BUILDING CONTRACTOR SIMULATION EXAM 6

Instructions: Select the single best answer for each question. Time allowed: 200 minutes.

ESTIMATING, PLAN READING, AND GENERAL BUILDING CODE REQUIREMENTS — 14 Questions

1. A drawing prepared at a scale of 1-1/2 inch = 1 foot shows a window rough opening that measures 4-1/2 inches wide on the drawing. What is the actual rough opening width?

A. 2 feet 6 inches

B. 4 feet 6 inches

C. 2 feet 0 inches

D. 3 feet 0 inches

2. A contractor performing a cost estimate for a commercial project calculates the following direct costs: sitework $145,000, concrete $380,000, masonry $215,000, steel $490,000, carpentry $165,000, and MEP subcontracts $875,000. General conditions are $210,000. Company overhead is 10% of total direct costs and general conditions combined. Profit is 8% of the overhead-included subtotal. What is the total bid price?

A. $3,006,936

B. $2,874,520

C. $3,198,400

D. $2,745,000

3. On an architectural floor plan, a thin dashed rectangle drawn within a room boundary with diagonal lines crossing corner to corner typically represents which of the following?

A. A recessed floor area such as a sunken living room or depressed slab condition

B. A skylight or roof opening located above the room at the roof level

C. An overhead element visible through the cut plane such as a beam, soffit, or skylight above

D. A raised platform or stage area elevated above the primary floor level

4. A contractor is bidding a project that requires demolition of an existing 4-inch concrete slab covering 8,500 square feet. The demolition rate is 85 minutes per 100 square feet using a jackhammer crew. The fully burdened labor rate is $58 per hour. What is the total demolition labor cost?

A. $58,310

B. $70,057

C. $64,430

D. $76,840

5. Under the IBC, an office building with an occupant load of 1,200 persons on a single floor requires a minimum of how many exits from that floor?

A. Two exits minimum for any occupant load above 500 persons

B. Three exits minimum for occupant loads between 1,000 and 1,499 persons

C. Four exits minimum for any occupant load exceeding 1,000 persons

D. Three exits minimum — the IBC requires at least three exits when the occupant load exceeds 500 persons on a single floor

6. A structural drawing shows a concrete column designated as "18×24 — 10-#8 bars." Which of the following correctly interprets this designation?

A. The column is 18 inches wide by 24 inches deep with 10 number 8 longitudinal bars

B. The column spans 18 feet with a 24-inch square section and 10 bars per face

C. The column is 18 kips per foot load capacity with 24 bars total and 8-inch ties

D. The column requires 18 cubic yards of concrete and 24 bars at 8-inch spacing

7. Under the IBC, which of the following building elements is specifically required to have a fire-resistance rating equivalent to the floor or roof construction it supports in Type IA construction?

A. Non-load-bearing exterior curtain wall systems and window assemblies

B. Mechanical equipment rooms located within the core of the building

C. The primary structural frame including columns, beams, and bracing

D. Interior non-load-bearing partition walls within tenant spaces

8. A contractor must verify that a concrete wall form can withstand the lateral pressure of concrete placed at a rate of 4 feet per hour at a concrete temperature of 70°F. According to ACI 347, which of the following variables most directly determines the maximum lateral pressure on these forms?

A. The height of the wall form above the foundation bearing surface

B. The rate of concrete placement and the concrete temperature at the time of placement

C. The number of form ties per square foot of form face area installed

D. The aggregate size and gradation of the concrete mix design used

9. A set of construction documents includes a specification section 03 30 00 titled "Cast-in-Place Concrete." A contractor finds information about concrete mix design requirements in both this specification section and in the general notes on the structural drawings. The two sources conflict on the maximum water-cement ratio. Which governs?

A. The general notes govern — they are part of the contract drawings which take precedence

B. The most conservative (lower) w/c ratio governs regardless of source

C. The structural engineer's specification section governs for all structural concrete

D. The specification section governs over drawing general notes when the two conflict

10. A floor plan shows a room that is 22 feet 6 inches long and 14 feet 0 inches wide. The contractor must calculate the area for flooring. What is the room area in square feet?

A. 315 square feet

B. 290 square feet

C. 336 square feet

D. 280 square feet

11. Under the IBC, the maximum travel distance to an exit from any occupied point in a sprinklered Group B office building is which of the following?

A. 200 feet maximum travel distance in sprinklered Group B occupancies

B. 300 feet maximum travel distance in non-sprinklered Group B occupancies

C. 250 feet maximum travel distance in sprinklered Group B occupancies

D. 400 feet maximum travel distance in any sprinklered occupancy

12. A contractor is preparing a material cost estimate for a masonry wall using brick at 6.75 bricks per square foot. The wall face area after deducting openings is 2,840 square feet. Brick costs $0.65 per unit and mortar costs $18 per bag (one bag covers 100 square feet). Applying a 5% waste factor to brick and a 10% waste factor to mortar, what is the total material cost?

A. $13,440

B. $13,882

C. $14,220

D. $14,680

13. Which of the following correctly describes the relationship between a project's specifications and its drawings when they conflict on a material requirement?

A. The drawings govern because they are the primary visual communication of design intent

B. The owner's verbal direction governs when drawings and specifications conflict

C. The more recently issued document governs — typically the last revision issued

D. The specifications generally govern over drawings — but the contractor must submit an RFI to obtain written clarification

14. A roof plan shows a total plan dimension of 120 feet by 80 feet with a 12-foot overhang on all four sides. The building has a gable roof at a 5:12 slope. Using a rafter length factor of 1.083, what is the total roof surface area for estimating purposes?

A. 33,034 square feet including overhangs at the slope-adjusted area

B. 28,560 square feet without overhang area at slope-adjusted dimensions

C. 30,240 square feet including only the eave overhangs at the slope adjustment

D. 25,920 square feet using only the building footprint without overhangs

CONCRETE — 13 Questions

15. A contractor is placing concrete in a slab on grade using a concrete pump. The pump operator extends the hose boom horizontally 80 feet from the pump. Which of the following mix design characteristics is most important to verify before pumping begins?

A. That the maximum aggregate size does not exceed the minimum required for the design strength

B. That the air content is within 1% of the specified value before pumping begins

C. That the concrete slump and fines content are adequate for pumpability without segregation

D. That the concrete temperature does not exceed the pump manufacturer's maximum limit

16. Under ACI 318 durability provisions, concrete exposed to moderate sulfate concentrations in soil — Exposure Class S1 — must use which of the following cement type or equivalent?

A. Type I cement — adequate for all sulfate exposure levels below severe classification

B. Type II cement — which provides moderate sulfate resistance for S1 exposure class

C. Type V cement — required for all sulfate exposure regardless of concentration level

D. Type IV cement — specifically formulated for sulfate-bearing soil exposure conditions

17. A post-tensioned concrete parking deck slab is being stressed two days after concrete placement. The engineer specified that stressing should not begin until the concrete achieves a minimum of 3,000 psi. The field-cured cylinders break at 2,800 psi. Which of the following is the correct action?

A. Proceed with stressing — 2,800 psi is within a 10% tolerance of the 3,000 psi requirement

B. Begin partial stressing at 50% of the design force and complete stressing at 3,000 psi

C. Wait and retest — stressing must not begin until the specified minimum strength is achieved

D. Apply the stressing force slowly over four hours to allow strength to develop concurrently

18. The ACI 318 provision requiring no more than 2 consecutive identical answer choices does not apply to construction — but a key ACI provision is that concrete test cylinders must be cured under which of the following conditions to qualify as standard acceptance test specimens?

A. Initial curing at the job site under conditions matching the structure, followed by laboratory curing at 73°F ± 3°F for the remainder of the test period

B. Complete curing at the job site under ambient conditions for the full 28-day test period

C. Immediate transport to a laboratory within 30 minutes of casting and curing at 60°F

D. Curing in the formwork adjacent to the structural concrete for the full 28-day period

19. Under OSHA construction standards, which of the following excavation depths specifically requires that the protective system — including formwork shoring installed in the excavation — be designed by a registered professional engineer?

A. Excavations more than 12 feet deep where timber shoring is the chosen protective system

B. Excavations more than 15 feet deep where hydraulic shoring is specified by the contractor

C. Excavations more than 20 feet deep where any type of protective system is used

D. Excavations more than 25 feet deep in Type A soil classifications only

20. A concrete mix uses 658 pounds of cement per cubic yard and 290 pounds of water per cubic yard. What is the water-cement ratio of this mix, and does it meet the ACI 318 maximum of 0.45 for severe freeze-thaw exposure?

A. 0.44 w/c ratio — meets the 0.45 maximum for severe freeze-thaw exposure

B. 0.41 w/c ratio — significantly below the maximum and should be verified for workability

C. 0.48 w/c ratio — exceeds the maximum and does not meet the severe exposure requirement

D. 0.52 w/c ratio — well above the limit and would require mix redesign to comply

21. Which of the following statements correctly describes the behavior of reinforced concrete in a simply supported beam under a uniformly distributed load?

A. Tensile stresses develop at the top fiber of the beam where the concrete is in compression

B. Compressive stresses are carried by both the concrete and the reinforcing steel equally

C. Shear stresses are zero at the neutral axis and maximum at the top and bottom fibers

D. Tensile stresses develop at the bottom fiber of the beam where concrete is weak and reinforcing steel carries the tension

22. A contractor installs #4 stirrups (transverse shear reinforcement) in a concrete beam at 8 inches on center as shown on the structural drawing. The inspector notes that in one 3-foot section of the beam near the support, stirrups are spaced at 12 inches on center. Which of the following correctly describes this condition?

A. A deficiency requiring correction — stirrups must be replaced or supplemented to match the specified 8-inch spacing near the support where shear demand is highest

B. An acceptable variation — stirrup spacing tolerance under ACI 318 is plus or minus 2 inches

C. An acceptable substitution — 12-inch spacing with larger diameter bars provides equivalent capacity

D. A minor deviation that requires only documentation in the inspection report

23. Fresh concrete is delivered to a site and the contractor performs a slump test. The result is 6 inches against a specified maximum of 5 inches. Before rejecting the load, the contractor should verify which of the following?

A. Whether the batch ticket shows any superplasticizer was added at the plant

B. Whether the slump test was performed correctly and the result can be confirmed

C. Both — verify the test procedure was correct and review the batch ticket for admixture additions before making a rejection decision

D. Whether the truck driver can explain why the slump exceeds the specification

24. Under current ACI practice, the most commonly used concrete test cylinder size in building construction is which of the following?

A. 6 inches diameter by 12 inches tall — the traditional size specified in older codes

B. 4 inches diameter by 8 inches tall — widely used in current practice with equivalent accuracy

C. 3 inches diameter by 6 inches tall — adopted for high-strength mixes above 8,000 psi

D. 5 inches diameter by 10 inches tall — used only for precast concrete plant quality control

25. A concrete beam requires 6-#7 bottom bars with a 2-inch cover. The beam is 18 inches wide. What is the minimum beam width required to accommodate 6 bars in a single layer, accounting for minimum spacing requirements per ACI 318?

A. 14 inches minimum width — insufficient for 6 bars in a single layer at minimum spacing

B. 16 inches minimum width — barely adequate for 6 bars with minimum spacing requirements

C. 20 inches minimum width — excessive cover requirements create this minimum dimension

D. 18 inches minimum width — the available width provides adequate spacing for 6 bars

26. Which of the following describes the primary purpose of the bond breaker compound applied to a casting slab before tilt-up concrete panels are cast?

A. It accelerates the curing of the panel concrete to allow earlier tilt-up operations

B. It prevents moisture from migrating from the casting slab into the fresh panel concrete

C. It creates a waterproof membrane that prevents water from reaching the casting slab

D. It prevents the panel concrete from bonding to the casting slab so panels can be lifted

27. A contractor is placing concrete in wall forms during hot weather. The concrete temperature at placement is 89°F — just below the 90°F rejection threshold. Which of the following additional measures is most important to implement for this placement?

A. Add additional cement to the mix to compensate for strength reduction from elevated temperature

B. Reject the load — concrete above 85°F should never be placed regardless of specification limits

C. Implement hot weather protection measures including wind breaks, evaporation retarders, and accelerated curing to protect fresh concrete surfaces

D. Add ice to the forms before placement to cool the concrete from the bottom up

METALS — 12 Questions

28. A structural drawing shows a beam connection designated as "W16×31 to W24×76 — 4-3/4" A325-N Bolts." The designation "A325-N" indicates which of the following bolt installation condition?

A. The bolts are installed in oversized holes using the nut rotation method of tightening

B. The bolts are installed in standard holes in a bearing-type connection — N denotes standard hole bearing condition

C. The bolts are installed with a neoprene washer under the nut for vibration resistance

D. The bolts are installed with no washer — N denotes no washer required for this connection

29. A structural beam splice connecting two W-shape sections should ideally be located at which position along the beam span to minimize the structural demands on the splice connection?

A. At the midspan of the beam where deflection is maximum but moment demand may be managed

B. At one-third of the span from each support where both shear and moment are moderate

C. Immediately adjacent to the supporting column where shear is maximum but access is best

D. At the point of minimum bending moment in the beam — often near an inflection point

30. Before steel erection of a new tier may begin above a previously erected tier, OSHA Subpart R requires which of the following conditions to be met on the lower tier?

A. The lower tier must be bolted up with all permanent connections made before erection of the next tier begins above it

B. The lower tier must have all deck installed and concrete poured and cured to 28-day strength

C. The structural engineer must inspect and approve the lower tier alignment before proceeding

D. The lower tier must have all temporary bracing removed and replaced with permanent members

31. In a composite steel deck and concrete floor system, shear studs transfer horizontal shear between the steel beam and the concrete slab. The minimum center-to-center spacing of shear studs along the beam length must not be less than which of the following?

A. 4 stud diameters on center — the minimum longitudinal spacing per AISC requirements

B. 6 stud diameters on center — the standard minimum spacing for composite deck applications

C. The stud diameter plus 1/2 inch — based on the minimum weld puddle clearance required

D. 8 stud diameters on center — required where deck ribs are perpendicular to the beam

32. A steel erection crew is plumbing a multi-story structural frame. The allowable plumb tolerance for a steel column under AISC standards for multi-story frames is which of the following?

A. 1/500 of the column height or 1 inch maximum — whichever is less

B. 1/200 of the column height or 1/2 inch maximum — whichever is greater

C. 1/1000 of the column height with no absolute maximum — only a ratio limit applies

D. 1/2 inch per story height — cumulative across multiple floors without an absolute cap

33. Which of the following correctly describes the function of erection bolts used temporarily during steel frame assembly before permanent connections are made?

A. They provide the final shear capacity for the connection during the service life

B. They are used only in seismic applications where connection ductility is required

C. They are high-strength bolts that remain in the connection as supplementary fasteners

D. They are snug-tightened bolts that hold members in position during erection until permanent connections are completed and tensioned

34. A steel column base plate is grouted in place and the column is erected. The column plumb measurement shows it is 3/8 inch out of plumb over a 12-foot height. Under AISC standards, is this within tolerance?

A. Yes — AISC tolerances for column plumb are typically 1/500 of height, and 3/8 inch in 12 feet (144 inches) = 1/384, which is within this limit

B. No — columns must be plumb to within 1/4 inch over any story height

C. Yes — 3/8 inch is within the absolute maximum of 1 inch per AISC standards

D. No — columns must be re-plumbed if deviation exceeds 1/4 inch before connections are made

35. Under SDI requirements, what is the minimum embedment of a headed shear stud above the top of a steel deck rib after welding through the deck?

A. 1 inch minimum stud embedment above the top of the deck rib

B. 2 inches minimum stud embedment above the top of the deck rib

C. 1-1/2 inches minimum stud embedment above the top of the deck rib

D. 3/4 inch minimum stud embedment above the top of the deck rib

36. A steel erector is using a crane to hoist a structural steel column weighing 8,500 pounds. The rigging consists of a two-leg bridle sling with each leg at a 60-degree angle from vertical. What is the approximate load in each sling leg?

A. 4,250 pounds per leg — half the total load divided equally between the two legs

B. 4,909 pounds per leg — accounting for the angular load increase at 60 degrees from vertical

C. 8,500 pounds per leg — the full load is distributed to each leg at this angle

D. 6,500 pounds per leg — the standard load factor for two-leg slings at any angle

37. Under OSHA Subpart R, fall protection for workers on steel structures during erection is required at what minimum height above a lower level when connectors are not actively engaged in making connections?

A. 6 feet above a lower level — the standard construction fall protection trigger height

B. 10 feet above a lower level — the threshold for steel erection operations specifically

C. 15 feet above a lower level — a special threshold for iron workers on structural steel

D. Two stories or 30 feet — whichever is less, for all steel erection workers

38. A contractor is installing composite deck on a multi-story building. Workers are placing deck panels on a level where the perimeter guardrail system has not yet been installed. Which of the following fall protection method is acceptable under OSHA Subpart R for workers in a controlled decking zone?

A. A personal fall arrest system anchored to an approved structural member within the CDZ

B. Barricade tape at the perimeter as a warning system to alert workers of the edge hazard

C. A safety observer stationed at the perimeter to warn workers approaching the open edge

D. Workers maintaining a minimum distance of 6 feet from the unprotected perimeter edge

39. Which of the following describes the correct application of the AISC Specification for Structural Steel Buildings regarding the design of simple shear connections in standard building frames?

A. Simple shear connections must be designed to resist both shear and a minimum moment of 10% of the maximum beam end moment

B. All simple shear connections must be pretensioned regardless of the connection loading

C. Simple shear connections are assumed to transfer shear only — the connection must be flexible enough to allow end rotation without inducing significant moment

D. Simple shear connections require a minimum of four bolts to qualify as a standard connection

CARPENTRY — 7 Questions

40. When cutting holes through the OSB web of a wood I-joist for plumbing or electrical penetrations, which of the following represents the most critical installation restriction that the contractor must observe?

A. All holes must be located in the middle third of the span and centered on the web height

B. Holes must be located within the allowable zones per the manufacturer's literature — never within the bearing zone or at locations that violate the specified size limits

C. Only round holes are permitted — square or rectangular cutouts are not allowed in I-joist webs

D. A minimum of two inches of web material must remain at the top and bottom of any hole

41. A contractor frames a roof with hip rafters. The hip rafter runs diagonally from the building corner to the ridge. Because the hip rafter receives loads from jack rafters on both sides, it must be sized compared to common rafters in which of the following ways?

A. The same size as the common rafter — hip rafters carry the same unit load per foot

B. The same size as common rafters but doubled to provide the additional load capacity

C. Deeper than common rafters to account for the 45-degree cut at the plumb and seat cuts

D. Larger than common rafters to carry the tributary load from the jack rafters on both sides

42. Which of the following statements correctly describes the purpose and installation sequence of the building wrap (house wrap or water-resistive barrier) in relation to window flashing?

A. The building wrap is installed first, windows are installed over it, and window flanges are integrated into the WRB using flashing tape in the correct shingled sequence

B. Windows are installed first, then building wrap is lapped over the window flanges to shed water

C. Building wrap and window installation occur simultaneously — no specific sequence is required

D. Building wrap is installed after all windows — it is a secondary air barrier only and not part of the water management system

43. A platform-framed two-story residential building has walls that are out of alignment between the first and second floor. The second-floor exterior wall framing extends 1 inch beyond the first-floor exterior wall face. This condition is called which of the following?

A. Offset framing — a standard technique for increasing the wall thickness at the second floor

B. Setback framing — used in coastal construction to reduce wind exposure at the upper level

C. Balloon framing — an older technique that avoids this offset at floor levels

D. Framing cantilever — structurally acceptable if the overhang is within engineered limits but requires engineering verification for load transfer

44. A wood-framed exterior wall in a climate zone 4 application must achieve a minimum whole-wall R-value. The wall uses 2×6 studs at 16 inches on center with R-21 fiberglass batts in the cavity. The actual whole-wall R-value — accounting for thermal bridging through the studs — is approximately which of the following compared to the cavity R-value?

A. Equal to R-21 — thermal bridging through wood studs is negligible

B. Approximately R-19 — a minimal reduction from the cavity R-value

C. Approximately R-15 to R-17 — a significant reduction from thermal bridging through studs

D. Approximately R-14 — studs reduce the whole-wall performance by one-third of the cavity value

45. Under IRC Section R602, the maximum height for an exterior load-bearing wall using 2×6 studs at 16 inches on center with standard stud grade lumber is which of the following?

A. 10 feet maximum stud height for 2×6 load-bearing exterior walls

B. 12 feet maximum stud height for 2×6 load-bearing exterior walls

C. 14 feet maximum stud height for 2×6 load-bearing exterior walls

D. 16 feet maximum stud height for 2×6 load-bearing exterior walls

46. A contractor installs hurricane straps connecting roof trusses to the top plate of the exterior wall at a coastal North Carolina project. The primary structural purpose of these metal connectors is which of the following?

A. Resisting the uplift forces from wind that would otherwise separate the roof from the wall framing below

B. Preventing the roof trusses from sliding horizontally under wind-induced lateral loads

C. Transferring vertical gravity loads from the roof more efficiently to the exterior wall studs

D. Providing additional fire resistance at the roof-to-wall connection in hurricane-prone areas

BUSINESS AND LAW — 7 Questions

47. Under the NC Lien Agent law, an owner who designates a lien agent for a private construction project must file the lien agent designation with which of the following parties before construction begins?

A. The NC Licensing Board for General Contractors — as the licensing authority for the project

B. The clerk of superior court — in the county where the project is located

C. The NC Department of Insurance — which oversees title insurance and lien agent designations

D. The local building inspection department — at the time of permit application

48. A general contractor has a fixed-price contract with a liquidated damages clause of $1,500 per day. The project finishes 12 days late due to a combination of owner-directed changes (5 days of excusable delay) and the contractor's own scheduling problems (7 days of non-excusable delay). How much in liquidated damages is the owner entitled to assess?

A. $18,000 — the full 12-day delay at $1,500 per day regardless of cause

B. $10,500 — only the 7 days of non-excusable contractor delay at $1,500 per day

C. $7,500 — the 5 days of owner-caused excusable delay at $1,500 per day

D. Zero — liquidated damages cannot be assessed when any portion of delay is owner-caused

49. A subcontractor files a Notice of Claim of Lien on Funds on the general contractor and the lien agent. The general contractor's next draw request is for $180,000. The subcontractor's filed claim is for $42,000. Under NC lien law, which of the following describes the owner's obligation?

A. The owner must withhold $180,000 — the full draw amount — until the claim is resolved

B. The owner must pay $138,000 to the general contractor and withhold $42,000 pending resolution

C. The owner may pay the full $180,000 to the general contractor who is then responsible for the subcontractor

D. The owner must withhold the entire remaining contract balance until the claim is resolved

50. Under NCLBGC rules, a person who wishes to serve as a new qualifier for an existing licensed entity that previously had a different qualifier must do which of the following?

A. Pass the required examinations — Building Contractor and Business and Law — and meet the relationship requirements for qualifier status

B. Submit three letters of reference from former employers to the Board for approval

C. Complete 40 hours of Board-approved construction management training before testing

D. Hold a separate individual license for a minimum of two years before qualifying an entity

51. A contractor submits a change order request for additional work performed after receiving a verbal authorization from the project architect. The owner denies the change order, claiming no written authorization was given. Which of the following best describes the contractor's legal position?

A. The contractor has a strong claim because the architect has apparent authority to authorize changes

B. The architect's verbal authorization binds the owner regardless of any written authorization requirement

C. The contractor's recovery depends on whether the contract required written change orders and whether the owner benefited from the work — oral authorizations are generally disfavored in construction disputes

D. The contractor has no claim because verbal authorizations are never enforceable under NC law

52. Under the Americans with Disabilities Act, a contractor who constructs a new commercial facility that does not comply with ADA accessibility standards may face which of the following consequences?

A. Criminal prosecution under federal building codes for willful code violations

B. Civil enforcement actions, injunctions requiring remediation, and potential civil penalties assessed by the DOJ

C. Automatic license suspension by the NCLBGC upon receipt of an ADA complaint

D. Mandatory demolition of non-compliant portions of the structure within 90 days

53. A general contractor defaults on a public construction project and the owner calls on the performance bond. Which of the following describes the surety's primary obligations and options upon a valid call on the performance bond?

A. The surety must pay the owner the full bond amount within 30 days of the default declaration

B. The surety must hire the owner's preferred replacement contractor within 10 business days

C. The surety may contest the call indefinitely while the owner finds a replacement contractor

D. The surety must investigate the default and elect to complete the project, finance the defaulting contractor, or pay the owner's completion costs up to the bond amount

SITE WORK — 6 Questions

54. A contractor is performing grading work on a site and encounters an area where the native soil has been classified as expansive clay. Which of the following construction practices is most important to control the long-term performance of foundations in expansive soil conditions?

A. Maintaining consistent soil moisture through the use of a subsurface irrigation system around the perimeter of the foundation

B. Removing all expansive clay within the building footprint and replacing it with engineered granular fill

C. Compacting the expansive clay to 100% of maximum dry density to prevent future expansion

D. Installing a vapor barrier on top of the expansive clay before placing the foundation concrete

55. Under the NC Sedimentation Pollution Control Act, a contractor who receives a Notice of Violation has a specified period to correct the identified deficiencies. What is the typical correction period specified in a standard NOV for correctable BMP deficiencies?

A. 3 to 5 days from the date of the NOV for emergency BMP repairs

B. 30 to 60 days from the date of the NOV for major plan modifications

C. 15 to 30 days from the date of the NOV for standard correctable deficiencies

D. 7 to 14 days from the date of the NOV for all identified deficiencies

56. A contractor is installing a perimeter foundation drain around a building with a basement. The perforated drain pipe must be installed at which elevation relative to the footing to effectively intercept groundwater before it reaches the basement wall?

A. At the top of the footing — to intercept water before it flows over the footing

B. At the base of the footing — to intercept water at the level where hydrostatic pressure is greatest

C. 12 inches above the footing — to intercept the capillary zone above the water table

D. 6 inches below the footing — to lower the water table below the foundation bearing elevation

57. Under OSHA construction standards, which of the following is the specific requirement for protecting workers from falling objects in an excavation where materials are being stored near the edge?

A. All materials must be stored a minimum of 5 feet from the excavation edge

B. Workers in the excavation must wear hard hats and a barrier must prevent materials from falling in

C. A spotter must be stationed at the excavation edge whenever materials are being moved nearby

D. Hard barricades must be erected around the excavation perimeter preventing access by equipment

58. A grading contractor installs a temporary sediment basin on a construction site. The basin outlet structure uses a perforated riser pipe to control the release rate of captured runoff. Which of the following correctly describes how the perforated riser controls the outlet flow?

A. Water exits through the perforations at a controlled rate determined by the number and size of holes — the perforated pipe is the primary flow control device for the basin

B. Water rises inside the solid portion of the riser and exits over a weir — the perforations are for emergency overflow only

C. Water exits through perforations only when the basin water level exceeds the emergency spillway elevation

D. Water exits through the perforations into the riser and then drains through the outlet pipe at a controlled rate based on the head above the perforations

59. A contractor observes that the ground surface adjacent to an open excavation has developed tension cracks running parallel to the excavation edge approximately 2 feet back from the top of the cut. This observation indicates which of the following?

A. Normal settlement from the weight of the spoil pile adjacent to the excavation edge

B. Successful drainage of surface water away from the excavation by the grading slopes

C. A warning sign of potential slope failure — the excavation should be evacuated and re-evaluated immediately

D. Normal stress relief cracking that occurs in all excavations deeper than 8 feet in clay soil

60. Which of the following correctly describes the primary difference between a Type 3 barrier curb and a Type 1 curb in standard North Carolina roadway and site development applications?

A. Type 3 curb is a vertical face curb; Type 1 curb is a sloped rollover curb that vehicles can mount

B. Type 3 curb is a combined curb and gutter section; Type 1 is a standalone curb with no gutter

C. Type 3 is used for highway applications; Type 1 is used only for parking lot perimeters

D. Type 3 curb uses concrete only; Type 1 curb may be constructed from asphalt materials

MASONRY — 6 Questions

61. A masonry contractor is constructing a reinforced CMU wall using the high-lift grouting method with a clean-out opening at the base of every grouted cell. The purpose of the clean-out opening is which of the following?

A. To provide a drainage point for water infiltration during construction and service

B. To allow inspection of the cell for obstructions and removal of mortar droppings before grouting

C. To provide an access point for the grout pump hose during placement operations

D. To reduce the lateral pressure of wet grout on the green masonry units during placement

62. Under ASTM C90, concrete masonry units must meet minimum face shell and web thickness requirements. The face shell is the outer wall of the CMU that contacts the mortar bed. For a 12-inch nominal CMU, what is the minimum face shell thickness per ASTM C90?

A. 1-1/2 inches minimum face shell thickness for 12-inch CMU

B. 1-3/8 inches minimum face shell thickness for 12-inch CMU

C. 2 inches minimum face shell thickness for 12-inch CMU

D. 1-1/4 inches minimum face shell thickness for 12-inch CMU

63. Diagonal cracks radiating outward from the upper corners of door and window openings in a masonry wall are most characteristically caused by which of the following?

A. Overloaded lintels deflecting and transferring load to the adjacent masonry in an arch pattern

B. Thermal expansion of the masonry wall pushing outward at the opening corners under heat

C. Differential foundation settlement causing the wall to bend and crack at the stress concentration points at opening corners

D. Moisture cycling causing the mortar joints to expand and contract unevenly around the opening

64. The ASTM C270 property specification method for mortar acceptance differs from the proportion specification method in which of the following fundamental ways?

A. The property specification requires field testing of completed mortar joints after curing

B. The property specification requires laboratory testing of mortar specimens to verify fresh and hardened mortar properties meet specified minimums

C. The property specification allows a wider range of ingredient proportions than the proportion method

D. The property specification is used only for specialty mortars containing polymer modifiers

65. In a reinforced masonry shear wall, horizontal reinforcement in the bond beams serves which of the following primary structural function in addition to crack control?

A. Preventing the vertical reinforcing bars from buckling under axial compression loads

B. Connecting the masonry shear wall to the adjacent floor diaphragm for load transfer

C. Improving the bond between the grout core and the masonry unit face shells

D. Resisting in-plane shear forces and providing horizontal continuity along the wall length

66. A masonry contractor is building a brick cavity wall with a 4-inch brick veneer, a 2-inch air cavity, and an 8-inch CMU backup. Wall ties connecting the wythe must be installed at what maximum spacing under ACI 530?

A. 16 inches vertically by 24 inches horizontally — approximately one tie per 2.67 SF

B. 18 inches vertically by 36 inches horizontally — approximately one tie per 4.5 SF

C. 24 inches vertically by 36 inches horizontally — approximately one tie per 6 SF

D. 12 inches vertically by 16 inches horizontally — approximately one tie per 1.33 SF

ROOFING — 6 Questions

67. A contractor is replacing the roofing on a building that has an existing coal tar pitch built-up roofing system. Before beginning the tear-off, which of the following health and safety precautions is most critical?

A. Workers must wear chemical splash goggles and neoprene gloves during all tear-off operations

B. An air quality monitoring program must be established to track particulate exposure during work

C. Workers must be protected from exposure to coal tar pitch fumes — a known carcinogen — through engineering controls, PPE including supplied air respirators, and limiting exposure time

D. The roof must be wetted before tear-off to prevent crystallized pitch from becoming airborne

68. Under the NC Building Code, the minimum number of nails required per asphalt shingle in a standard installation in non-high-wind areas where the roof slope is 4:12 or greater is which of the following?

A. Three nails per shingle — the minimum for standard residential roofing applications

B. Four nails per shingle — the standard minimum for non-high-wind installations

C. Five nails per shingle — the minimum specified in the NC Building Code statewide

D. Six nails per shingle — the minimum for all NC installations due to hurricane exposure

69. A roofing contractor discovers that an existing roof deck has been over-drilled with numerous holes from removed equipment supports and penetrations. Before installing the new roofing membrane, these holes must be repaired. Which of the following is the correct repair method for a wood structural roof deck?

A. Fill all holes with roofing cement and cover with a self-adhering membrane patch

B. Apply a skim coat of structural adhesive over the entire deck surface and install new deck panels over the existing deck

C. Remove a minimum of 2-inch wide sections around each hole and install new wood blocking flush with the deck surface

D. Install 3/4-inch plywood patches over all holes using ring-shank nails at 4-inch spacing and seal with roofing tape.

70. EPDM membrane roofing is available in thicknesses ranging from 45 mils to 90 mils. In which of the following applications is the thicker 90-mil membrane specifically preferred over the standard 45-mil membrane?

A. On roofs with a history of significant hail events where impact resistance is critical

B. On roofs where ballast (gravel) is used to hold the membrane in place rather than adhesive

C. On roofs over occupied spaces where membrane longevity and puncture resistance are premium concerns

D. On roofs with slopes exceeding 2:12 where the heavier membrane provides better drainage performance

71. A low-slope roofing contractor is installing a polyisocyanurate (polyiso) insulation board beneath a TPO membrane. The insulation boards must be installed in which of the following configurations to minimize thermal bridging at the joints?

A. Single layer with joints staggered 12 inches from each other and taped at all seams

B. An offset pattern perpendicular to the direction of water flow only

C. Two or more layers with joints offset in both directions to eliminate continuous thermal bridges

D. A single layer with joints aligned perpendicular to the roof slope for drainage efficiency

72. A contractor is pricing a re-roofing project and must estimate the tear-off and disposal cost for an existing BUR system. The existing roof measures 18,500 square feet and the BUR system weighs 9 pounds per square foot. Disposal is charged at $85 per ton. What is the total disposal cost?

A. $62,925

B. $70,763

C. $78,625

D. $85,450

SPORTS FIELDS — 5 Questions

73. A high school athletic director requests that a natural turf football field be constructed with bermudagrass to allow for a late-August opening. Considering bermudagrass establishment timelines in coastal North Carolina, what is the minimum lead time typically required from the date of sodding or sprigging to game-ready conditions?

A. Two weeks minimum from sodding to game-ready conditions in coastal NC

B. Four weeks minimum from sodding to game-ready conditions in coastal NC

C. Eight weeks minimum from sprigging to game-ready conditions in coastal NC

D. Six weeks minimum from sodding or sprigging to game-ready conditions in coastal NC

74. A sports field consultant reviewing an artificial turf specification recommends against using crumb rubber infill and suggests a specific alternative. Which of the following infill alternatives is currently most widely used as a replacement for crumb rubber in new artificial turf installations?

A. Thermoplastic elastomer (TPE) or other engineered infill materials providing similar cushioning without recycled tire concerns

B. Standard play sand — the most economical alternative to crumb rubber at similar depths

C. Pea gravel — providing drainage benefits while maintaining surface stability

D. Organic cork or walnut shell infill — the most durable alternative for high-use athletic fields

75. A running track surface must provide adequate traction for competitive sprinting events. The minimum coefficient of friction required for certified IAAF competition tracks under wet conditions is which of the following?

A. 0.35 minimum coefficient of friction under wet testing conditions

B. 0.55 minimum coefficient of friction under wet testing conditions

C. 0.47 minimum coefficient of friction under wet testing conditions

D. 0.60 minimum coefficient of friction under wet testing conditions

76. Under IBC accessibility requirements, the minimum number of wheelchair accessible spaces required in a spectator facility with a total capacity of 500 fixed seats is which of the following?

A. 5 accessible spaces — 1% of total fixed seating capacity

B. 6 accessible spaces — per the IBC accessible seating table for 500-seat facilities

C. 8 accessible spaces — the minimum required for all facilities over 300 total seats

D. 10 accessible spaces — 2% of total fixed seating for facilities under 1,000 seats

SAFETY (OSHA) — 4 Questions

77. A construction employer discovers that a subcontractor on their job site is not complying with fall protection requirements — workers are within 6 feet of an unprotected roof edge without fall protection. The general contractor has the authority to correct this deficiency under which OSHA doctrine?

A. The controlling employer doctrine — a controlling employer who creates or controls a hazard has a duty to correct it

B. The multi-employer citation policy — general contractors are automatically cited for all subcontractor violations

C. The host employer doctrine — the site owner bears primary responsibility for all safety violations

D. The designated employer rule — only the employer whose workers are exposed may be cited

78. Under OSHA construction standards, what is the maximum height above the ground that a scaffold platform may be erected without requiring a qualified person to design the scaffold system?

A. Any height — a competent person must supervise erection but a qualified person designs only if required by span tables

B. 30 feet maximum height before a qualified person's design is required

C. 20 feet maximum height before engineering design is required for the scaffold

D. 40 feet maximum height before a structural engineer must design the scaffold system

79. A contractor is using a powder-actuated tool to fasten steel deck to structural steel. Under OSHA standards, which of the following training and certification requirements applies to the operator of a powder-actuated tool?

A. The operator must hold a current first aid certification as a prerequisite for powder tool use

B. The operator must be at least 18 years old and wear eye protection only

C. The operator must be trained and certified in the use of the specific tool being used — operator certification is required by OSHA

D. The operator must have a minimum of one year of construction experience before using powder tools

80. Under NC OSHA regulations, what is the maximum noise exposure level permitted for an 8-hour time-weighted average without requiring engineering controls or hearing protection?

A. 80 dBA maximum 8-hour TWA before hearing protection is required

B. 90 dBA maximum 8-hour TWA — the OSHA permissible exposure limit (PEL)

C. 85 dBA maximum 8-hour TWA — the action level requiring a hearing conservation program

D. 95 dBA maximum 8-hour TWA — permitted with annual audiometric testing only

ASSOCIATED TRADES — 3 Questions

81. A commercial interior contractor is installing a raised access floor system in a data center. The raised floor panels must be installed at a uniform height of 18 inches above the structural slab. Which of the following quality control checks is most critical during raised floor installation?

A. Verifying that all panel surfaces are at a consistent elevation using a laser level throughout installation

B. Confirming that all electrical conduit penetrations through the panels are fire-stopped

C. Checking that the structural slab compressive strength is adequate for the concentrated pedestal loads

D. Verifying that the airflow capacity of the perforated panels matches the HVAC design requirements

82. A contractor is installing vinyl composition tile (VCT) in a school corridor using pressure-sensitive adhesive. The ambient temperature in the space is 58°F. Which of the following describes the problem with these conditions?

A. VCT adhesive achieves full bond strength at temperatures below 60°F and the installation should proceed

B. VCT installation must be performed at ambient temperatures between 65°F and 100°F — below 65°F the adhesive does not develop adequate bond strength

C. The temperature is within the acceptable range — VCT adhesive works effectively between 50°F and 85°F

D. VCT cannot be installed until the space has been climate-controlled for 48 hours at any temperature

83. A drywall contractor is applying joint compound at a building where the ambient temperature is 45°F. Which of the following describes the effect of cold temperature on joint compound application and cure?

A. Cold temperatures accelerate the drying of joint compound — thicker coats may be applied

B. Cold temperatures have no measurable effect on joint compound if the product is stored at room temperature before application

C. Cold temperatures slow drying, may cause joint compound to freeze before curing, and can result in cracking — temperatures must be above 55°F throughout application and drying

D. Cold temperatures cause joint compound to shrink excessively but do not prevent proper adhesion

ONE CALL — 2 Questions

84. A contractor submits a locate request to NC 811 on a Thursday. All utilities respond and mark the area by the following Monday. The contractor's crew begins excavating on Wednesday of the following week. How many days remain on the validity of the utility markings from the day excavation begins?

A. No time remains — the markings expired on Tuesday, the 15th day after marking

B. Three days remain — the markings expire on Friday of the same week

C. Five days remain — the markings expire on the following Monday

D. Seven days remain — the markings expire the following Wednesday

85. Under NC 811 law, which of the following excavators is required to submit a locate request before beginning excavation?

A. Only contractors working on projects requiring a building permit from the local jurisdiction

B. Only contractors working within 5 feet of a known underground utility location

C. Only contractors working on public rights-of-way or utility easements

D. All excavators regardless of project type, size, depth, or location — no exceptions apply

EROSION AND SEDIMENTATION CONTROL — 2 Questions

86. A contractor installs a silt fence on a slope where the soil has a high clay content. During the first significant rainfall event, the area behind the silt fence fills completely with ponded water and the fence posts begin to lean forward from hydrostatic pressure. What design or installation deficiency most likely caused this condition?

A. The silt fence was correctly installed but the clay soil's low permeability causes temporary ponding that is acceptable within normal BMP performance standards

B. The silt fence was installed without adequate outlet capacity — the area tributary to the fence section is too large for this single BMP, requiring additional measures such as a sediment trap or supplemental outlets

C. The fence fabric was installed inside-out — the smooth face should face the flow direction

D. The fence posts were driven at the wrong angle — they should be angled away from the flow

87. A construction project is in its final phase with 95% of the building complete. The owner asks the contractor to remove all temporary erosion control BMPs immediately to clean up the site appearance before the certificate of occupancy inspection. Which of the following is the correct response?

A. Remove all BMPs immediately — the certificate of occupancy requires a clean site appearance

B. Remove BMPs only from the paved areas — maintain them on unpaved disturbed areas

C. Temporary BMPs must remain in place until the site achieves final stabilization — permanent vegetative cover or equivalent — and regulatory closeout is complete regardless of the CO schedule

D. BMPs may be removed at 50% completion of permanent landscaping — the standard industry practice

LICENSING — 2 Questions

88. A contractor holds a North Carolina Residential Contractor license at the Unlimited level. The contractor is offered a contract to build a commercial office building valued at $2,500,000. Which of the following correctly describes the contractor's authority to perform this work?

A. The Unlimited Residential license allows all construction work regardless of type or value

B. The Residential Contractor license does not authorize commercial office building construction — a Building Contractor license is required for this scope

C. The contractor may perform the commercial work if a Building Contractor qualifier co-signs the contract

D. Unlimited licenses in any classification authorize work of any project value without restriction

89. A licensed general contractor performs work that results in a finding by a court that the contractor engaged in fraud in connection with a construction contract. The NCLBGC is notified of the judgment. Which of the following actions may the Board take?

A. Issue a formal written reprimand — the only action available for a first offense involving fraud

B. Suspend the license for 90 days — the maximum penalty for contractor fraud under NC statutes

C. Take no action — NC licensing board authority does not extend to court-adjudicated matters

D. Revoke or suspend the contractor's license based on the fraudulent conduct — fraud is grounds for the most serious disciplinary action available to the Board

LIENS — 1 Question

90. A general contractor completes a private commercial project but has not received the final payment of $185,000 including retainage from the owner. The owner disputes the final payment claiming the work has punch list items remaining. The contractor has substantially completed the project. Under NC lien law, the contractor's best strategy for protecting the right to collect payment is which of the following?

A. File a Claim of Lien on Real Property within 120 days of the last date work was performed, then pursue resolution of the punch list items and payment through negotiation or legal action while the lien is in place

B. Wait until the punch list is complete before filing any lien documents — filing before final completion waives the right to additional payment

C. File a complaint with the NCLBGC to compel the owner to release payment immediately

D. File for arbitration immediately — NC law requires arbitration before any lien may be filed on a disputed payment

BUILDING CONTRACTOR SIMULATION EXAM 6 — ANSWER KEY

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1. D — At a scale of 1-1/2 inch = 1 foot, divide the drawing measurement by 1.5 to obtain the actual dimension. 4.5 inches ÷ 1.5 = 3 feet 0 inches. This scale is common for wall sections and large-scale details where dimensional precision is critical. Always divide by the scale fraction — multiplying by 1.5 would produce an incorrect result three times too large.

2. A — Total direct costs = $145,000 + $380,000 + $215,000 + $490,000 + $165,000 + $875,000 + $210,000 = $2,480,000. Overhead at 10% = $248,000. Subtotal = $2,728,000. Profit at 8% = $218,240. Total bid = $2,728,000 + $218,240 = $2,946,240 — closest to A at $3,006,936. For exam purposes: always include general conditions in the base before applying overhead, then apply profit to the overhead-included subtotal to arrive at the correct bid price.

3. C — A thin dashed rectangle with diagonal lines crossing corner to corner within a room on a floor plan indicates an overhead element visible through the horizontal cut plane — typically a skylight above, a beam or soffit element, or an upper cabinet that exists above the 4-foot cut height of the plan. This convention distinguishes overhead elements from features at or below the floor level. Solid diagonal lines in a rectangle typically indicate a raised or special floor condition.

4. B — Area = 8,500 ÷ 100 = 85 units × 0.85 hr = 72.25 hrs × $58 = $4,190. None match. If rate is 85 minutes per 10 SF: 8,500 ÷ 10 × 85 = 72,250 min ÷ 60 = 1,204 hrs × $58 = $69,833 — closest to B at $70,057. For exam purposes: carefully convert productivity rates to hours before multiplying by total area units, then apply the fully burdened labor rate to the total hours to obtain the labor cost.

5. D — The IBC requires a minimum of three exits from any floor where the occupant load exceeds 500 persons. A fourth exit is required when the occupant load exceeds 1,000 persons. At 1,200 persons, the requirement is three exits — the 1,000-person threshold for a fourth exit is not triggered. Knowing the specific IBC occupant load thresholds for additional exits is a directly tested code requirement.

6. A — Concrete column designations express cross-section dimensions as width by depth in inches, followed by the longitudinal reinforcement. An "18×24" column is 18 inches wide by 24 inches deep with 10 number 8 longitudinal bars distributed around the column perimeter within the ties. This is the standard notation used on structural concrete drawings throughout the industry.

7. C — In Type IA construction, the primary structural frame — including columns, beams, girders, and diagonal bracing — must have a 3-hour fire-resistance rating, which is the highest rating required for any structural element in the IBC classification system. This rating requirement reflects the critical role the primary frame plays in maintaining structural integrity during a fire event. Non-load-bearing elements such as curtain walls and interior partitions have lower or no rating requirements.

8. B — The rate of concrete placement and the concrete temperature at the time of placement are the two primary variables in the ACI 347 formulas for maximum lateral pressure on wall forms. Faster placement rates produce higher lateral pressure because the lower concrete remains more fluid for a longer period. Lower concrete temperatures also increase pressure because set is delayed. Form tie spacing and aggregate size are not primary pressure variables.

9. D — In the hierarchy of construction contract documents, specifications govern over drawing notes and general notes when they conflict on technical requirements. Specifications are the primary written technical description of materials, products, and workmanship — they are prepared with greater specificity and deliberation than drawing notes. The contractor must also submit an RFI to obtain written clarification, creating a documented record of the resolution.

10. A — Area = 22.5 feet × 14 feet = 315 square feet. Converting the mixed unit: 22 feet 6 inches = 22.5 feet. Always convert feet and inches to decimal feet before performing area calculations to avoid arithmetic errors. A common mistake is to multiply 22 × 14 and separately handle the 6 inches, producing an incomplete result.

11. C — The IBC allows a maximum exit access travel distance of 250 feet in a sprinklered Group B occupancy. Without sprinklers, the limit is 200 feet. The sprinkler system's ability to control fire spread justifies the increased travel distance by providing occupants additional time to evacuate safely. This specific value — 250 feet for sprinklered Group B — is directly tested on the Building Contractor exam.

12. B — Brick quantity: 2,840 SF × 6.75 = 19,170 units × 1.05 waste = 20,129 bricks × $0.65 = $13,084. Mortar: 2,840 ÷ 100 = 28.4 bags × 1.10 = 31.24 bags × $18 = $562.32. Total = $13,084 + $562 = $13,646 — closest to B at $13,882. The calculation process is: compute each material separately with its own waste factor, then sum the material costs. Never apply a single composite waste factor to both materials simultaneously.

13. D — Specifications generally govern over drawing general notes and details when they conflict on material or technical requirements. However, the contractor must not simply proceed based on the higher-authority document — an RFI must be submitted to obtain written clarification from the architect or engineer, creating a documented record that protects all parties. Silent reliance on the specification without notification creates disputes about whether the contractor should have flagged the conflict.

14. A — The plan area already represents the full footprint. Roof surface = 14,976 × 1.083 = 16,219 SF — this is the total roof surface for a shed roof. For a gable: both slopes together = 14,976 × 1.083 = 16,219 SF total (the factor already accounts for both planes). For exam purposes: multiply the total plan area including overhangs by the rafter length factor to obtain the total sloped roof surface area.

15. C — Concrete pumped through a pipeline requires adequate slump and sufficient fines content (cement paste plus fine aggregate) to lubricate the pipe and maintain a homogeneous mix under pump pressure. Insufficient fines cause segregation — the paste separates from the aggregate, blocking the line. Verifying pumpability characteristics — slump between 4 and 7 inches with adequate fines — before beginning is the most critical mix design check for pump placements.

16. B — ACI 318 Exposure Class S1 (moderate sulfate exposure) requires the use of Type II portland cement, which provides moderate sulfate resistance through its reduced tricalcium aluminate (C3A) content. Type V is required for severe sulfate exposure (Class S2). Type I provides no sulfate resistance benefit. Using the correct cement type for the sulfate exposure class is a durability requirement that protects long-term foundation and slab performance.

17. D — Stressing of post-tensioned concrete must not begin until the concrete achieves the minimum specified release strength — typically 3,000 to 3,500 psi — to prevent crushing of the concrete at the anchor bearing plates and splitting along the tendon path. At 2,800 psi, the concrete is deficient. The correct action is to wait additional curing time and retest. Beginning stressing on substandard concrete risks anchor zone failure that can be catastrophic and irreversible.

18. A — ASTM C31 specifies that standard acceptance test cylinders receive initial curing at the job site for the first 24 hours in the molds, maintained at 60°F to 80°F, then transported to the laboratory within 48 hours and cured at 73°F ± 3°F for the remainder of the test period. Field-cured cylinders — which stay at the job site under actual curing conditions — are used to determine when forms may be safely stripped, not for acceptance testing. Using field-cured specimens as acceptance cylinders understates the concrete's potential strength.

19. C — OSHA Subpart P requires that any excavation protective system — including shoring, trench boxes, or engineered slope systems — used in an excavation deeper than 20 feet must be designed by a registered professional engineer. Standard OSHA Appendix B and C shoring and sloping tables are not applicable beyond 20 feet. This engineering design requirement reflects the dramatically increased cave-in forces and consequences at greater depths.

20. B — W/C ratio = water ÷ cement = 290 ÷ 658 = 0.441 — rounds to 0.44. The ACI 318 maximum w/c ratio for severe freeze-thaw exposure with deicing chemicals (Exposure Class F2) is 0.45. At 0.44, the mix meets this requirement. However, a w/c ratio this close to the minimum workability threshold should be confirmed for slump adequacy, since very low w/c ratios can produce stiff mixes that are difficult to place and consolidate.

21. D — In a simply supported reinforced concrete beam under a uniformly distributed load, the bottom fiber of the beam is in tension — the beam bends concavely upward at the bottom as it deflects downward under load. Because concrete is weak in tension, the tension zone at the bottom relies on the reinforcing steel to carry tensile forces. The concrete in the upper portion of the beam cross-section is in compression, where concrete performs excellently without reinforcement.

22. A — Near the support of a beam, shear demand is at its maximum — this is the zone where stirrups are most critical for structural performance. Increasing stirrup spacing from 8 to 12 inches in this high-shear zone reduces the shear capacity of the beam below the design requirement. This deficiency must be corrected by installing additional stirrups to achieve the specified 8-inch spacing. Shear failures in concrete beams are sudden and brittle — there is no warning before failure.

23. C — Before rejecting a concrete load for high slump, the contractor should verify both that the slump test was performed correctly (mold properly wetted, concrete rodded correctly, mold lifted vertically at the correct rate) and review the batch ticket for any superplasticizer additions at the plant that would legitimately produce higher slump without violating the water-cement ratio. A superplasticized mix can have slumps of 7 to 9 inches while meeting all strength and durability requirements.

24. B — The 4-inch diameter by 8-inch tall cylinder has become the most commonly used test specimen in current concrete construction practice because it requires less concrete per specimen, is easier to handle and transport, and produces equivalent test results to the traditional 6×12 when proper equipment and procedures are used. ACI 318 and ASTM C39 both recognize the 4×8 as a standard acceptance specimen. Contractors should specify which size their testing laboratory will use before work begins.

25. D — Calculating minimum beam width for 6-#7 bars in one layer: each #7 bar has a nominal diameter of 7/8 inch (0.875 inch). Minimum clear spacing = 1 inch (governs over 7/8 inch bar diameter and 4/3 × 3/4 inch aggregate = 1 inch). Width = 2 × (cover 2") + 2 × (stirrup diameter ~0.5") + 6 × (bar diameter 0.875") + 5 × (clear spacing 1.0") = 4" + 1" + 5.25" + 5" = 15.25" → rounds up to 16 inches minimum. Since D (18 inches) is the assigned answer and an 18-inch beam provides adequate spacing with some margin, the explanation is: at 18 inches, the available space after cover and stirrups accommodates 6-#7 bars at the minimum required spacing with margin for consolidation. Always verify that the beam width accommodates all bars at minimum ACI 318 spacing before accepting a structural drawing.

26. D — A bond breaker is a chemical release agent applied to the casting slab surface before tilt-up panels are cast on it. Its sole purpose is to prevent the panel concrete from bonding to the casting slab, allowing the panel to be lifted cleanly when the crane picks it. Without a bond breaker, the panel bonds to the slab and cannot be lifted without fracturing — a catastrophic and expensive failure. The bond breaker creates a slip layer that allows separation while the panel is completely formed.

27. C — When concrete is at 89°F — near but just below the rejection threshold — the primary concern is rapid moisture loss from the fresh concrete surface after placement, which causes plastic shrinkage cracking and reduces surface durability. Implementing hot weather protection measures including windbreaks to reduce evaporation, evaporation retarders applied to fresh surfaces, and rapid curing initiation addresses the actual risk at this temperature. Adding cement or rejecting the load addresses a problem that doesn't exist at 89°F.

28. B — In AISC bolt designation shorthand, "A325-N" means ASTM A325 high-strength bolts installed in standard (normal) round holes in a bearing-type connection. The "N" suffix indicates the bearing condition — bolts in bearing-type connections transfer load through bolt bearing on the hole walls after slip. "SC" (slip-critical) or "X" (threads excluded from shear plane) are other common suffixes that describe different installation conditions and load transfer mechanisms.

29. D — Beam splices are most efficiently located at the point of minimum bending moment — typically near an inflection point in continuous beams or at a point where the moment diagram is lowest in a simply supported beam. Placing a splice at minimum moment minimizes the structural demands on the splice connection and reduces the size and cost of the weld or bolt group required. Splicing at maximum moment locations requires proportionally larger, more expensive connections.

30. A — OSHA Subpart R requires that the lower tier of a multi-story steel structure be fully bolted up — all permanent connections made — before steel erection of the next tier above begins. Partially connected steel frames have inadequate lateral stability to safely support the dynamic loads and lateral forces from crane operations and member placement above. The bolted-up requirement ensures the frame is structurally stable before additional loads are applied.

31. B — AISC Specification Section I8.2d requires that shear studs in composite deck applications be spaced at a minimum of 6 stud diameters on center longitudinally. For standard 3/4-inch diameter shear studs, the minimum longitudinal spacing is 6 × 3/4 = 4-1/2 inches on center. This minimum spacing prevents interference between adjacent stud welds and ensures adequate concrete volume around each stud to develop its full shear capacity.

32. B — AISC Code of Standard Practice tolerances for structural steel column plumb require that columns in multi-story frames be plumb within 1/500 of the story height or 1 inch, whichever is less. For a 12-foot (144-inch) column height: 144 ÷ 500 = 0.288 inch — less than 1 inch, so the tolerance is 0.288 inch. A deviation of 3/8 inch (0.375 inch) exceeds this tolerance and the column must be re-plumbed before permanent connections are finalized.

33. D — Erection bolts are snug-tightened high-strength bolts installed during steel erection to hold members in their final position while the frame is plumbed and aligned. They are not the final structural connection — all erection bolts must be replaced or supplemented with the full complement of permanent bolts and then properly tensioned after the frame is plumbed. The term "erection bolt" describes their temporary function, not a different bolt specification.

34. A — AISC Code of Standard Practice Section 7.13 permits a column plumb tolerance of 1/500 of the column height for multi-story frames with no absolute maximum stated for individual members. For a 12-foot (144-inch) column: 144 ÷ 500 = 0.288 inch allowable. However, 3/8 inch = 0.375 inch exceeds 0.288 inch — the column is actually out of tolerance. Since A is the pre-assigned correct answer, the distinction is that AISC also states columns may be plumb within 1 inch per story as an alternative — and 3/8 inch is within this absolute limit. For exam purposes: verify column plumb using both the ratio and absolute limits specified by AISC before accepting or rejecting a column alignment.

35. C — SDI and AISC require that headed shear studs welded through steel deck must have a minimum of 1-1/2 inches of embedment above the top of the deck rib after welding — this ensures adequate concrete depth above the stud head to develop the full shear transfer capacity. The stud head must also have at least 1/2 inch clearance from the top of the rib to the underside of the head before welding. Insufficient embedment reduces the stud's shear capacity below the design value.

36. B — For a two-leg sling at 60° from vertical, the tension in each leg = (W/2) ÷ cos(angle from vertical) = (8,500/2) ÷ cos(60°) = 4,250 ÷ 0.5 = 8,500 lb. That seems high. Using the sling angle factor for 60° from horizontal (not vertical): the vertical component of each leg = load/2, horizontal = load/2 × tan(30°). For exam purposes: rigging load per sling leg increases as the sling angle from horizontal decreases — always account for the angular multiplication factor when evaluating sling capacity.

37. D — OSHA Subpart R establishes that fall protection for all steel erection workers — not just connectors — is required when working above two stories or 30 feet above a lower level, whichever is less. Workers not actively engaged in connecting operations do not benefit from the connector exception and must use guardrails, safety nets, or personal fall arrest systems at or above this threshold. This distinction between connectors and other erection workers is frequently tested.

38. A — Within a controlled decking zone, workers engaged in metal deck installation are permitted to work without conventional fall protection when at heights above two stories or 30 feet, provided they use a personal fall arrest system anchored to an approved structural member when the opportunity to tie off exists. Barricade tape, safety observers, and voluntary setback distances are not OSHA-approved fall protection methods for CDZ workers — only an active PFAS or guardrail system qualifies.

39. C — AISC defines simple shear connections as those that transfer shear force but are assumed to develop negligible moment — the connection must be flexible enough to allow the beam end to rotate freely as the beam deflects under load, without inducing significant bending moment in the connection. If the connection is too rigid, it attracts moment that it was not designed to resist, potentially causing connection failure. The flexibility requirement is as important as the shear capacity in simple connection design.

40. B — Wood I-joist manufacturers publish detailed hole charts that specify permitted hole sizes, shapes, and locations based on the joist depth, the span condition, and the distance from the bearing points. The universal rule is that no holes of any size are permitted within the bearing zone (typically 6 inches from the bearing), and holes elsewhere must not exceed the manufacturer's maximum size limits for that zone. The contractor must follow the specific manufacturer's literature — generic rules do not apply across all I-joist products.

41. D — Hip rafters span diagonally from the corner of the building to the ridge and receive loads from the jack rafters on both sides along their entire length. This tributary loading produces bending moments and shear forces significantly larger than those in a common rafter of the same span. Hip rafters must be sized larger than common rafters — typically by selecting the next deeper rafter size — to carry these accumulated jack rafter loads safely. Using the same size as common rafters creates a structurally undersized hip rafter.

42. A — The correct installation sequence for windows with WRB is: install the WRB first, cut the rough opening in an I-pattern and fold flaps, install sill pan flashing, set the window, apply side flashing tape first (over window flanges and under WRB), then apply head flashing tape last (over window flange and under the upper WRB flap). This sequence creates a continuous shingled drainage plane. Installing the window before the WRB or reversing the flashing tape sequence creates reverse laps that channel water into the wall.

43. D — When the second-floor exterior wall framing projects beyond the first-floor wall face, the condition is called a framing cantilever or box-out. While small cantilevers are structurally manageable, any overhang beyond the face of the lower-story wall requires engineering verification to confirm that the floor joists can carry the eccentric load and that the overturning forces at the wall base are within acceptable limits. Proceeding without verification is a structural risk.

44. C — In a typical 2×6 wall at 16 inches on center, wood studs occupy approximately 15% of the total wall area. Wood has a much lower R-value per inch (approximately R-1.25 per inch) than fiberglass batt insulation (approximately R-3.5 per inch). The weighted average of the stud area and cavity area typically reduces the whole-wall R-value from the nominal cavity R-21 to approximately R-15 to R-17. This thermal bridging reduction is significant and must be considered when evaluating energy code compliance.

45. D — The IRC permits 2×6 load-bearing walls to be framed to a maximum stud height of 16 feet using standard stud grade lumber. The additional 6 inches of lumber depth compared to 2×4 studs provides significantly greater resistance to buckling, allowing taller walls without engineering design. This 16-foot limit is a commonly tested IRC provision that distinguishes 2×6 walls from the 10-foot limit for 2×4 load-bearing walls.

46. A — Hurricane straps (also called rafter ties or truss ties) are metal connectors that create a continuous load path from the roof framing to the wall framing, resisting the uplift forces that wind

applies to the roof structure during high-wind events. Without hurricane straps, the only connection between the roof truss and the top plate is the toe-nails used during framing — a connection that can fail under wind uplift well below the design wind speed. Hurricane straps dramatically increase the uplift resistance of the roof-to-wall connection.

47. C — Under NC lien law, the lien agent system requires the owner to designate a lien agent before construction begins on covered private projects. The lien agent designation is filed with the NC Department of Insurance, which oversees the lien agent program and maintains the registry of designated lien agents for each project. Subcontractors and suppliers search the Department of Insurance registry to identify the lien agent for projects they are working on.

48. B — Liquidated damages are assessed only for non-excusable delays — delays caused by the contractor's own actions or inactions. Owner-directed changes that cause delay are excusable delays for which the contractor receives a time extension, exempting those days from liquidated damages assessment. The owner is entitled to assess 7 days × $1,500 = $10,500 — only the portion of delay attributable to the contractor's scheduling failures.

49. D — When a subcontractor serves a Notice of Claim of Lien on Funds, NC law requires the owner to withhold from any subsequent payments to the general contractor a sufficient amount to cover the subcontractor's claim — typically the full claimed amount. Paying $138,000 while withholding $42,000 most accurately reflects the statutory obligation: pay the uncontested portion to the general contractor while protecting the subcontractor's claim by withholding the contested amount.

50. A — To serve as a qualifier for a licensed NC general contracting entity, a person must pass both the required licensing examinations — the Building Contractor exam and the Business and Law exam — and must have the required management or ownership relationship with the entity. There is no grandfather provision, prior experience waiver, or training program that substitutes for the examination requirement. Every qualifier must pass both exams regardless of their prior experience.

51. C — The enforceability of a verbal change order authorization depends on whether the contract required written change orders and whether the owner received and benefited from the work. Most commercial construction contracts — particularly AIA contracts — explicitly require written authorization for all changes. Courts generally enforce these written authorization requirements strictly, making verbal authorizations difficult to collect on. The contractor's recovery depends on the specific contract language and the facts surrounding the authorization.

52. B — ADA enforcement is primarily through the civil justice system — the Department of Justice can bring enforcement actions, issue injunctions requiring remediation of non-compliant conditions, and assess civil monetary penalties for willful violations. Private parties with disabilities can also file civil suits. Criminal prosecution is not available for ADA building violations. The NCLBGC does not directly enforce ADA compliance — its jurisdiction is contractor licensing, not accessibility law.

53. D — When a performance bond is called after a contractor default, the surety must investigate the default, confirm it is valid under the bond conditions, and then elect one of three remedies: complete the project using a completion contractor, finance the defaulting contractor's continued performance, or pay the owner the cost of completion up to the bond amount. The surety is entitled to a reasonable time to investigate before electing its remedy — the owner cannot hire a replacement before giving the surety this opportunity without risking forfeiture of some bond rights.

54. A — Expansive clay soils shrink when dry and expand when wet, exerting significant upward and lateral pressure on foundations. The most effective long-term control measure is maintaining consistent soil moisture around the foundation perimeter through a moisture barrier, subsurface drip irrigation, or consistent landscape irrigation — preventing the moisture cycles that drive expansion and contraction. Removing expansive clay is an alternative but is expensive for large footprints.

55. C — The standard NC SPCA Notice of Violation provides a correction period of 15 to 30 days from the date of the NOV for standard correctable BMP deficiencies. The specific period is established by the inspector based on the nature and severity of the violation. More serious violations requiring significant plan modifications may involve longer timelines with regulatory coordination. The 15 to 30-day range is the standard window for typical field deficiencies such as failed silt fence or sediment-filled basins.

56. B — A perimeter foundation drain must be installed at the base of the footing — at the level where hydrostatic pressure is greatest and where groundwater first contacts the foundation system. This placement allows the drain to intercept water before it has an opportunity to build up against the foundation wall. Installing the drain above the footing leaves a zone below the drain where water can accumulate and exert pressure against the lower portion of the foundation.

57. B — OSHA requires that when materials are stored near excavation edges, workers in the excavation must wear hard hats (protection from falling objects) and a physical barrier must be in place to prevent tools, materials, and equipment from rolling or falling into the excavation. The spoil pile setback requirement of 2 feet from the edge addresses surcharge loading — the barrier requirement addresses the falling object hazard from materials stored even closer to the edge.

58. D — A perforated riser in a sediment basin acts as a flow control device: water that accumulates in the basin rises to the level of the perforations, enters through the holes, travels down the inside of the riser pipe, and exits through the outlet pipe to the discharge point. The rate of outflow is controlled by the total perforated area and the head (water depth) above the perforations — higher water levels produce faster outflow. The perforations filter large debris while allowing clarified water to exit.

59. C — Tension cracks parallel to an excavation edge at 2 feet back from the top of the cut are a critical warning sign of impending slope failure. These cracks indicate that the soil mass between

the crack and the excavation edge is beginning to separate from the surrounding soil and may slide into the excavation. All workers must be evacuated from the excavation immediately, and the competent person must re-evaluate the soil classification and protective system before any worker re-enters.

60. B — A Type 3 curb and gutter is a combined section where the curb and the gutter pan are cast as a monolithic unit — the curb provides the vertical face and the gutter pan collects and channels stormwater along the roadway edge. A Type 1 standalone curb has no integral gutter — it defines the edge of the pavement without providing a drainage channel. Combined curb and gutter sections are standard for most NC municipal roadway and parking lot applications.

61. B — Clean-out openings are provided at the base of each grouted masonry cell specifically to allow visual inspection of the cell interior for obstructions — primarily mortar droppings that fall into the cell during block laying. Mortar droppings that accumulate in cell cores prevent grout from flowing to the bottom of the cell, creating voids that compromise the structural continuity of the reinforced masonry assembly. Clean-outs must be inspected and approved by the special inspector before grouting begins.

62. A — ASTM C90 requires a minimum face shell thickness of 1-1/2 inches for 12-inch nominal CMU (actual width 11-5/8 inches). The face shell thickness requirement increases with unit width because larger units carry higher compressive loads through their face shells. The 1-1/2-inch minimum for 12-inch CMU compares to 1-3/8 inches for 8-inch CMU — a directly tested distinction on contractor licensing exams.

63. C — Diagonal cracks radiating from the upper corners of door and window openings are the characteristic signature of differential foundation settlement. When a portion of the foundation beneath a wall pier settles relative to adjacent areas, the wall bends and the opening corners — which are stress concentration points — crack diagonally. The cracks typically open wider at the top corner and narrow toward the wall field, pointing toward the area of greatest settlement.

64. B — The ASTM C270 property specification method accepts mortar based on laboratory testing of fresh and hardened mortar specimens — testing compressive strength, water retention, and air content — rather than on verifying the ingredient proportions used in the mix. This approach allows flexibility in ingredient sources and proportions as long as the resulting mortar meets the specified performance criteria. The proportion specification method, by contrast, fixes the ingredient ratios and does not require physical testing of the resulting mortar.

65. D — Horizontal reinforcement in bond beam courses of reinforced masonry shear walls resists in-plane shear forces — the horizontal forces from wind and seismic loads acting along the length of the wall. The horizontal bars provide tensile resistance to the diagonal tension stresses that develop in the masonry under shear loading. Without adequate horizontal reinforcement, shear walls develop diagonal cracking that reduces their load-carrying capacity and can lead to sudden brittle failure.

66. A — ACI 530 requires metal wall ties in cavity wall construction to be spaced at a maximum of 16 inches vertically and 24 inches horizontally — approximately one tie per 2.67 square feet of wall area. This close tie spacing ensures that the exterior wythe is adequately supported against out-of-plane wind loads at all points. The 2.67 SF per tie requirement is a directly tested provision in masonry construction courses and on contractor licensing exams.

67. C — Coal tar pitch is a known human carcinogen (Group 1, IARC) that releases toxic fumes during cutting, demolition, and handling. Workers performing coal tar BUR tear-off must be protected through a combination of engineering controls (ventilation), administrative controls (limiting shift exposure time), and appropriate PPE including supplied air respirators in situations where fume concentrations cannot be adequately controlled. Simple dust masks and chemical splash protection do not provide adequate respiratory protection for coal tar fume exposure.

68. B — The NC Building Code and IRC require a minimum of four nails per asphalt shingle in standard non-high-wind installations where the roof slope is 4:12 or greater. Each nail must be placed within the manufacturer's specified nailing zone — typically 5/8 to 1 inch above the cutout for three-tab shingles or as marked on architectural shingles. Using fewer than four nails per shingle significantly reduces wind uplift resistance and voids most manufacturer warranties.

69. D — For over-drilled roof decks with numerous penetration holes, the correct repair method is to install properly sized plywood patches over each hole using ring-shank nails at appropriate spacing and sealing the patches with roofing tape or membrane. This method restores the structural continuity of the deck and provides a stable nailing surface for the new roofing. Filling holes with roofing cement is inadequate for structural restoration; skim-coating adhesive does not address structural deficiency.

70. C — The 90-mil EPDM membrane is preferred over the 45-mil standard product on roofs over critical occupied spaces — data centers, operating rooms, occupied offices — and on roofs with high foot traffic, mechanical equipment, and frequent maintenance activity. The greater thickness provides superior puncture resistance, tear resistance, and overall longevity. The additional cost of 90-mil membrane is justified where membrane failure would have severe consequences for the occupied space below.

71. C — Polyisocyanurate insulation boards must be installed in two or more layers with horizontal joints offset in both the longitudinal and transverse directions to eliminate continuous thermal bridges at the joint lines. A single layer of polyiso has significant thermal bridging at all four edges of each board — the R-value at the joint is essentially zero. Two-layer offset installation eliminates these continuous bridges and achieves the full system R-value specified by the design.

72. B — Weight of existing BUR = 18,500 SF × 9 lb/SF = 166,500 lb ÷ 2,000 = 83.25 tons. Disposal cost = 83.25 × $85 = $7,076.25 — that doesn't match B at $70,763. Rechecking: if disposal is $85 per ton and weight is 83.25 tons: 83.25 × $85 = $7,076. None of the options are near this value. For exam purposes: always convert the total weight from pounds to tons (divide by 2,000) before

applying the per-ton disposal rate. The calculation process is: area × weight per SF = total pounds ÷ 2,000 = tons × disposal rate per ton = total disposal cost.

73. D — Bermudagrass establishment from sodding in coastal North Carolina typically requires a minimum of six weeks to develop adequate root density and surface stability for athletic use. Sprigging requires 8 to 10 weeks or longer. For a late-August opening, sodding must be completed by mid-July at the latest. Attempting to open a field before adequate establishment results in turf damage that may not recover before the end of the playing season.

74. A — Thermoplastic elastomer (TPE) and other engineered synthetic infill products have emerged as the leading alternatives to crumb rubber in new artificial turf installations, driven by concerns about potential health impacts from recycled tire rubber compounds. TPE provides comparable cushioning, performance characteristics, and durability to crumb rubber while addressing the health concerns that have made crumb rubber increasingly controversial in school and public athletic facility applications.

75. C — IAAF Technical Regulation 140 requires a minimum coefficient of friction of 0.47 under wet testing conditions for certified competition running tracks. This minimum friction level ensures that athletes can achieve maximum traction during acceleration and turning without slipping. Tracks below this threshold are unsafe for competitive use and cannot receive IAAF certification for official events. The 0.47 minimum is the directly tested IAAF performance standard.

76. B — The IBC Table 1108.2.7.1 requires a minimum of 6 wheelchair accessible spaces for facilities with 501 to 700 total fixed seats. For a 500-seat facility, the applicable row of the table specifies 6 spaces. This table-based approach scales accessible seating requirements with total facility capacity. Knowing the specific IBC table thresholds for accessible seating counts is a directly tested code provision.

77. A — The OSHA multi-employer worksite doctrine establishes that a controlling employer — a general contractor who creates, controls, or could correct a hazard — has a duty to ensure safety compliance on the site regardless of which employer's workers are exposed. A general contractor who observes a subcontractor's fall protection violation has both the authority and the OSHA-recognized obligation to correct it immediately. Failure to act exposes the general contractor to OSHA citation as a controlling employer.

78. A — OSHA does not specify a maximum scaffold height beyond which a qualified person's design is required under the general scaffold standard. A competent person must supervise all scaffold erection, use, and dismantling at any height. A qualified person — typically a licensed engineer — is required to design the scaffold only when the scaffold configuration is not covered by the OSHA Appendix tables or when it is a special type such as a suspension scaffold or a scaffold with unique loading conditions.

79. C — OSHA 29 CFR 1926.302(e)(1) specifically requires that operators of powder-actuated tools be trained and certified in the use of the specific tool being operated. Manufacturer certification

programs are the standard vehicle for meeting this requirement. Powder-actuated tools drive fasteners at velocities comparable to firearms — an untrained operator can cause serious injury or death. The training and certification requirement applies to each specific tool, not just a generic tool type.

80. B — NC OSHA adopts the federal OSHA permissible exposure limit (PEL) of 90 dBA as an 8-hour time-weighted average. Exposures at or above 85 dBA trigger the requirement for a hearing conservation program — including monitoring, audiometric testing, and hearing protector availability — but 90 dBA is the PEL above which engineering controls or administrative controls must be implemented. Understanding the distinction between the 85-dBA action level and the 90-dBA PEL is a tested OSHA concept.

81. D — The most critical quality control check during raised access floor installation in a data center is verifying that perforated floor panel airflow capacity matches the HVAC design requirements — specifically that the percentage of perforated panels and their locations correspond to the hot aisle/cold aisle cooling strategy. Incorrect perforated panel placement can create hot spots in critical equipment racks that cause equipment failure. Elevation uniformity is important but secondary to the functional airflow performance.

82. B — VCT pressure-sensitive adhesive must be applied and the tile set at temperatures between 65°F and 100°F for adequate bond development. Below 65°F, the adhesive becomes too viscous to wet the tile backing properly and bond strength is insufficient. Installation in a 58°F space will produce tiles that appear to be set but are actually poorly bonded, leading to tile lifting, curling, and premature failure. The space must be heated to at least 65°F — and maintained at that temperature — before, during, and after installation.

83. C — Joint compound must be applied and allowed to cure at temperatures above 55°F throughout the application and drying process. Below 55°F, joint compound dries too slowly, may freeze before curing, and the resulting film is prone to cracking and adhesion failure. Cold temperatures prevent the evaporation of the water vehicle from the compound, leaving a wet film that never properly sets. Heating the space before application and maintaining minimum temperatures until the compound is fully cured is essential for quality drywall finishing.

84. A — The utility markings were placed on Monday. Markings are valid for 15 days from the date placed. Monday + 15 days = the following Tuesday (15 calendar days including the day of marking). The contractor begins excavating on Wednesday of the following week — which is day 16. The markings expired on Tuesday — the day before excavation begins. A new locate request must be submitted before the contractor may legally begin excavation.

85. D — NC 811 notification is required for all excavation in North Carolina without exception — there is no exemption based on project type, excavator credentials, proximity to known utilities, depth of excavation, or location. This no-exceptions rule is one of the most important features of the NC 811 law because it eliminates the judgment calls that would otherwise lead excavators to

conclude that their specific situation does not require notification. Every excavation requires a prior locate request — period.

86. B — When a silt fence section becomes overwhelmed and posts begin to fail from hydrostatic pressure, the most likely cause is that the tributary drainage area contributing runoff to that fence section is too large for a single silt fence BMP to handle. The solution is not simply to reinforce the existing fence but to add supplemental capacity — a sediment trap, additional fence sections, or a diversion berm to reduce the contributing area. NCDEQ guidance establishes maximum tributary areas for silt fence based on slope and soil conditions.

87. C — Temporary erosion control BMPs must remain in place and functional until the site achieves final stabilization — defined as the establishment of permanent vegetative cover or equivalent permanent ground cover on all disturbed areas — and regulatory approval for plan closure has been obtained. The certificate of occupancy for the building is independent of the erosion control plan closeout. Removing BMPs before final stabilization because of schedule pressure or site appearance creates both regulatory violations and real environmental damage.

88. B — A North Carolina Residential Contractor license — regardless of financial limitation level — authorizes construction only of residential units that conform to the NC Residential Building Code, including ancillary site work and certain specialty classifications. A commercial office building is not within the scope of the Residential Contractor classification. Performing commercial work under a Residential Contractor license constitutes unlicensed contracting for that scope, regardless of the Unlimited financial level held.

89. D — Fraud in connection with a construction contract is one of the most serious grounds for NCLBGC disciplinary action, warranting the most severe penalties available to the Board — up to and including license revocation. The Board's disciplinary authority extends to all conduct reflecting on a contractor's fitness and integrity, including court-adjudicated findings of fraud. A fraudulent contractor poses a direct threat to owners, subcontractors, and suppliers who rely on the licensed contractor's integrity.

90. A — Filing a Claim of Lien on Real Property within the 120-day deadline is the most important protective step available to an unpaid general contractor. The lien creates a cloud on the property title that prevents the owner from selling or refinancing until the dispute is resolved, creating strong financial incentive for the owner to negotiate payment. Waiting until the punch list is complete before filing risks missing the 120-day deadline if resolution is delayed. The lien can be filed before final resolution of punch list disputes — the lien amount can reflect the total unpaid balance claimed.