

A. Clinker
B. Limestone
C. Wet process
D. Form of gases
E. Cement
F. None of the Above

19. Although the dry process is the most modern and popular way to manufacture cement, some kilns in the United States use a wet process. The two processes are essentially alike except in the wet process, the _____are ground with water before being fed into the kiln.

A. Clinker
B. Limestone
C. Wet process
D. Raw material(s)
E. Cement
F. None of the Above

Composition of Concrete

20. _____ available, created by varying the proportions of the main ingredients below. In this way or by substitution for the cementitious and aggregate phases, the finished product can be tailored to its application with varying strength, density, or chemical and thermal resistance properties.

A. Portland cement
B. Water
C. There are many types of concrete
D. Chemical admixture(s)
E. Reinforcement(s)
F. None of the Above

21. "_____ " consists of large chunks of material in a concrete mix, generally coarse gravel or crushed rocks such as limestone, or granite, along with finer materials such as sand.

A. Mix design
B. Fly ash
C. Concrete
D. Aggregate
E. Binder for the aggregate
F. None of the Above

22. "_____", most commonly Portland cement is associated with the general term "concrete." A range of materials can be used as the cement in concrete. One of the most familiar of these alternative cements is asphalt.

A. Portland cement
B. Cement
C. Thermal resistance
D. Chemical admixture(s)
E. Reinforcement(s)
F. None of the Above

23. Other cementitious materials such as fly ash and slag cement, are sometimes added to _____ and become a part of the binder for the aggregate.

A. Mix design
B. Fly ash
C. Concrete
D. Portland cement
E. Binder for the aggregate
F. None of the Above

24. Water is then mixed with this_____, which produces a semi-liquid that workers can shape (typically by pouring it into a form).

A. Portland cement
B. Dry composite
C. Thermal resistance
D. Chemical admixture(s)
E. Reinforcement(s)
F. None of the Above

25. The concrete solidifies and hardens through a chemical process called hydration. The water reacts with the cement, which bonds the other components together, creating_____.

A. Mix design
B. Fly ash
C. Concrete
D. A robust stone-like material
E. Binder for the aggregate
F. None of the Above

26. "_____" are added to achieve varied properties. These ingredients may speed or slow down the rate at which the concrete hardens, and impart many other useful properties including increased tensile strength and water resistance.

A. Portland cement
B. Chemical mixtures
C. Thermal resistance
D. Chemical admixture(s)
E. Reinforcement(s)
F. None of the Above

27. "Reinforcements" are often added to _____.
A. Mix design D. Hydration
B. Fly ash E. Binder for the aggregate
C. Concrete F. None of the Above

28. _____can be formulated with high compressive strength, but always has lower tensile strength. For this reason it is usually reinforced with materials that are strong in tension (often steel).
A. Mix design D. Chemical process called hydration
B. Fly ash E. Binder for the aggregate
C. Concrete F. None of the Above

29. "_____" are becoming more popular in recent decades. The use of recycled materials as concrete ingredients has been gaining popularity because of increasingly stringent environmental legislation, and the discovery that such materials often have complementary and valuable properties.
A. Portland cement D. Chemical admixture(s)
B. Mineral admixtures E. Reinforcement(s)
C. Thermal resistance F. None of the Above

30. The most conspicuous of these are fly ash, a by-product of coal-fired power plants, and silica fume, a byproduct of industrial electric arc furnaces. The use of these materials in concrete reduces the amount of resources required, as the _____act as a cement replacement.
A. Mix design D. Hydration
B. Fly ash E. Binder for the aggregate
C. Ash and fume F. None of the Above

31. This displaces some _____production, an energetically expensive and environmentally problematic process, while reducing the amount of industrial waste that must be disposed of.
A. Portland cement D. Chemical admixture(s)
B. Cement E. Reinforcement(s)
C. Thermal resistance F. None of the Above

32. The _____ depends on the type of structure being built, how the concrete is mixed and delivered, and how it is placed to form the structure.
A. Mix design D. Chemical process called hydration
B. Fly ash E. Binder for the aggregate
C. Concrete F. None of the Above

Water

33. Combining water with a _____forms a cement paste by the process of hydration. The cement paste glues the aggregate together, fills voids within it, and makes it flow more freely.
A. Chemical admixture(s) D. Composite material
B. Cementitious material E. Cement paste
C. Concrete mixture(s) F. None of the Above

34. A lower water-to-cement ratio yields a stronger, more durable concrete, whereas more water gives a freer-flowing concrete with a higher slump. _____used to make concrete can cause problems when setting or in causing premature failure of the structure.
A. Chemical admixture(s) D. Composite material
B. Exposed aggregate(s) E. Cement paste
C. Concrete mixture(s) F. None of the Above

35. Hydration involves many different reactions, often occurring at the same time. As the reactions proceed, the products of the cement hydration process gradually bond together the individual sand and gravel particles and other components of the concrete to form _____.
A. Aggregate(s) D. Cementitious material
B. A solid mass E. Reinforced concrete
C. Strength gradients F. None of the Above

Aggregates

36. _____make up the bulk of a concrete mixture. Sand, natural gravel, and crushed stone are used mainly for this purpose.
A. Fine and coarse aggregates D. Composite material
B. Exposed aggregate(s) E. Cement paste
C. Concrete mixture(s) F. None of the Above

37. _____(from construction, demolition, and excavation waste) are increasingly used as partial replacements of natural aggregates, while a number of manufactured aggregates, including air-cooled blast furnace slag and bottom ash are also permitted.
A. Aggregate(s) D. Cementitious material
B. Recycled aggregates E. Reinforced concrete
C. Strength gradients F. None of the Above

38. The presence of _____greatly increases the durability of concrete above that of cement, which is a brittle material in its pure state. Thus concrete is a true composite material.
A. Chemical admixture(s) D. Aggregate
B. Exposed aggregate(s) E. Cement paste
C. Concrete mixture(s) F. None of the Above

39. Redistribution of _____ after compaction often creates inhomogeneity due to the influence of vibration. This can lead to strength gradients.
A. Aggregate(s) D. Cementitious material
B. Hydration E. Reinforced concrete
C. Strength gradients F. None of the Above

40. Decorative stones such as quartzite, small river stones or crushed glass are sometimes added to the surface of concrete for a decorative "_____" finish, popular among landscape designers. In addition to being decorative, exposed aggregate adds robustness to a concrete driveway.
A. Chemical admixture(s) D. Composite material
B. Exposed aggregate(s) E. Cement paste
C. Concrete mixture(s) F. None of the Above

Reinforcement

41. Concrete is strong in compression, as the _____efficiently carries the compression load. However, it is weak in tension as the cement holding the aggregate in place can crack, allowing the structure to fail. Reinforced concrete adds steel reinforcing bars, steel fibers, glass fibers, or plastic fibers to carry tensile loads.

A. Aggregate(s)
B. Hydration
C. Strength gradients
D. Cementitious material
E. Reinforced concrete
F. None of the Above

Chemical Admixtures

42. _____ are materials in the form of powder or fluids that are added to the concrete to give it certain characteristics not obtainable with plain concrete mixes. In normal use, admixture dosages are less than 5% by mass of cement and are added to the concrete at the time of batching/mixing.

A. Chemical admixture(s)
B. Exposed aggregate(s)
C. Concrete mixture(s)
D. Composite material
E. Cement paste
F. None of the Above

43. Accelerating _____are especially useful for modifying the properties of concrete in cold weather.

A. Air entrainment(s)
B. Accelerating admixture(s)
C. Defoamer(s)
D. Superplasticizer(s)
E. Admixtures
F. None of the Above

44. _____slow the hydration of concrete and are used in large or difficult pours where partial setting before the pour is complete is undesirable. Typical polyol retarders are sugar, sucrose, sodium gluconate, glucose, citric acid, and tartaric acid.

A. Bonding agent(s)
B. Superplasticizer(s)
C. Plasticizer(s)
D. Retarders
E. Latent hydraulic properties
F. None of the Above

45. Air entrainments add and entrain tiny air bubbles in the concrete, which reduces damage during freeze-thaw cycles, increasing durability. However, entrained air entails a trade off with strength, as each 1% of air may decrease compressive strength 5%. If too much air becomes trapped in the concrete as a result of the mixing process, _____can be used to encourage the air bubble to agglomerate, rise to the surface of the wet concrete and then disperse.

A. Air entrainment(s)
B. Accelerating admixture(s)
C. Defoamer(s)
D. Superplasticizer(s)
E. Corrosion inhibitor(s)
F. None of the Above

46. _____ increase the workability of plastic or "fresh" concrete, allowing it be placed more easily, with less consolidating effort. A typical plasticizer is lignosulfonate.

A. Bonding agent(s)
B. Superplasticizer(s)
C. Plasticizer(s)
D. Portland cement (blended cements)
E. Latent hydraulic properties
F. None of the Above

47. _____ can be used to reduce the water content of a concrete while maintaining workability and are sometimes called water-reducers due to this use. Such treatment improves its strength and durability characteristics.

A. Bonding agent(s)
B. Superplasticizer(s)
C. Plasticizer(s)
D. Portland cement (blended cements)
E. Latent hydraulic properties
F. None of the Above

48. _____ (also called high-range water-reducers) are a class of plasticizers that have fewer deleterious effects and can be used to increase workability more than is practical with traditional plasticizers.

A. Air entrainment(s)
B. Accelerating admixture(s)
C. Defoamer(s)
D. Superplasticizer(s)
E. Corrosion inhibitor(s)
F. None of the Above

49. _____include sulfonated naphthalene formaldehyde condensate, sulfonated melamine formaldehyde condensate, acetone formaldehyde condensate and polycarboxylate ethers.

A. Bonding agent(s)
B. Superplasticizer(s)
C. Plasticizer(s)
D. Portland cement (blended cements)
E. Compounds used as superplasticizers
F. None of the Above

50. _____are used to minimize the corrosion of steel and steel bars in concrete.

A. Air entrainment(s)
B. Accelerating admixture(s)
C. Defoamer(s)
D. Superplasticizer(s)
E. Corrosion inhibitor(s)
F. None of the Above

51. _____ are used to create a bond between old and new concrete (typically a type of polymer) with wide temperature tolerance and corrosion resistance.

A. Bonding agent(s)
B. Superplasticizer(s)
C. Plasticizer(s)
D. Portland cement (blended cements)
E. Latent hydraulic properties
F. None of the Above

52. _____improve pumpability, thicken the paste and reduce separation and bleeding.

A. Air entrainment(s)
B. Accelerating admixture(s)
C. Defoamer(s)
D. Superplasticizer(s)
E. Corrosion inhibitor(s)
F. None of the Above

Mineral Admixtures and Blended Cements

53. _____that have pozzolanic or latent hydraulic properties, these very fine-grained materials are added to the concrete mix to improve the properties of concrete (mineral admixtures), or as a replacement for Portland cement (blended cements).

A. Bonding agent(s)
B. Superplasticizer(s)
C. Plasticizer(s)
D. Portland cement (blended cements)
E. Inorganic materials
F. None of the Above

54. _____s which incorporate limestone, fly ash, blast furnace slag, and other useful materials with pozzolanic properties into the mix, are being tested and used.

A. Bonding agent(s)
B. Superplasticizer(s)
C. Plasticizer(s)
D. Portland cement (blended cements)
E. Latent hydraulic properties
F. None of the Above

55. This development is due to _____ production being one of the largest producers (at about 5 to 10%) of global greenhouse gas emissions, as well as lowering costs, improving concrete properties, and recycling wastes.

A. Air entrainment(s)
B. Accelerating admixture(s)
C. Defoamer(s)
D. Superplasticizer(s)
E. Cement
F. None of the Above

56. Fly ash: A by-product of coal-fired electric generating plants, it is used to partially replace _____ (by up to 60% by mass).

A. Bonding agent(s)
B. Superplasticizer(s)
C. Plasticizer(s)
D. Portland cement
E. Latent hydraulic properties
F. None of the Above

57. The properties of _____depend on the type of coal burnt. In general, siliceous fly ash is pozzolanic, while calcareous fly ash has latent hydraulic properties.

A. Concrete production
B. Water
C. Superplasticizer(s)
D. Addition of various additives
E. Fly ash
F. None of the Above

58. Ground granulated blast furnace slag (GGBFS or GGBS): A by-product of steel production is used to partially replace _____(by up to 80% by mass). It has latent hydraulic properties.

A. Concrete
B. Silica fume
C. Reactive ingredient(s)
D. Cement
E. Portland cement
F. None of the Above

59. Silica fume: A byproduct of the production of silicon and ferrosilicon alloys. Silica fume is similar to fly ash, but has a particle size 100 times smaller. This results in a higher surface-to-volume ratio and a much faster pozzolanic reaction. _____is used to increase strength and durability of concrete, but generally requires the use of superplasticizers for workability.

A. Concrete production
B. Silica fume
C. Superplasticizer(s)
D. Addition of various additives
E. The properties of fly ash
F. None of the Above

60. High reactivity Metakaolin (HRM): Metakaolin produces concrete with strength and durability similar to concrete made with _____. While silica fume is usually dark gray or black in color, high-reactivity metakaolin is usually bright white in color, making it the preferred choice for architectural concrete where appearance is important.

A. Concrete
B. Silica fume
C. Reactive ingredient(s)
D. Cement
E. Aggregate
F. None of the Above

Concrete Production

61. Concrete production is the process of mixing together the various ingredients—water, aggregate, cement, and any additives—to produce concrete. _____production is time-sensitive.

A. Concrete
B. Water
C. Superplasticizer(s)
D. Addition of various additives
E. The properties of fly ash
F. None of the Above

62. Once the ingredients are mixed, workers must put the concrete in place before it hardens. In modern usage, most _____ production takes place in a large type of industrial facility called a concrete plant, or often a batch plant.

A. Concrete
B. Silica fume
C. Reactive ingredient(s)
D. Cement
E. Aggregate
F. None of the Above

63. In general usage, concrete plants come in two main types, ready mix plants and central mix plants. A ready mix plant mixes all the ingredients except water, while a central mix plant mixes all the ingredients including _____.

A. Concrete production
B. Water
C. Superplasticizer(s)
D. Addition of various additives
E. Aggregate
F. None of the Above

64. A central mix plant offers more accurate control of the _____ quality through better measurements of the amount of water added, but must be placed closer to the work site where the concrete will be used, since hydration begins at the plant.

A. Concrete
B. Silica fume
C. Reactive ingredient(s)
D. Cement
E. Aggregate
F. None of the Above

65. A concrete plant consists of large storage hoppers for various reactive ingredients like cement, storage for bulk ingredients like_____, mechanisms for the addition of various additives and amendments, machinery to accurately weigh, move, and mix some or all of those ingredients, and facilities to dispense the mixed concrete, often to a concrete mixer truck.

A. Concrete production
B. Water
C. Superplasticizer(s)
D. Addition of various additives
E. Aggregate and water
F. None of the Above

66. _____is usually prepared as a viscous fluid, so that it may be poured into forms, which are containers erected in the field to give the concrete its desired shape. There are many different ways in which concrete formwork can be prepared, such as Slip forming and Steel plate construction. Alternatively, concrete can be mixed into dryer, non-fluid forms and used in factory settings to manufacture Precast concrete products.

A. Modern concrete
B. Silica fume
C. Reactive ingredient(s)
D. Cement
E. Aggregate
F. None of the Above

67. There is a wide variety of equipment for processing concrete, from hand tools to heavy industrial machinery. Whichever equipment builders' use, however, the objective is to produce the desired building material; ingredients must be properly mixed, placed, shaped, and retained within time constraints. Once the mix is where it should be, the curing process must be controlled to ensure that the _____ attains the desired attributes. During concrete preparation, various technical details may affect the quality and nature of the product.

A. Concrete
B. Silica fume
C. Reactive ingredient(s)
D. Cement
E. Aggregate
F. None of the Above

More on Portland Cement

68. When initially mixed, Portland cement and water rapidly form a gel of tangled chains of interlocking crystals, and _____continue to react over time. Initially the gel is fluid, which improves workability and aids in placement of the material, but as the concrete sets, the chains of crystals join into a rigid structure, counteracting the fluidity of the gel and fixing the particles of aggregate in place.

A. HEM Nano concrete
B. Separate paste mixing
C. Volumetric stability
D. Quasi-laminar flow of the mixture
E. Components of the gel
F. None of the Above

69. During curing, the cement continues to react with the residual water in a process of hydration. In properly formulated concrete, once this curing process has terminated the product has the desired physical and_____.

A. Uniform mixture(s)
B. Residual water
C. Premixed paste
D. Cement hydration
E. Chemical properties
F. None of the Above

70. Among the qualities typically desired, are mechanical strength, low moisture permeability, and chemical and_____.

A. HEM Nano concrete
B. Separate paste mixing
C. Volumetric stability
D. Quasi-laminar flow of the mixture
E. Gel of tangled chains of interlocking crystals
F. None of the Above

Mixing Concrete

71. Thorough mixing is essential for the production of _____. For this reason equipment and methods should be capable of effectively mixing concrete materials containing the largest specified aggregate to produce uniform mixtures of the lowest slump practical for the work.

A. Uniform mixture(s)
B. Residual water
C. Premixed paste
D. Cement hydration
E. Uniform, high-quality concrete
F. None of the Above

72. Separate _____ mixing has shown that the mixing of cement and water into a paste before combining these materials with aggregates can increase the compressive strength of the resulting concrete.

A. Paste
B. Separate paste mixing
C. Volumetric stability
D. Quasi-laminar flow of the mixture
E. Gel of tangled chains of interlocking crystals
F. None of the Above

73. The paste is generally mixed in a high-speed, shear-type mixer at a w/cm (water to cement ratio) of 0.30 to 0.45 by mass. _____ may include admixtures such as accelerators or retarders, superplasticizers, pigments, or silica fume. The premixed paste is then blended with aggregates and any remaining batch water and final mixing is completed in conventional concrete mixing equipment.

A. Uniform mixture(s)
B. Residual water
C. Premixed paste
D. Cement hydration
E. The cement paste premix
F. None of the Above

Nano Concrete

74. Is created by_____ , sand and water using a specific consumed power of 30 - 600 watt/kg for a net specific energy consumption of at least 5 kJ/kg of the mix.

A. HEM Nano concrete
B. Separate paste mixing
C. Volumetric stability
D. Quasi-laminar flow of the mixture
E. High-energy mixing (HEM) of cement
F. None of the Above

75. A plasticizer or a superplasticizer is then added to the activated mixture which can later be mixed with aggregates in a conventional concrete mixer. In the _____sand provides dissipation of energy and increases shear stresses on the surface of cement particles.

A. Uniform mixture(s)
B. Residual water
C. Premixed paste
D. Cement hydration
E. HEM process
F. None of the Above

76. The quasi-laminar flow of the mixture characterized with Reynolds number less than 800 is necessary to provide more effective energy absorption. This results in the increased volume of water interacting with cement and acceleration of _____.

A. HEM Nano concrete
B. Separate paste mixing
C. Volumetric stability
D. Quasi-laminar flow of the mixture
E. Gel of tangled chains of interlocking crystals
F. None of the Above

77. The initial natural process of _____ with formation of colloidal globules about 5 nm in diameter after 3-5 min of HEM spreads out over the entire volume of cement – water matrix. HEM is the "bottom-up" approach in Nanotechnology of concrete.

A. Uniform mixture(s)
B. Residual water
C. Premixed paste
D. Cement hydration
E. Plasticizer or a superplasticizer
F. None of the Above

78. The liquid activated mixture is used by itself for casting small architectural details and decorative items, or foamed (expanded) for_____.

A. HEM Nano concrete
B. Separate paste mixing
C. Volumetric stability
D. Quasi-laminar flow of the mixture
E. Lightweight concrete
F. None of the Above

79. _____hardens in low and subzero temperature conditions and possesses an increased volume of gel, which drastically reduces capillarity in solid and porous materials.

A. HEM Nano concrete
B. Separate paste mixing
C. Volumetric stability
D. Quasi-laminar flow of the mixture
E. Gel of tangled chains of interlocking crystals
F. None of the Above

Workability

80. Workability is the ability of a fresh (plastic) concrete mix to fill the form/mold properly with the desired work (vibration) and without reducing the _____.

A. Water content
B. Concrete's quality
C. High-flow concrete
D. Concrete slump test
E. A relatively wet concrete sample
F. None of the Above

81. Workability depends on water content, aggregate (shape and size distribution), cementitious content and age (level of hydration) and can be modified by adding chemical admixtures, like _____.

A. Superplasticizer
B. Very low slump
C. Slump
D. Water-cement ratio
E. Cone on the narrow end
F. None of the Above

82. Raising the water content or adding _____increases concrete workability. Excessive water leads to increased bleeding (surface water) and/or segregation of aggregates (when the cement and aggregates start to separate), with the resulting concrete having reduced quality.

A. Water content
B. Concrete's quality
C. High-flow concrete
D. Concrete slump test
E. Chemical admixtures
F. None of the Above

83. The use of an aggregate with an undesirable gradation can result in a very harsh mix design with a very low slump, which cannot readily be made more workable by addition of reasonable amounts of_____.

A. Superplasticizer
B. Very low slump
C. Slump
D. Water-cement ratio
E. Water
F. None of the Above

Concrete Slump Test

84. Workability can be measured by the concrete slump test, a simplistic measure of the plasticity of a _____ following the ASTM C 143 or EN 12350-2 test standards.

A. Water content
B. Concrete's quality
C. High-flow concrete
D. Concrete slump test
E. Fresh batch of concrete
F. None of the Above

85. Slump is normally measured by filling an "Abrams cone" with a sample from a fresh batch of concrete. The cone is placed with the wide end down onto a level, non-absorptive surface. It is then filled in three layers of equal volume, with each layer being tamped with a steel rod to consolidate the_____.

A. Layer
B. Very low slump
C. Slump
D. Water-cement ratio
E. Cone on the narrow end
F. None of the Above

86. When the cone is carefully lifted off, the enclosed material slumps a certain amount, owing to gravity. A relatively dry sample slumps very little, having a slump value of one or two inches (25 or 50 mm) out of one foot (305 mm). _____ may slump as much as eight inches. Workability can also be measured by the flow table test.

A. Water content
B. Concrete's quality
C. High-flow concrete
D. Concrete slump test
E. A relatively wet concrete sample
F. None of the Above

87. _____ can be increased by addition of chemical admixtures such as plasticizer or superplasticizer without changing the water-cement ratio. Some other admixtures, especially air-entraining admixture, can increase the slump of a mix.

A. Superplasticizer
B. Very low slump
C. Slump
D. Water-cement ratio
E. Cone on the narrow end
F. None of the Above

88. _____, like self-consolidating concrete, is tested by other flow-measuring methods.

A. Water content
B. Concrete's quality
C. High-flow concrete
D. Concrete slump test
E. A relatively wet concrete sample
F. None of the Above

89. One of these methods includes placing the cone on the narrow end and observing how the mix flows through the cone while it is gradually lifted. After mixing, _____is a fluid and can be pumped to the location where needed.

A. Superplasticizer
B. Very low slump
C. Slump
D. Water-cement ratio
E. Concrete
F. None of the Above

Curing

90. In all but the_____, care must be taken to properly cure concrete, to achieve best strength and hardness. This happens after the concrete has been placed. Cement requires a moist, controlled environment to gain strength and harden fully. The cement paste hardens over time, initially setting and becoming rigid though very weak and gaining in strength in the weeks following. In around 4 weeks, typically over 90% of the final strength is reached, though strengthening may continue for decades.

A. Curing process
B. Least critical applications
C. Structure exploitation
D. Moist, controlled environment
E. Additional common curing method(s)
F. None of the Above

91. The conversion of calcium hydroxide in the concrete into calcium carbonate from _____ over several decades further strengthens the concrete and makes it more resistant to damage. However, this reaction, called carbonation, lowers the pH of the cement pore solution and can cause the reinforcement bars to corrode.

A. Absorption of CO_2
B. Properly curing concrete
C. Cement pore solution
D. Ill effects of ambient condition(s)
E. Greater shrinkage cracking
F. None of the Above

92. _____ of concrete during the first three days is critical.

A. Curing process
B. Hydration
C. Structure exploitation
D. Moist, controlled environment
E. Hydration and hardening
F. None of the Above

93. Abnormally fast drying and shrinkage due to factors such as evaporation from wind during placement may lead to increased tensile stresses at a time when it has not yet gained sufficient strength, resulting in _____.

A. High-early-strength concrete
B. Properly curing concrete
C. Cement pore solution
D. Ill effects of ambient condition(s)
E. Greater shrinkage cracking
F. None of the Above

94. The early strength of the concrete can be increased if it is kept damp during the curing process. Minimizing stress prior to_____ .

A. Curing process
B. Hydration
C. Structure exploitation
D. Curing minimizes cracking
E. Additional common curing method(s)
F. None of the Above

95. High-early-strength concrete is_____ , often by increased use of cement that increases shrinkage and cracking.

A. High-early-strength concrete
B. Properly curing concrete
C. Designed to hydrate faster
D. Ill effects of ambient condition(s)
E. Greater shrinkage cracking
F. None of the Above

96. The strength of concrete changes (increases) for up to three years. It depends on cross-section dimension of elements and_____ .

A. Curing process
B. Hydration
C. Structure exploitation
D. Conditions of structure exploitation
E. Additional common curing method(s)
F. None of the Above

97. Properly curing concrete leads to increased strength and lower permeability and avoids cracking where the surface dries out prematurely. Care must also be taken to avoid freezing or overheating due to the_____. Improper curing can cause scaling, reduced strength, poor abrasion resistance and cracking.

A. High-early-strength concrete
B. Properly curing concrete
C. Exothermic setting of cement
D. Ill effects of ambient condition(s)
E. Greater shrinkage cracking
F. None of the Above

Properties

98. Concrete has relatively high compressive strength, but much lower_____ . For this reason it is usually reinforced with materials that are strong in tension (often steel).

A. Curing process
B. Hydration
C. Structure exploitation
D. Moist, controlled environment
E. Tensile strength
F. None of the Above

99. The _____ is relatively constant at low stress levels but starts decreasing at higher stress levels as matrix cracking develops.

A. High-early-strength concrete
B. Properly curing concrete
C. Cement pore solution
D. Ill effects of ambient condition(s)
E. Elasticity of concrete
F. None of the Above

100. Concrete has a very low coefficient of thermal expansion and shrinks as it matures. All concrete structures crack to some extent, due to shrinkage and tension. Concrete that is subjected to _____is prone to creep.

A. Water content
B. Concrete's quality
C. High-flow concrete
D. Long-duration forces
E. A relatively wet concrete sample
F. None of the Above