PRACTICE EXAM 4: NASCLA TRADE EXAM SIMULATION (115 QUESTIONS)

Time Allowed: 330 Minutes (5 Hours 30 Minutes)

Total Questions: 115

Passing Score: 70% (81 Correct)

DOMAIN 1: GENERAL REQUIREMENTS (Questions 1–25)

1. A contractor is designing a commercial building with a Group A1 occupancy (theater with fixed seating) and a Group B occupancy (office) on different floors. The architect selects the separated occupancies approach. The fireresistancerated separation between Group A1 and Group B is determined from IBC Table 508.4. If a sprinkler system reduces the required separation by one hour, and the nonsprinklered requirement is 2 hours, what is the required separation in the sprinklered building?

A. No separation is required between these occupancies when sprinklers are installed throughout

B. 2hour separation is still required because sprinklers do not affect occupancy separation ratings

C. 1hour fireresistancerated separation between the Group A1 and Group B occupancies

D. ½hour fireresistancerated separation between the Group A1 and Group B occupancies

2. Under the IBC, a building classified as Type IVA mass timber construction may reach a maximum height of 18 stories. What fire protection feature is mandatory for all Type IVA buildings regardless of height?

A. An automatic sprinkler system installed throughout the entire building in accordance with NFPA 13

B. A deluge fire suppression system on every floor with chemical suppression agents in the stairways

C. Fire walls dividing the building into sections of no more than 10,000 square feet per fire area

D. A minimum 4hour fireresistance rating on all mass timber elements without exception

3. A contractor is calculating the occupant load for a 9,000 square foot warehouse (Group S2, lowhazard storage). The IBC assigns an occupant load factor of 500 gross square feet per person for warehouse space. What is the calculated occupant load?

A. 30 occupants based on the 300 square feet per person general storage factor

B. 45 occupants based on the 200 square feet per person residential factor

C. 60 occupants based on the 150 square feet per person business occupancy factor

D. 18 occupants based on the 500 square feet per person warehouse factor

4. A building inspector discovers that a penetration through a 2hour fireresistancerated floor assembly has been sealed with standard silicone caulk rather than an approved firestop system. What is the correct assessment of this condition?

A. Standard silicone caulk is an acceptable firestop material for all floor penetrations up to 2 inches

B. This is a code violation because penetrations through rated assemblies require approved firestop systems tested per ASTM E814 that maintain the assembly's fireresistance rating

C. The caulk is acceptable if the penetrating item is a metallic pipe with a melting point above 1,500°F

D. Only penetrations larger than 4 inches in diameter require approved firestop systems in floor assemblies

5. Under the IBC, what is the minimum number of accessible vanaccessible parking spaces required relative to the total number of accessible spaces in a parking lot?

A. At least 1 of every 6 accessible spaces (or fraction thereof) must be vanaccessible with a minimum 96inchwide access aisle

B. At least 1 of every 10 accessible spaces must be vanaccessible with a minimum 60inchwide access aisle

C. All accessible spaces must be vanaccessible with 96inch access aisles without exception

D. Vanaccessible spaces are not required as long as the total accessible count meets Table 1106.1

6. A contractor is constructing a twostory commercial building where the second floor has an occupant load of 250. The building has two exit stairways. Under the IBC, what is the minimum exit separation distance in a nonsprinklered building if the floor's maximum diagonal dimension is 180 feet?

A. 45 feet minimum separation, which is onequarter of the 180foot diagonal dimension

B. 60 feet minimum separation, which is onethird of the 180foot diagonal dimension

C. 90 feet minimum separation, which is onehalf of the 180foot diagonal dimension

D. 120 feet minimum separation, which is twothirds of the 180foot diagonal dimension

7. A fire protection engineer specifies that a Group I3 (detention facility) building requires smoke barriers to create smoke compartments. The IBC limits the maximum area of each smoke compartment in a Group I3 occupancy. Why are smoke compartments particularly important in detention facilities?

A. Smoke compartments allow inmates to evacuate the building independently without staff assistance

B. Smoke compartments eliminate the need for automatic sprinkler systems in detention facilities

C. Smoke compartments reduce the structural load on the fireresistancerated walls by compartmentalizing

D. Occupants in detention facilities are under restraint and cannot selfevacuate, requiring horizontal relocation to adjacent safe compartments during a fire

8. Under the IBC, what is the minimum required illumination level at the walking surface of exit access corridors, exit stairways, and exit discharge during normal building operation?

A. 1 footcandle at the walking surface during normal operation, with emergency lighting providing the same level for 90 minutes upon power failure

B. 5 footcandles at the walking surface during normal operation in all egress components at all times

C. 10 footcandles at the walking surface during normal operation for all commercial occupancy groups

D. No minimum illumination is required during normal operation — only emergency lighting requirements apply

9. A contractor is evaluating a building's compliance with IBC accessibility requirements. The building has three public entrances and one service entrance. How many of the public entrances must be accessible?

A. Only 1 public entrance must be accessible if it is the main entrance to the building

B. At least 2 of the 3 public entrances must be accessible, which satisfies the 60% minimum requirement including the main entrance

C. All 4 entrances (including the service entrance) must be accessible without any exceptions

D. None of the entrances must be accessible if the building has fewer than 5 total entrance points

10. Under the IBC, what specific requirement applies to exit signs in buildings with more than one exit to ensure occupants travel in the correct direction during an emergency?

A. Exit signs must be illuminated only during fire alarm activation to prevent confusion during normal use

B. Exit signs must flash on and off at a rate of 1 cycle per second during fire alarm activation for visibility

C. Exit signs must include the building's street address to help emergency responders identify the structure

D. Directional exit signs must indicate the direction of egress travel to the nearest exit so occupants do not travel away from their closest exit

11. A contractor is constructing a new threestory Group E (elementary school) building. The architect specifies Type IIIA construction. Under IBC Table 601, what is the minimum fireresistance rating required for the bearing walls (both exterior and interior) in Type IIIA construction?

A. Exterior bearing walls require noncombustible materials with a 2hour rating; interior bearing walls require a 1hour rating

B. Both exterior and interior bearing walls require a 2hour fireresistance rating without exception

C. Exterior bearing walls require a 3hour rating; interior bearing walls require a 2hour rating

D. No fireresistance rating is required for bearing walls in Type IIIA construction

12. A building contains a Group M (mercantile) occupancy with a fire area of 10,000 square feet and no automatic sprinkler system. According to IBC Section 903.2, does this building require an automatic sprinkler system?

A. Yes, because all Group M occupancies require sprinklers regardless of fire area size

B. Yes, because the sprinkler threshold for Group M is 5,000 square feet without sprinklers

C. No, because the 12,000 square foot fire area threshold has not been exceeded for Group M occupancies

D. No, because Group M occupancies are exempt from sprinkler requirements in all configurations

13. Under the IBC, when a building undergoes an alteration, the altered elements must comply with current accessibility requirements. However, the cost of accessibility improvements is limited to a maximum percentage of the alteration cost. What is this cost limitation?

A. 10% of the total alteration cost is the maximum required expenditure for accessibility improvements

B. 20% of the total alteration cost is the maximum required expenditure for accessibility improvements

C. 50% of the total alteration cost is the maximum required expenditure for accessibility improvements

D. There is no cost limitation — all altered elements must be fully accessible regardless of cost

14. A contractor receives construction documents showing that a fireresistancerated shaft enclosure around a mechanical duct penetrates multiple floors. Under the IBC, what is the purpose of a shaft enclosure?

A. Shaft enclosures provide acoustic separation between floors to meet sound transmission class requirements

B. Shaft enclosures serve only as architectural concealment for MEP systems with no fire safety function

C. Shaft enclosures protect against horizontal fire spread between adjacent rooms on the same floor

D. Shaft enclosures prevent the vertical spread of fire, smoke, and gases through openings that connect two or more stories

15. Under the IBC, common path of egress travel in a Group B (business) occupancy with an automatic sprinkler system is limited to what maximum distance?

A. 100 feet maximum common path of egress travel in a sprinklered Group B occupancy

B. 75 feet maximum common path of egress travel in a sprinklered Group B occupancy

C. 200 feet maximum common path of egress travel in a sprinklered Group B occupancy

D. 50 feet maximum common path of egress travel in a sprinklered Group B occupancy

16. A contractor is reviewing plans for a commercial building with a belowgrade story that has its floor level more than 30 inches below the finished ground level. Under the IBC, what special consideration applies to this belowgrade story regarding exits?

A. Belowgrade stories are exempt from all means of egress requirements if a fire alarm system is installed

B. Belowgrade stories require only one exit regardless of occupant load or travel distance

C. Belowgrade stories must have at least one exit that discharges directly to the exterior at grade level or through an enclosed exit stairway

D. Belowgrade stories require a minimum of four exits regardless of occupant load or area

17. Under the IBC, what is the minimum required fireresistance rating for the structural frame of a Type IIB building?

A. 1hour fireresistance rating for the structural frame of Type IIB construction

B. 0 hours — no fireresistance rating is required for the structural frame in Type IIB construction

C. 2hour fireresistance rating for the structural frame of Type IIB construction

D. ½hour fireresistance rating for the structural frame of Type IIB construction

18. A building's fire alarm system includes both manual pull stations and automatic smoke detectors. Under the IBC, at what locations must manual fire alarm boxes (pull stations) be installed?

A. Only at the main entrance to the building and at the fire alarm control panel location

B. At every interior door within the building regardless of whether the door serves as an exit

C. Only in mechanical rooms and electrical rooms where fire hazards are concentrated

D. At each exit doorway and at other locations required by the fire code, typically within 5 feet of each exit

19. A contractor is constructing a commercial building and the specifications call for a fireresistancerated horizontal assembly (floor/ceiling assembly). Under the IBC, what must be done at every joint and penetration in this assembly?

A. Every joint must be protected with an approved fireresistant joint system and every penetration must be firestopped to maintain the integrity of the rated assembly

B. Joints and penetrations in horizontal assemblies are exempt from firestop requirements if the building is sprinklered

C. Only joints exceeding 1 inch in width require fireresistant treatment in horizontal assemblies

D. Penetrations through horizontal assemblies do not require firestopping if they are enclosed in metal conduit

20. Under the IBC, what is the minimum height that a vent through roof (VTR) for a plumbing vent stack must terminate above the roof surface to prevent water entry?

A. 3 inches above the roof surface for all roof slopes and drainage configurations

B. 12 inches above the roof surface regardless of roof type or slope conditions

C. 6 inches above the roof surface to prevent water entry during ponding or rain events

D. The VTR may terminate flush with the roof surface if equipped with a weatherproof cap

21. A building inspector finds that the guardrails on a commercial building's secondfloor mezzanine are 39 inches high. Under the IBC, do these guardrails comply with the minimum height requirement for commercial buildings?

A. Yes, the IBC requires only 36 inches for all commercial building guardrails without exceptionB. No, the IBC requires a minimum guardrail height of 42 inches for commercial buildings, and 39 inches does not comply

C. Yes, because 39 inches exceeds the 36inch requirement for mezzanines specifically

D. No, because mezzanine guardrails require a minimum height of 48 inches, which is higher than standard guardrails

22. Under the IBC, a certificate of occupancy must be issued before a building can be occupied. Who is responsible for issuing the certificate of occupancy?

A. The architect issues the certificate after completing the final punch list inspection

B. The contractor issues the certificate after all closeout documentation has been submitted

C. The fire marshal issues the certificate after the fire alarm and sprinkler systems pass acceptance testing

D. The building official issues the certificate after confirming that the building complies with the approved documents and building code

23. A contractor is building a Group S2 (parking garage) occupancy with open sides. Under the IBC, an open parking garage is defined as having openings on two or more sides that

provide a minimum percentage of wall area for natural ventilation. What is the approximate minimum opening percentage required?

A. At least 20% of the total perimeter wall area at each tier must be open for natural ventilation

B. At least 50% of the total perimeter wall area at each tier must be open for natural ventilation

C. At least 10% of the total perimeter wall area at each tier must be open for natural ventilation

D. At least 75% of the total perimeter wall area at each tier must be open for natural ventilation

24. Under the IBC, what is the minimum distance that a plumbing vent through roof must be located from any openable window, door, or air intake to prevent sewer gases from entering the building?

A. 3 feet from any openable window, door, or mechanical air intake on the building

B. 5 feet from any openable window, door, or mechanical air intake on the building

C. 20 feet from any openable window, door, or mechanical air intake on the building

D. 10 feet from any openable window, door, or mechanical air intake on the building

25. A contractor discovers that an existing commercial building being renovated was originally constructed under the 2009 IBC. The current renovation project is being permitted under the 2021 IBC. Under the IBC, what general rule applies to existing buildings that are being altered?

A. The entire existing building must be brought into full compliance with the 2021 IBC regardless of scope

B. The altered elements must comply with the current code (2021 IBC), while unaltered portions may remain in compliance with the code under which they were originally built

C. The building is grandfathered entirely under the 2009 IBC and no current code provisions apply

D. Only the fire alarm system must be upgraded to current code standards during any renovation project

DOMAIN 2: SITE CONSTRUCTION (Questions 26–40)

26. A contractor is evaluating the results of a Standard Proctor compaction test (ASTM D698) for structural fill material. The test results show a maximum dry density of 120 pcf at an optimum moisture content of 12%. The specification requires 95% compaction. What is the minimum acceptable field dry density?

A. 114 pcf, calculated as 95% of the maximum dry density of 120 pcf determined by the Proctor test

B. 108 pcf, calculated as 90% of the maximum dry density of 120 pcf determined by the Proctor test

C. 120 pcf, because the field density must always match the laboratory maximum without reduction

D. 100 pcf, calculated as a standard minimum for all structural fill regardless of Proctor results

27. A contractor notices that water is accumulating in a foundation excavation despite the absence of rain. The water level is rising steadily from the bottom of the excavation. What is the most likely source of this water, and what action must be taken?

A. The water is caused by a broken fire hydrant nearby and the contractor should contact the water utility

B. The water is condensation from the exposed soil surface and will dissipate without intervention

C. The groundwater table is at or above the excavation level and the contractor must implement dewatering before workers enter and reclassify the soil as Type C under OSHA

D. The water is from an underground spring that cannot be addressed by any construction method

28. A contractor is performing rough grading on a commercial site and encounters a previously unknown underground storage tank (UST) not identified in the Phase I Environmental Site Assessment. What is the correct course of action?

A. Remove the tank immediately using the excavator already onsite and dispose of it at the nearest landfill

B. Cover the tank with fill material and continue grading operations as if the tank were not discovered

C. Notify the owner immediately and report the finding to the appropriate regulatory authority without further disturbance

D. Stop all work in the area, notify the project owner and ADEM, and engage a qualified environmental professional to assess the situation before any further disturbance

29. Under OSHA's excavation safety standard, what is the minimum required width for a trench shield (trench box) to safely protect workers during excavation operations?

A. The trench shield must be wide enough to provide at least 24 inches of clearance on each side of the worker and must extend at least 18 inches above the surrounding grade level

B. There is no minimum width — the trench shield only needs to be tall enough to match the excavation depth

C. The trench shield must be exactly 4 feet wide to accommodate standard utility pipe installations

D. The trench shield width is determined by the pipe diameter and must be exactly twice the pipe size

30. A contractor is constructing a commercial building on a site with expansive clay soils. What characteristic of expansive clays makes them problematic for foundation construction?

A. Expansive clays are too hard to excavate without blasting and require specialized rockcutting equipment

B. Expansive clays swell significantly when wet and shrink when dry, creating cyclical volume changes that can heave and crack foundations

C. Expansive clays are always contaminated with heavy metals that require environmental remediation

D. Expansive clays cannot support any structural load and always require deep foundation systems

31. A contractor is installing erosion control blankets on a steep slope adjacent to a commercial building under construction. What is the primary purpose of erosion control blankets?

A. Erosion control blankets provide permanent structural reinforcement to the slope against landslides

B. Erosion control blankets serve as a decorative ground cover that improves the aesthetics of construction sites

C. Erosion control blankets protect exposed soil from raindrop impact and sheet erosion while allowing vegetation to establish through the blanket material

D. Erosion control blankets act as a vapor barrier that prevents moisture from evaporating from the soil

32. When a contractor discovers that the actual bearing soil at the foundation level differs materially from the conditions described in the geotechnical report, what is the immediate required notification?

A. The contractor should proceed with the pour and address any settlement issues through warranty repairs

B. The contractor should contact the local building inspector and request a variance from the foundation design

C. The contractor must notify the concrete supplier to modify the mix design for the different soil conditions

D. The contractor must immediately notify the structural engineer and geotechnical engineer so the foundation design can be evaluated and potentially modified before concrete is placed

33. A contractor is installing a driven pile foundation for a commercial building. During pile driving, the contractor observes that a pile suddenly drops several feet with minimal hammer resistance after previously driving at normal resistance. What does this sudden loss of resistance most likely indicate?

A. The pile has encountered a void, soft soil layer, or underground cavity below the resistant stratum it was previously penetrating

B. The pile driving hammer has malfunctioned and is delivering excessive energy to the pile cap

C. The pile has reached competent bedrock and the reduced resistance indicates the pile is fully seated

D. The pile has fractured internally and the lower portion has separated from the upper portion

34. According to the IBC, what is the minimum thickness of a vapor barrier placed beneath a concrete slab on grade to prevent moisture vapor from migrating through the slab?

A. 4mil polyethylene is the minimum acceptable thickness for underslab vapor barriers per the IBC

B. 6mil polyethylene or Class A vapor retarder as specified in the code and industry standards for underslab applications

C. 15mil polyethylene is required as the minimum for all underslab vapor barrier installations

D. No minimum thickness is specified because the IBC does not address underslab moisture protection

35. A contractor is installing underground storm drainage piping using reinforced concrete pipe (RCP). What bedding requirement must be met before the pipe is placed in the trench?

A. The pipe may rest directly on the native soil at the bottom of the trench without any bedding material

B. The pipe must be placed on a rigid concrete cradle that extends 180 degrees around the pipe circumference

C. The pipe must be suspended from the top of the trench with metal straps and no contact with the trench bottom

D. A uniform granular bedding material must be placed and compacted to a minimum of 4 inches beneath the pipe to provide even support

36. A contractor is performing a phase of construction that requires operating heavy equipment adjacent to an existing building. The geotechnical engineer has expressed concern about the vibrations from the equipment affecting the existing structure. What preconstruction measure should be taken?

A. No measures are needed because construction vibrations cannot damage adjacent structures

B. The contractor should operate equipment only during nighttime hours to minimize the impact on building occupants

C. A preconstruction condition survey of the adjacent structure should be documented before vibrationgenerating work begins to establish a baseline for comparison if damage claims arise

D. The contractor should increase the speed of equipment operations to minimize the duration of vibration exposure

37. A contractor is reviewing the project's erosion and sediment control plan and notices that inlet protection is specified around all storm drain inlets within the construction area. What is the purpose of inlet protection devices?

A. Inlet protection prevents sedimentladen runoff from entering the storm drainage system, which would carry sediment directly to receiving waterways

B. Inlet protection prevents vehicles from driving over storm drain grates and damaging them during construction

C. Inlet protection prevents construction debris from clogging the underground stormwater pipe network

D. Inlet protection is a decorative cover that improves the appearance of construction sites near public roads

38. Under OSHA's excavation safety standard, atmospheric testing is required in certain excavation conditions before workers enter the trench. Under what conditions is atmospheric testing required?

A. Atmospheric testing is required in every excavation exceeding 4 feet in depth regardless of location

B. Atmospheric testing is required when oxygen deficiency or hazardous atmospheres could exist, such as near landfills, chemical facilities, or areas with decaying organic material

C. Atmospheric testing is required only when the excavation will remain open for more than 30 calendar days

D. Atmospheric testing is never required in excavations and applies only to confined space entry situations

39. A contractor is constructing a concrete curb and gutter system for a commercial parking lot. What is the primary function of the curb and gutter system beyond defining the pavement edge?

A. The curb and gutter provides structural support to the pavement edge and prevents lateral spreading

B. The curb and gutter serves as a pedestrian barrier that prevents vehicles from entering landscaped areas

C. The curb and gutter acts as a temporary sediment control measure during the construction phase only

D. The curb and gutter controls surface water by channeling runoff along the pavement edge to storm drain inlets for collection

40. A contractor has completed placing and compacting structural fill for a building pad. Before the foundation contractor begins excavating for footings, the project specifications require a proof roll of the completed fill surface. What is the purpose of a proof roll?

A. A proof roll verifies the compacted fill's ability to support construction traffic by driving a loaded vehicle across the surface and observing for deflection, pumping, or rutting that would indicate soft or inadequately compacted areas

B. A proof roll measures the exact elevation of the fill surface using a laser level for grade verification

C. A proof roll applies a final layer of asphalt sealant to the fill surface to prevent moisture infiltration

D. A proof roll compacts the top 2 inches of fill using a smoothdrum vibratory roller for final densification

DOMAIN 3: CONCRETE (Questions 41–46)

41. A contractor is reviewing the concrete specifications for a commercial building foundation. The specification calls for "5,000 psi concrete at 28 days." A coworker suggests using a mix with a higher watercement ratio to improve workability. The contractor objects. What is the correct relationship between watercement ratio and compressive strength?

A. A higher watercement ratio produces higher compressive strength because more water improves hydration

B. Lower watercement ratios produce higher compressive strength; higher ratios produce lower strength, reduced durability, and increased permeability

C. The watercement ratio has no relationship to compressive strength — only the cement content matters

D. The relationship between watercement ratio and strength is random and cannot be predicted

42. A concrete contractor is placing a 6inchthick slab on grade and the specifications require contraction joints (control joints) at regular intervals. The joints must be cut to a minimum depth. What is the correct minimum joint depth for this 6inch slab?

A. ¾ inch deep, which is oneeighth of the 6inch slab thickness for proper crack control

B. 3 inches deep, which is onehalf of the 6inch slab thickness for full penetration

C. The joint depth is the same regardless of slab thickness and is always cut to exactly 1 inch

D. 1½ inches deep, which is onequarter of the 6inch slab thickness for proper crack control

43. A contractor receives a delivery of concrete and the batch ticket shows that the concrete contains a retarding admixture. Under what conditions would a retarding admixture be specified in a concrete mix?

A. In hot weather when concrete would otherwise set too quickly before it can be properly placed and finished, or in large pours where extended workability is needed to prevent cold joints

B. In cold weather when concrete must set more quickly to resist freezing during the early curing period

C. When the concrete will be exposed to sulfatebearing soils that could attack the cement paste over time

D. When the specification calls for high early strength to allow formwork stripping within 24 hours of placement

44. A project specification requires welded wire reinforcement (WWR) in a slab on grade. The contractor's crew places the WWR flat on the vapor barrier before the concrete pour. What is wrong with this installation?

A. WWR should be placed on top of the finished concrete surface after the pour as a bonded overlay

B. WWR on the vapor barrier is acceptable because the slab bears on the soil and the reinforcement position is irrelevant

C. WWR must be positioned at middepth or slightly above middepth of the slab to be effective for crack control — resting on the bottom provides almost no benefit

D. WWR should be installed vertically in the slab with the wires running perpendicular to the concrete surface

45. A concrete contractor is forming a retaining wall and needs to calculate the maximum lateral pressure the formwork must resist. Which factor does NOT directly affect the maximum lateral pressure of fresh concrete on wall forms?

A. The compressive strength (f'c) specified for the hardened concrete at 28 days

B. The rate of placement — how fast the forms are being filled measured in feet per hour

C. The vibration method used for consolidation and whether external or internal vibrators are employed

D. The temperature of the concrete — warmer concrete sets faster and reduces the maximum pressure

46. A contractor is placing concrete for an elevated structural slab and the structural engineer requires the forms and shores to remain in place until the concrete reaches a specific strength. The ambient temperature has been below 40°F for the past week. How does cold weather affect the decision on when to strip forms?

A. Cold weather has no effect on form stripping times because concrete strength gain is temperatureindependent

B. Forms should be stripped earlier in cold weather to expose the concrete to air and accelerate curing

C. Form stripping times are based solely on calendar days and are not adjusted for ambient temperature

D. Form stripping times must be extended in cold weather because concrete gains strength more slowly at lower temperatures, and the concrete must reach adequate strength before support is removed

DOMAIN 4: MASONRY (Questions 47–50)

47. A masonry contractor is laying the first course of a reinforced CMU wall on the foundation. Why is the first course the most critical course in the entire wall?

A. The first course uses a different type of mortar than all subsequent courses for structural reasons

B. The first course establishes the alignment, level, and dimensional accuracy for the entire wall — any error in the first course is magnified as the wall rises

C. The first course must be laid without mortar to allow adjustment after the full wall height is reached

D. The first course is the only course that requires reinforcing steel and grout in all CMU cells

48. A masonry specification calls for Type M mortar for a belowgrade retaining wall. What is the minimum compressive strength of Type M mortar, and why is it specified for this application?

A. 750 psi — Type M is selected for its superior workability in belowgrade applications

B. 1,800 psi — Type M provides the highest bond strength for walls subject to lateral loads

C. 2,500 psi — Type M provides the highest compressive strength and is used for belowgrade masonry, foundations, and retaining walls

D. 350 psi — Type M is the most economical mortar for largevolume belowgrade applications

49. A masonry contractor is building a running bond CMU wall and reaches an opening for a window. What structural element must be installed above the opening to support the masonry above?

A. A lintel — a horizontal structural member spanning the opening that transfers loads from the masonry above to the jamb supports on each side

B. A control joint — a vertical separation that allows the wall to move freely above the opening

C. A bond beam at the sill level only with no structural support required above the opening

D. A steel column installed inside the wall cavity at each side of the opening for lateral support

50. In masonry construction, expansion joints serve a different purpose than control joints. What type of masonry requires expansion joints, and what movement do they accommodate?

A. CMU (concrete masonry) walls require expansion joints to accommodate moisturerelated shrinkage

B. All masonry walls require expansion joints at every course to allow vertical settlement

C. Stone masonry walls require expansion joints at every change in stone type or color

D. Brick masonry walls require expansion joints to accommodate thermal expansion, as clay bricks expand over time due to moisture absorption and temperature changes

DOMAIN 5: METALS (Questions 51–56)

51. A contractor is reviewing a steel erection plan and the ironworkers are preparing to erect the first columns. Before any steel can be set, the contractor must verify the anchor bolt layout. What is the AISC tolerance for anchor bolt placement relative to the center of the bolt group?

A. ±½ inch from the center of the bolt group for each individual anchor bolt location

B. ±¼ inch from the center of the bolt group for each individual anchor bolt location

C. ±⅛ inch from the center of the bolt group for each individual anchor bolt location

D. ±1 inch from the center of the bolt group for each individual anchor bolt location

52. A structural engineer specifies that all beamtocolumn connections in the lateral forceresisting system must use slipcritical connections with Class A faying surfaces. What surface preparation is required for Class A faying surfaces?

A. The surfaces must be coated with a minimum 2mil thickness of zincrich primer before bolt installation

B. The surfaces must be unpainted clean mill scale or blastcleaned with a Class A coating that achieves the required slip coefficient

C. The surfaces must be lubricated with antiseize compound to ensure uniform bolt tension across the connection

D. The surfaces must be painted with two coats of red oxide primer and allowed to cure for 48 hours minimum

53. A contractor is installing composite metal floor decking on a commercial steel frame building. The specifications require puddle welds (burnthrough welds) to attach the deck to the supporting steel beams. What is a puddle weld?

A. A continuous fillet weld running the full length of the decktobeam contact line on both sides

B. A predrilled hole in the deck filled with weld metal to create a mechanical interlock with the beam

C. A groove weld applied to the deck ribs at every third rib along the beam flange for attachment

D. A spot weld made by melting through the deck sheet and fusing it to the beam flange below at discrete locations

54. A contractor discovers that several highstrength A490 bolts on the project have been stored outdoors without protection and show visible surface rust. Are these bolts still acceptable for structural use?

A. Light surface rust on A490 bolts does not affect their structural capacity as long as the threads are not damaged and the nut can be installed and rotated freely — heavy corrosion or pitting requires rejection

B. Any visible rust on A490 bolts automatically disqualifies them from structural use without exception

C. Rusted A490 bolts may be used only in bearingtype connections but never in slipcritical connections

D. The bolts must be regalvanized onsite before installation to restore the original corrosion protection

55. A steel erection crew has completed a section of the structural frame and the surveyor is checking the plumb of the columns before final bolt tightening. One column is found to be ¾ inch out of plumb over a 20foot height. Does this column meet AISC erection tolerances?

A. No — the maximum deviation is ½ inch for a 20foot column under AISC tolerance standards

B. The tolerance cannot be determined without knowing the total building height and the column's position

C. Yes — the AISC tolerance of 1/500 of the column length yields 20 × 12 ÷ 500 = 0.48 inches, so ¾ inch does NOT comply

D. Yes — the tolerance is 1 inch per 10 feet of column height, and ¾ inch is well within this limit

56. A contractor is installing coldformed steel (CFS) framing for interior partitions in a commercial building. The stud designation reads "600S16254." What do the numbers in this designation represent?

A. A 6inch deep stud section with a 60inch maximum height limitation and 54 screws per panel

B. A 600pound capacity stud with a 162inch maximum span and 54mil minimum thickness requirement

C. A 6foot long stud with 16.2inch spacing and 54 studs required per wall section for structural adequacy

D. The stud has a 6inch web depth, 15/8 inch flanges, and is manufactured from 54mil (0.054 inch) thick steel

DOMAIN 6: WOOD (Questions 57–61)

57. A contractor is framing an exterior wall and the building designer specifies a header over a 6footwide window opening in a loadbearing wall. The header must span the opening and carry the loads from above. For a standard 2×6 wall, which of the following header configurations is appropriate for this span?

A. A flat (laidonside) 2×4 header because the wall is not loadbearing above the opening

B. A single 2×6 set on edge with cripple studs above for bearing support at the top plate

C. A doubled 2×4 header set on edge because 2×4 is sufficient for any residential or commercial span

D. A doubled 2×10 or engineered lumber header set on edge, sized by the structural engineer for the specific span and load conditions

58. A contractor is building a woodframed commercial building and the fire inspector requires fire blocking in the exterior wall cavity at the secondfloor level. Under the IBC, what materials are acceptable for use as fire blocking?

A. 2× nominal lumber, two layers of 1inch nominal boards, ½inch gypsum board, or other approved noncombustible materials installed to fill the cavity completely

B. Only sheet metal plates with a minimum thickness of 26 gauge welded to the stud faces on both sides

C. Loosefill fiberglass insulation stuffed into the cavity is the only accepted material for fire blocking

D. Fire blocking is required only in balloonframed construction and is never needed in platformframed walls

59. A contractor is calculating the board feet of lumber needed for a project. A lumber order calls for 50 pieces of 2×8 lumber, each 12 feet long. How many board feet does this order represent?

A. 800 board feet total for the 50piece order of 2×8×12 lumber

B. 800 board feet, calculated as (2 × 8 × 12) ÷ 12 = 16 board feet per piece × 50 pieces

C. 400 board feet, calculated using the actual dimensions rather than nominal dimensions

D. 1,600 board feet, calculated as 2 × 8 × 12 = 192 board feet per piece × 50 pieces

60. A contractor is reviewing structural drawings that specify a parallel strand lumber (PSL) column for a heavy load application. What distinguishes PSL from laminated veneer lumber (LVL)?

A. PSL and LVL are identical products manufactured by the same process with no structural differences

B. PSL uses only recycled wood fibers while LVL uses only virgin timber from oldgrowth forests

C. PSL is manufactured from long, thin strands of wood veneer bonded under pressure, producing an extremely strong member suitable for columns and heavy beams, while LVL uses thin continuous veneers

D. PSL is a decorative trim product with no structural capacity while LVL is used for all structural applications

61. A contractor is installing roof trusses on a commercial building. The truss manufacturer's installation guide requires temporary bracing during and after erection until the permanent bracing (sheathing and bridging) is installed. What risk does the contractor face if temporary bracing is omitted during truss installation?

A. The trusses will sag excessively at midspan but will not collapse until the roof load is applied

B. The trusses may warp permanently but will maintain adequate structural capacity for the design loads

C. Omitting temporary bracing is acceptable as long as the roof sheathing is installed within the same day

D. Unbraced trusses can topple in a dominochain collapse, as one truss falling laterally pushes adjacent trusses over in sequence, potentially causing catastrophic failure of the entire roof system

DOMAIN 7: THERMAL AND MOISTURE PROTECTION (Questions 62–66)

62. A commercial building envelope consultant specifies a rainscreen wall system for the exterior of a midrise office building. What is the fundamental principle of a rainscreen system?

A. A rainscreen system uses a drainage cavity between the cladding and the waterresistive barrier, with the cladding serving as the primary rain deflector and the WRB serving as the secondary waterproofing line of defense

B. A rainscreen system applies waterproof paint to the exterior cladding to prevent all moisture penetration

C. A rainscreen system uses a singlelayer barrier wall with no air space between the cladding and structure

D. A rainscreen system relies entirely on the cladding material to stop 100% of water penetration without backup

63. A contractor is installing polyisocyanurate (polyiso) rigid foam insulation on a commercial roof deck. The manufacturer's literature states an Rvalue of R6.0 per inch. The contractor

notices that the project is located in a cold climate where winter temperatures regularly drop below 20°F. What performance concern should the contractor be aware of regarding polyiso in cold temperatures?

A. Polyiso rigid board insulation maintains its full rated Rvalue at all temperatures without any reduction

B. Polyiso Rvalue increases at cold temperatures, providing even better performance than the rated value

C. Polyiso's Rvalue decreases at very low temperatures, meaning actual coldweather performance may be lower than the stated rating measured at 75°F mean temperature

D. Polyiso cannot be installed in any climate where temperatures drop below 40°F due to material failure

64. A contractor is installing a modified bitumen roofing system. The specifications call for SBSmodified bitumen applied by torch application. What does the "SBS" designation indicate about the membrane?

A. SBS stands for "Standard Bitumen Sheet" and refers to the standard unmodified asphalt membrane

B. SBS stands for "StyreneButadieneStyrene," a rubber modifier that improves the asphalt's flexibility and elasticity, particularly at lower temperatures

C. SBS stands for "SingleBarrier System" and describes the number of membrane layers required

D. SBS stands for "Structural Barrier Substrate" and refers to the insulation board beneath the membrane

65. A building owner reports that moisture is appearing on the interior surface of exterior walls during the summer months in a commercial building in Alabama. The walls have a Class I vapor barrier (polyethylene sheeting) on the interior side of the studs. What is the most likely cause of this moisture problem?

A. The roof is leaking and water is migrating down through the wall cavities to the interior surfaces

B. The plumbing system has a hidden leak within the wall cavity that is producing condensation

C. The HVAC system is producing excessive humidity that is overwhelming the vapor barrier's capacity

D. The Class I interior vapor barrier is trapping moisture that has migrated inward from the hot, humid exterior through the wall assembly, condensing on the cool interior surface of the polyethylene

66. A contractor is installing a singleply EPDM roofing membrane on a commercial building. Unlike TPO and PVC membranes, EPDM seams are not welded. How are EPDM membrane seams typically joined?

A. EPDM seams are joined by mechanical fastening with stainless steel screws at 4inch intervals

B. EPDM seams are joined by heat fusion using the same hotair welding equipment as TPO membranes

C. EPDM seams are bonded with adhesive or seam tape that creates a watertight seal at each overlap

D. EPDM seams are sewn together with synthetic thread and then sealed with a liquidapplied membrane coating

DOMAIN 8: DOORS, WINDOWS, AND GLAZING (Questions 67–70)

67. A contractor is selecting hardware for interior doors along an accessible route in a commercial building. The IBC and ADA require that door hardware be operable without tight grasping, pinching, or twisting of the wrist. Which of the following hardware types complies with this requirement?

A. Leverstyle handles that can be operated with one hand and do not require tight grasping or twisting

B. Round doorknobs that require the user to grasp and rotate the knob to release the latch mechanism

C. Thumbturn deadbolts that require pinching and turning with the thumb and forefinger to operate

D. Recessed finger pulls that require the user to insert fingers into a pocket and pull laterally to open

68. A contractor is installing exterior commercial aluminum storefront doors and the architect has specified automatic door closers. Under ADA requirements, what is the maximum closing time permitted for these door closers from a 90degree open position to 12 degrees from the latch?

A. 3 seconds maximum closing time from 90 degrees open to 12 degrees from the latch position

B. 10 seconds maximum closing time from 90 degrees open to 12 degrees from the latch position

C. 1 second maximum closing time from 90 degrees open to 12 degrees from the latch position

D. 5 seconds minimum closing time from 90 degrees open to 12 degrees from the latch position

69. A contractor is installing windows in a commercial building and the specifications require a maximum Ufactor of 0.35 for the window assembly. A window manufacturer submits a product with a centerofglass Ufactor of 0.28 but a total assembly Ufactor of 0.38. Does this window meet the specification?

A. Yes, because the centerofglass Ufactor of 0.28 is below the maximum of 0.35 specified

B. No, because the total assembly Ufactor of 0.38 exceeds the specified maximum of 0.35, and the specification applies to the complete window assembly including frame and edge effects

C. Yes, because the average of the centerofglass and assembly Ufactors is 0.33, which is below 0.35

D. The specification cannot be evaluated without also knowing the SHGC and VT values of the glazing

70. Under the IBC, what is the minimum height of the guardrail on an operable commercial window when the sill is located less than 36 inches above the floor and the window opens to a drop of 72 inches or more?

A. No guardrail is required for operable windows in commercial buildings regardless of sill height

B. A 24inch guardrail is sufficient for all operable window conditions in commercial occupancies

C. A guardrail or window opening limiter must be provided to prevent falls, consistent with the guardrail requirements for opensided walking surfaces

D. The window must be replaced with a fixed nonoperable window because operable windows are prohibited below 36 inches

DOMAIN 9: FINISHES (Questions 71–75)

71. A contractor is installing ⅝inch Type X gypsum board on the ceiling of a commercial kitchen as part of a 1hour fireresistancerated floor/ceiling assembly. The specifications require screws at 12 inches on center along each joist. During installation, the contractor notices that the screws are being driven until the head is flush with the board surface. Is this installation correct?

A. Yes, screws should be driven flush with the gypsum board surface for proper holding capacity and fire rating compliance

B. No, screws must protrude ¼ inch above the board surface to provide mechanical interlock with the joint compound

C. No, screws must be driven until the head is recessed 3/16 inch below the surface for maximum pullthrough resistance

D. Yes, but only if the screw penetrates the framing by at least 2 inches regardless of head depth

72. A commercial building specification calls for ceramic tile installation in a lobby with a mortar bed installation method rather than thinset adhesive. What distinguishes a mortar bed tile installation from a thinset installation?

A. Mortar bed installation uses premixed mastic adhesive while thinset uses drymix cementbased adhesive

B. Mortar bed installation is always performed on walls while thinset is used exclusively on floors

C. There is no difference — mortar bed and thinset are identical installation methods with different names

D. Mortar bed installation uses a thick layer of sandcement mortar (¾ inch to 1¼ inches) to create a level substrate, while thinset uses a thin layer of adhesive (3/16 inch to ¼ inch) applied to an alreadylevel substrate

73. A painting contractor is preparing to apply semigloss latex paint to new gypsum board walls in a commercial office building. The gypsum board has been finished to Level 4. What must be applied to the gypsum board surface before the topcoat paint?

A. No preparation is needed — semigloss paint may be applied directly to finished Level 4 gypsum board

B. A primer coat must be applied to seal the porous gypsum board surface and provide uniform adhesion and sheen for the topcoat

C. A coat of polyurethane sealer must be applied to waterproof the gypsum board before painting

D. Two coats of oilbased stainblocking primer are required by code before any latex topcoat application

74. A contractor is selecting resilient flooring for a medical clinic where infection control is a priority. What characteristic of the flooring material is most important for this healthcare application?

A. The flooring must have a heatwelded seam system that creates a monolithic, seamless surface resistant to bacterial growth and fluid penetration

B. The flooring must have the deepest available texture for maximum slip resistance in all conditions

C. The flooring must be available in the specific color palette required by the clinic's interior designer

D. The flooring must be the lowestcost option available to maximize the clinic's construction budget

75. A contractor discovers that acoustic ceiling tiles (ACT) specified for an open office area have a Noise Reduction Coefficient (NRC) of 0.70. What does this NRC rating indicate about the ceiling tile's performance?

A. The ceiling tile blocks 70% of sound transmission between adjacent rooms separated by the ceiling

B. The ceiling tile reduces background noise by 70 decibels in the space below the ceiling

C. The ceiling tile absorbs approximately 70% of sound energy striking its surface, reducing reverberation and echo in the open office environment

D. The ceiling tile has a fireresistance rating of 70 minutes when tested per ASTM E119

DOMAIN 10: MECHANICAL AND PLUMBING SYSTEMS (Questions 76–81)

76. A contractor is constructing a commercial building with a hydronic heating system. The system uses a natural gasfired boiler to produce hot water that is circulated through piping to fan coil units throughout the building. What is the function of the fan coil units in this system?

A. The fan coil units generate hot water independently using electric resistance heating elements

B. The fan coil units serve only as air filters and do not contribute to heating or cooling the space

C. The fan coil units compress refrigerant gas to produce heat through the refrigeration cycle

D. The fan coil units blow air across hot water coils, transferring heat from the water to the room air for space heating

77. Under the International Plumbing Code, the maximum flow rate for a toilet (water closet) in a commercial building is limited to conserve water. What is the current maximum flow rate for standard commercial toilets?

A. 3.5 gallons per flush, which was the standard before water conservation requirements were enacted

B. 1.6 gallons per flush maximum, with many jurisdictions now requiring 1.28 gpf highefficiency toilets

C. 0.5 gallons per flush for all commercial toilets installed after 2020 in all jurisdictions

D. 5.0 gallons per flush for commercial applications, with lower limits applying only to residential fixtures

78. A fire protection engineer specifies a deluge sprinkler system for a chemical storage room classified as Group H3 occupancy. How does a deluge system differ from a wet pipe system?

A. In a deluge system all sprinkler heads are open (no heatsensitive elements) and water is released from every head simultaneously when a separate detection system activates the deluge valve

B. A deluge system operates identically to a wet pipe system but uses a different type of sprinkler head

C. A deluge system releases water from only the heads closest to the fire while keeping all other heads sealed

D. A deluge system uses foam rather than water and is activated by manual pull stations at exit doors

79. A contractor is installing a building automation system (BAS) for a commercial HVAC system. What is the primary function of a building automation system?

A. The BAS replaces all manual thermostats with fixedtemperature settings that cannot be adjusted

B. The BAS provides emergency power to the HVAC equipment during electrical outages using battery backup

C. The BAS monitors and controls HVAC, lighting, and other building systems from a central workstation, optimizing energy use and maintaining comfort across all zones

D. The BAS serves exclusively as a fire alarm system that shuts down HVAC equipment during fire events

80. Under the International Plumbing Code, a commercial building must provide a minimum number of plumbing fixtures based on the occupancy type and the number of occupants. Which IPC table provides the minimum fixture requirements?

A. IPC Table 403.3, which lists fixture requirements based on building height and construction type

B. IPC Table 605.1, which lists fixture requirements based on the water supply pipe material used

C. IPC Table 305.1, which lists fixture requirements based on the building's fireresistance rating

D. IPC Table 403.1, which lists the minimum plumbing fixture requirements by occupancy type and occupant count

81. A contractor discovers that the sprinkler system's main control valve (OS&Y valve) has been partially closed by an unauthorized person. What is the immediate life safety concern created by this condition?

A. A partially closed OS&Y valve restricts water flow to the sprinkler system, potentially preventing adequate water delivery during a fire and leaving the building unprotected or underprotected

B. A partially closed valve increases water pressure in the system, creating a risk of pipe rupture

C. A partially closed valve has no effect on system performance because the valve operates in only two states

D. A partially closed valve causes the fire alarm system to malfunction and generate false alarms

DOMAIN 11: ELECTRICAL SYSTEMS (Questions 82–84)

82. A contractor is reviewing the electrical design for a commercial building and the engineer specifies 277volt circuits for overhead LED lighting fixtures. Why is 277 volts used for commercial lighting instead of the standard 120 volts?

A. 277volt LED fixtures produce brighter light output than 120volt fixtures of the same wattage rating

B. 277 volts is one phase of the 480/277volt wye service, allowing direct connection without a stepdown transformer, reducing electrical distribution costs and energy losses

C. 277volt circuits are required by the NEC for all commercial lighting regardless of fixture type or wattage

D. 277volt circuits use smaller conduit than 120volt circuits, saving material costs throughout the building

83. Under the NEC, overcurrent protection devices (circuit breakers and fuses) serve a critical safety function in the electrical distribution system. What is the primary purpose of these devices?

A. To regulate voltage levels and maintain a constant 120 volts at all receptacles throughout the building

B. To measure electrical consumption for billing purposes and communicate usage data to the electric utility

C. To provide convenient switching for individual circuits to facilitate maintenance and equipment changes

D. To detect excessive current flow and interrupt the circuit before the wiring overheats and causes a fire or equipment damage

84. A contractor is installing temporary electrical service on a construction site. The NEC requires that all 120volt, singlephase, 15 and 20ampere receptacle outlets on construction sites be protected by which device?

A. A surge protector rated for at least 1,000 joules of protection capacity per receptacle circuit

B. An arcfault circuit interrupter (AFCI) breaker at the temporary panel for all branch circuits

C. A groundfault circuit interrupter (GFCI) providing protection at 5 milliamps of groundfault current

D. A doublepole circuit breaker with a minimum 30ampere rating for all temporary construction receptacles

DOMAIN 12: PROCUREMENT AND CONTRACTING REQUIREMENTS (Questions 85–115)

85. A contractor is preparing a bid for a commercial project. During the document review, the estimator identifies a conflict between the architectural floor plan (which shows a 10foot ceiling height) and the building section (which shows a 12foot ceiling height). Under standard bidding practice, what should the contractor do?

A. Submit a request for information (RFI) or prebid question to the architect seeking clarification of the correct ceiling height before completing the bid

B. Use the lower ceiling height to submit the most competitive bid possible and address the difference later

C. Use the higher ceiling height and add a markup for the increased risk and material cost without notifying anyone

D. Ignore the conflict because minor discrepancies in the documents are the architect's problem, not the contractor's

86. Under AIA A201, the contractor must provide a performance bond and payment bond when required by the contract. What is the typical bond amount for each of these bonds relative to the contract price?

A. 50% of the contract price for the performance bond and 25% for the payment bond

B. 25% of the contract price for the performance bond and 10% for the payment bond

C. 100% of the contract price for both the performance bond and the payment bond

D. 200% of the contract price for the performance bond and 100% for the payment bond

87. A project owner decides to terminate the contractor for cause under AIA A201 after repeated failures to maintain the project schedule. Before terminating, what procedural step must the owner take?

A. The owner must file a complaint with the state licensing board and wait for a hearing before terminating

B. The owner must submit a written request to the architect for a recommendation on whether to terminate

C. The owner may terminate immediately without notice because schedule failures constitute automatic breach

D. The owner must provide written notice to the contractor and the contractor's surety, giving the contractor an opportunity to cure the default within the time specified

88. A contractor on a public project submits the lowest bid at $4,200,000. The secondlowest bid is $4,450,000. The owner's engineer's estimate was $4,800,000. All bids are below the estimate. Under standard public bidding procedures, how does the owner evaluate whether to award the contract?

A. The owner must reject all bids because any bid more than 5% below the engineer's estimate is suspect

B. The owner evaluates whether the lowest bidder is both responsive (bid complies with requirements) and responsible (bidder has the capacity, experience, and financial stability to perform the work)

C. The owner must award to the secondlowest bidder to avoid the risk of an unrealistically low bid

D. The owner must rebid the project because the spread between the bids exceeds 10% of the low bid

89. Under AIA A201, the contractor has the right to stop work under specific circumstances. What condition must exist before the contractor may stop work?

A. The owner has failed to make a certified payment within the contractually specified timeframe, and the contractor has provided 7 days' written notice to the owner and architect

B. The architect has rejected a submittal and the contractor disagrees with the architect's review comments

C. A subcontractor has failed to show up for work and the affected trade cannot proceed for more than 24 hours

D. The weather has prevented outdoor work for more than 3 consecutive working days during the project

90. A general contractor is comparing two subcontractor bids for the fire protection (sprinkler) trade package. Bidder A includes the sprinkler system, fire pump, and fire department connection in their scope. Bidder B includes only the sprinkler piping and heads but excludes the fire pump and FDC. What critical step must the contractor take before incorporating either bid?

A. The contractor should automatically select Bidder A because it appears to have the more complete scope

B. The contractor should automatically select Bidder B because it has the lower base price

C. The contractor must verify the exact scope of each bid against the specifications to ensure that the incorporated bid covers the complete fire protection scope, and price any gaps

D. The contractor should average both bids and use the average as the fire protection cost in the estimate

91. Under standard construction contract provisions, what is a "liquidated damages" clause and how does it differ from an actual damages claim?

A. Liquidated damages are actual damages calculated after the fact based on the owner's proven financial losses

B. Liquidated damages are a preagreed fixed amount per day of delay specified in the contract, substituting for the calculation of actual damages which would be difficult to determine

C. Liquidated damages are penalties designed to punish the contractor and are not related to actual harm

D. Liquidated damages apply only to subcontractors and never to the general contractor under the prime contract

92. A contractor is reviewing a subcontract and notices that the payment terms state "paywhenpaid." What does a "paywhenpaid" clause mean?

A. The general contractor must pay the subcontractor within 7 days of submitting the subcontractor's invoice

B. The subcontractor must pay for all materials in advance and is reimbursed only after project completion

C. The general contractor pays the subcontractor immediately upon receipt of each monthly pay application

D. The general contractor's obligation to pay the subcontractor is contingent on the general contractor first receiving payment from the owner for the subcontractor's work

93. Under AIA A201, the architect has the authority to reject work that does not conform to the contract documents. However, the architect does NOT have authority over certain aspects of the contractor's operations. Which of the following is outside the architect's authority?

A. The contractor's construction means, methods, techniques, sequences, and procedures, which are the contractor's sole responsibility

B. The quality of materials and products incorporated into the work as specified in the contract documents

C. The interpretation of the construction documents when disputes arise about the design intent

D. The certification of progress payments based on the contractor's applications and the observed progress

94. A contractor is working on a project where the owner has provided a geotechnical report as part of the bid documents. During foundation excavation, the contractor encounters rock at the foundation level that was not indicated in the geotechnical report. The contract contains a differing site conditions clause. What type of differing site condition does this represent?

A. Type II — conditions at the site that are unusual and differ materially from those ordinarily encountered

B. Type I — conditions known to the contractor before bidding and accepted as part of the contract risk

C. This is not a differing site condition because rock is always expected at foundation depth on any project

D. Type I — subsurface conditions that differ materially from those indicated in the contract documents, specifically the geotechnical report

95. A project owner wants to ensure that all construction materials meet the specified quality standards before they are incorporated into the work. Under AIA A201, what mechanism does the contract provide for this quality verification?

A. The owner may perform unannounced inspections at any time but may not reject materials already installed

B. The contract requires the contractor to submit shop drawings, product data, and samples for the architect's review before procurement and installation of materials

C. The owner must hire an independent testing laboratory to test every material before delivery to the site

D. The contractor selfcertifies all materials by signing a compliance letter before each monthly pay application

96. Under standard construction contract provisions, what is the purpose of a "nodamagefordelay" clause in a prime contract between the owner and the general contractor?

A. The clause prevents the owner from claiming any damages against the contractor for schedule delays

B. The clause prevents both parties from claiming any damages of any kind during the entire project duration

C. The clause limits the contractor's remedy for ownercaused delays to a time extension only, without additional monetary compensation for the extended general conditions and other delay costs

D. The clause eliminates all schedule requirements and allows the contractor to complete the project at any pace

97. A contractor completes a commercial project and the owner takes possession at substantial completion. Three months later, the owner discovers that several windows are leaking during heavy rain. Under the standard oneyear contractor warranty, what is the contractor's obligation?

A. The contractor must investigate the leaks and, if they are caused by defective workmanship or materials, repair the windows at no cost to the owner within the warranty period

B. The contractor has no obligation because the owner accepted the building at substantial completion

C. The contractor's warranty covers only structural defects, not window leaks or envelope performance issues

D. The owner must hire a separate contractor to repair the leaks and cannot hold the original contractor responsible

98. A contractor is reviewing a project where the specifications require LEED Gold certification. What impact does this green building certification requirement have on the contractor's obligations?

A. LEED certification is purely voluntary and the contractor has no contractual obligation to achieve it

B. LEED certification requires only the installation of solar panels and has no other construction impacts

C. LEED certification is solely the architect's responsibility and does not affect the contractor's scope of work

D. The contractor must comply with specific requirements for materials, waste diversion, indoor air quality, energy performance, and documentation as specified in the contract to support the LEED certification goal

99. Under AIA A201, what is the contractor's obligation regarding permits required for the construction work?

A. The architect is solely responsible for obtaining all permits as part of the design services contract

B. The contractor is generally responsible for obtaining and paying for the building permit and other permits required for the construction work, unless the contract states otherwise

C. The owner must obtain all permits before the contractor mobilizes to the site under every contract

D. Permits are not required for commercial construction work performed by a licensed general contractor

100. A general contractor on a commercial project receives a notice from a subcontractor stating that the subcontractor intends to file a mechanics' lien because the general contractor has not paid for completed work. What immediate action should the general contractor take?

A. Ignore the notice because subcontractors cannot file mechanics' liens on commercial projects

B. Terminate the subcontractor's contract immediately to prevent any further work and additional lien exposure

C. Review the subcontractor's payment history, verify whether payment is due, and take steps to resolve the payment dispute before the lien is filed to protect the owner's property from encumbrance

D. File a counterlien against the subcontractor's property to offset the threatened mechanics' lien claim

101. Under standard construction contract provisions, what constitutes "final completion" of a construction project?

A. Final completion occurs when the structural frame is erected and the building is weathertight

B. Final completion occurs when the contractor has demobilized all equipment and removed temporary facilities

C. Final completion is the same milestone as substantial completion with no additional requirements beyond that point

D. Final completion occurs when all punch list items are corrected, all closeout documentation is delivered, all contractual requirements are fulfilled, and the architect issues the final certificate for payment

102. A contractor submits a value engineering (VE) proposal to the owner suggesting an alternative structural system that would reduce the project cost by $150,000. Under a standard VE sharing arrangement, how are the savings typically distributed?

A. The savings are typically shared between the owner and the contractor according to a negotiated percentage, often 50/50, with the contractor receiving compensation for the creative solution

B. The contractor retains 100% of the savings because the VE proposal was the contractor's idea

C. The owner retains 100% of the savings because the contract price was already agreed upon

D. The savings are donated to a construction industry education fund as required by standard contract terms

103. A contractor is bidding a project that includes both a base bid and five deductive alternates. The owner's budget is limited. How should the contractor approach the pricing of deductive alternates?

A. Deductive alternates should be priced at zero to make the base bid appear more competitive

B. Each deductive alternate should reflect the actual cost savings of deleting the specified scope, accurately priced so the owner can make informed decisions about which alternates to accept

C. Deductive alternates should be priced higher than the actual cost savings to maximize profit if the owner accepts them

D. The contractor should refuse to price deductive alternates because they reduce the total contract value

104. Under AIA A201, the owner has the right to carry out work that the contractor has failed to perform after proper notice. If the owner engages a separate contractor to perform this work, what financial remedy is available?

A. The owner may not engage separate contractors under any circumstances while the prime contract is in effect

B. The owner may deduct the cost of the remedial work from payments otherwise due to the contractor

C. The owner must pay the separate contractor from a separate budget and cannot deduct any amount from the prime contractor

D. The owner may deduct the cost of the remedial work from payments due to the contractor, plus a reasonable markup to cover the owner's administrative costs of managing the separate contractor

105. A contractor is preparing a proposal for a designbuild project. Unlike a traditional designbidbuild bid, what additional service must the designbuild contractor provide?

A. The designbuild contractor must provide construction inspection services in place of the building official

B. The designbuild contractor must provide surety bonds for all subcontractors on the project individually

C. The designbuild contractor must provide both design and construction services under a single contract, including engaging the architect or engineer as part of the designbuild team

D. The designbuild contractor must provide permanent financing for the project's full construction cost

106. Under AIA A201, the contractor is required to maintain a current set of construction documents at the project site marked to show all changes made during construction. What are these markedup documents called?

A. Asbuilt drawings (record drawings) that document the actual installed conditions including all deviations from the original design and field changes

B. Shop drawings that show the contractor's proposed fabrication details for all building components

C. Progress photographs that visually document the construction sequence at weekly intervals

D. Daily reports that describe the weather, workforce, and activities performed each working day

107. A contractor receives a specification that requires "mockups" for the exterior curtain wall system before fullscale installation begins. What is the purpose of a construction mockup?

A. A mockup is a fullscale sample installation used to establish quality standards, test performance, and obtain approval for appearance, workmanship, and installation procedures before the full scope of work begins

B. A mockup is a miniature scale model used only for marketing presentations to prospective tenants

C. A mockup is a computer rendering created by the architect that replaces the need for physical samples

D. A mockup is the contractor's cost estimate for the curtain wall presented in a visual format for the owner

108. Under standard construction contract provisions, what is the significance of the "substantial completion" milestone regarding the owner's use of the building?

A. The owner may not enter the building for any purpose until final completion is achieved and documented

B. The owner may use individual rooms as they are completed but may not occupy the entire building

C. The owner may occupy or use the building for its intended purpose only after the architect issues a temporary certificate

D. Upon substantial completion, the owner may occupy or use the building for its intended purpose, the warranty period begins, and the owner assumes responsibility for maintenance, utilities, and insurance

109. A contractor is working on a project where the owner has hired a separate testing laboratory to perform concrete compression testing, soil compaction testing, and structural steel inspection. Under AIA A201, who pays for these testing services?

A. Testing and inspection services engaged directly by the owner are paid for by the owner as a project cost, not by the contractor

B. The contractor must pay for all testing services regardless of who engages them

C. The architect pays for all testing services as part of the construction administration fee

D. Testing costs are shared equally between the owner and the contractor on all commercial projects

110. A contractor is reviewing a project specification that includes a "retainage reduction" provision allowing retainage to be reduced from 10% to 5% after the project reaches 50% completion. What is the benefit of this provision to the contractor?

A. Retainage reduction has no financial benefit to the contractor because the total retainage amount remains the same

B. Retainage reduction increases the contractor's total profit margin by reducing the owner's holdback percentage

C. Retainage reduction improves the contractor's cash flow by releasing a portion of previously withheld retainage and reducing the percentage withheld from future progress payments

D. Retainage reduction eliminates the need for the contractor to provide a performance bond after 50% completion

111. A subcontractor on a commercial project completes their work and submits a request for final payment including release of retainage. Under standard subcontract provisions, what documentation must the subcontractor typically provide before receiving final payment?

A. Only a final invoice is required — no additional documentation is needed for subcontractor final payment

B. A final lien waiver, warranty documentation, asbuilt drawings for their scope, O&M manuals for installed equipment, and any required training documentation

C. A letter from the building official confirming that the subcontractor's work passed all required inspections

D. A performance evaluation signed by the project superintendent rating the subcontractor's work quality

112. Under standard construction contract provisions, what happens to the contractor's warranty obligations if a warranty claim is submitted in the eleventh month after substantial completion and the repair takes two months to complete?

A. The warranty expires at the oneyear mark regardless of pending claims, and any uncompleted repairs are the owner's responsibility

B. The contractor has no obligation to respond to claims submitted after the sixth month of the warranty period

C. The warranty automatically extends by one year for any claim submitted during the original warranty period

D. The warranty for the repaired work typically restarts for a reasonable period from the date the repair is completed, though the original warranty on unaffected work expires at the oneyear mark

113. A contractor is reviewing a project's insurance requirements and notices that the contract requires a waiver of subrogation. What does a waiver of subrogation accomplish in a construction contract?

A. A waiver of subrogation eliminates the need for the contractor to carry commercial general liability insurance

B. A waiver of subrogation allows the insured to sue their own insurance company for delayed claim payments

C. A waiver of subrogation prevents the insurance company from pursuing recovery against other parties to the contract after paying a claim, reducing intraproject litigation

D. A waiver of subrogation transfers the policy deductible from the contractor to the project owner

114. Under AIA A201, the contractor must coordinate the work of all subcontractors and ensure that their work is properly sequenced. If a coordination failure between two subcontractors causes damage to completed work, who is financially responsible for the repair?

A. The general contractor bears the responsibility for coordination failures and the cost of repairing damage caused by the failure to properly sequence and coordinate subcontractor work

B. Each subcontractor is individually responsible for all damage on the project regardless of fault

C. The architect is financially responsible because the design should have prevented coordination conflicts

D. The owner bears all risk for coordination failures under the standard general conditions of the contract

115. A contractor is preparing a costloaded CPM schedule for a commercial project. What does "costloading" the schedule accomplish?

A. Costloading assigns the schedule of values dollar amounts to each scheduled activity, enabling the generation of monthly cash flow projections and providing the basis for progress payment applications

B. Costloading determines the structural load capacity of each building component based on the construction sequence

C. Costloading calculates the weight of construction materials to be delivered each week for logistics planning

D. Costloading assigns liquidated damages amounts to each critical path activity for schedule enforcement

Practice Exam 4: Answer Key and Explanations

DOMAIN 1: GENERAL REQUIREMENTS (Questions 1–25)

1. C — When the IBC permits a 1hour reduction in occupancy separation for sprinklered buildings, a nonsprinklered 2hour requirement becomes a 1hour requirement. Table 508.4 allows this reduction for most occupancy pairings when the building is fully sprinklered per NFPA 13. The sprinkler system provides active fire suppression that compensates for the reduced passive separation.

2. A — All Type IV mass timber buildings (IVA, IVB, and IVC) require automatic sprinkler systems installed throughout in accordance with NFPA 13. This is a mandatory requirement regardless of building height or area because the combustible structural material requires active fire suppression as a fundamental safety measure to supplement the passive fire resistance of the mass timber elements.

3. D — The occupant load for warehouse space is calculated as 9,000 SF ÷ 500 SF/person = 18 occupants. The 500 gross square feet per person factor for warehouse (Group S2) occupancies reflects the very low occupant density typical of storage and warehousing operations. This is the lowest density factor among common occupancy types.

4. B — Standard silicone caulk is not an approved firestop material. Penetrations through fireresistancerated assemblies must be sealed with firestop systems that have been tested per ASTM E814 (UL 1479) and listed for the specific penetration type and rated assembly. An approved firestop system maintains the fireresistance rating of the assembly at each penetration point.

5. A — IBC Section 1106.5 requires that at least 1 of every 6 accessible parking spaces (or fraction thereof) be designated as vanaccessible, with a minimum access aisle width of 96 inches (8 feet). Vanaccessible spaces are wider than standard accessible spaces to accommodate wheelchair lifts and ramps that deploy from the side of the vehicle.

6. C — In a nonsprinklered building, IBC Section 1007.1.1 requires the two exits to be separated by at least onehalf the maximum overall diagonal dimension of the floor area served. Onehalf of 180 feet equals 90 feet minimum separation. In sprinklered buildings, this is reduced to onethird of the diagonal.

7. D — Occupants in Group I3 detention facilities are under restraint and cannot evacuate the building independently. Smoke compartments allow staff to relocate inmates horizontally to an adjacent safe compartment on the same floor rather than attempting vertical evacuation through stairways, which would require unlocking cells and maintaining security during the emergency.

8. A — IBC Section 1008.1 requires a minimum illumination of 1 footcandle at the walking surface in exit access corridors, exit stairways, and exit discharge areas during normal building operation. Emergency lighting must provide the same 1 footcandle level for a minimum of 90 minutes upon failure of the normal power supply.

9. B — The IBC requires at least 60% of public entrances to be accessible. With 3 public entrances, 60% equals 1.8, which rounds up to 2 accessible entrances. The main entrance must always be included in the accessible count. Service entrances are not counted as public entrances for accessibility purposes.

10. D — IBC Section 1013.1 requires directional exit signs where more than one exit is available, indicating the direction of egress travel to the nearest exit. Without directional signs, occupants might travel away from the nearest exit toward a more distant one, increasing their egress time and exposure to smoke and fire.

11. A — Type III construction requires noncombustible exterior walls. For Type IIIA, IBC Table 601 requires exterior bearing walls to have a 2hour fireresistance rating using noncombustible materials, while interior bearing walls require a 1hour rating and may be constructed of combustible materials (such as wood framing with firerated gypsum board).

12. C — The IBC requires automatic sprinklers in Group M occupancies when the fire area exceeds 12,000 square feet. At 10,000 square feet, this building falls below the threshold and does not require sprinklers based on fire area alone. However, other triggering conditions (such as building height or stories) may still require sprinklers.

13. B — The IBC limits the cost of accessibility improvements during an alteration to 20% of the total alteration cost. This provision recognizes that requiring full accessibility compliance

for minor alterations could impose disproportionate costs while ensuring progressive improvement. Changes of occupancy require full compliance regardless of cost.

14. D — Shaft enclosures are fireresistancerated vertical enclosures that prevent the vertical spread of fire, smoke, and gases through openings connecting two or more stories. Ducts, pipes, elevators, stairways, and other vertical penetrations must be enclosed in rated shaft walls to prevent them from acting as chimneys during a fire.

15. A — The IBC limits common path of egress travel in sprinklered Group B occupancies to 100 feet. This is the distance from the most remote point in any occupied space to the point where two separate paths of egress become available. Without sprinklers, the limit is 75 feet for most occupancies.

16. C — Belowgrade stories present unique egress challenges because occupants must travel upward to reach the exit discharge at grade level. The IBC requires at least one exit that discharges directly to the exterior at grade or through an enclosed exit stairway. This ensures that occupants have a protected path from below grade to the exterior.

17. B — IBC Table 601 requires 0 hours (no fireresistance rating) for the structural frame in Type IIB construction. Type IIB requires all materials to be noncombustible but imposes no fireresistance rating requirements on any building element. This makes it the least restrictive of the two Type II subtypes.

18. D — IBC Section 907.4.2 requires manual fire alarm boxes (pull stations) at each exit doorway on each floor, typically within 5 feet of the exit door, and at other locations as required by the fire code. This placement ensures that an occupant heading toward an exit can activate the fire alarm as part of their egress path.

19. A — IBC Sections 714 and 715 require that every joint and every penetration in a fireresistancerated horizontal assembly be protected with approved fireresistant joint systems and firestop systems. Any unprotected opening in a rated floor/ceiling assembly creates a pathway for fire and smoke to spread vertically between stories.

20. C — The plumbing vent through roof must terminate at least 6 inches above the roof surface to prevent water from entering the vent during ponding conditions on lowslope roofs. Additionally, the VTR must be at least 10 feet from any openable window, door, or air intake to prevent sewer gases from entering the building.

21. B — The IBC requires a minimum guardrail height of 42 inches for commercial buildings, measured vertically from the walking surface to the top of the guardrail. At 39 inches, the mezzanine guardrails are 3 inches below the minimum requirement and do not comply. Residential occupancies may use 36inch guardrails, but commercial buildings require 42 inches.

22. D — The building official is the authority responsible for issuing the certificate of occupancy after confirming through final inspection that the building complies with the approved construction documents and the building code. No building may be occupied until the building official issues this certificate.

23. A — IBC Section 406.5 defines an open parking garage as one with openings on two or more sides totaling at least 20% of the total perimeter wall area at each tier. These openings provide natural ventilation that disperses carbon monoxide and other vehicle exhaust gases, reducing the need for mechanical ventilation systems.

24. D — The plumbing vent through roof must terminate at least 10 feet from any openable window, door, or mechanical air intake to prevent sewer gases from being drawn into the building through these openings. This separation distance ensures that the dilution of sewer gases by outdoor air is sufficient before they reach any building opening.

25. B — The IBC applies the principle that altered elements must comply with the current code, while unaltered portions of existing buildings may remain in compliance with the code under which they were originally constructed. This prevents the unreasonable burden of bringing an entire building up to current code when only a portion is being renovated.

DOMAIN 2: SITE CONSTRUCTION (Questions 26–40)

26. A — 95% of the maximum dry density of 120 pcf equals 114 pcf (120 × 0.95 = 114). This is the minimum acceptable field dry density that the compaction testing must verify. If the nuclear density gauge reading shows a dry density below 114 pcf, the fill has not been adequately compacted and must be reworked.

27. C — Water rising from the bottom of an excavation without recent rainfall indicates that the groundwater table is at or above the excavation level. The contractor must implement dewatering (pumping) before workers enter, and under OSHA, any soil from which water is seeping is automatically classified as Type C regardless of its other properties.

28. D — Discovering an unknown underground storage tank is a potential environmental emergency. The contractor must stop all work in the affected area to prevent disturbing potentially contaminated soil, notify the project owner and ADEM, and engage a qualified environmental professional to assess the tank's condition, contents, and surrounding soil before any further disturbance.

29. A — While OSHA does not specify an exact minimum width for trench shields, the shield must be large enough to provide adequate working space for the workers inside and must extend at least 18 inches above the surrounding grade to protect workers from loose soil rolling into the trench from the excavation edges.

30. B — Expansive clays swell significantly when they absorb moisture and shrink when they dry, creating cyclical volume changes that can heave foundations during wet periods and allow settlement during dry periods. This repeated cycle of swelling and shrinking can crack foundations, distort structural frames, and damage floor slabs over the life of the building.

31. C — Erosion control blankets protect exposed soil surfaces from raindrop impact (which dislodges soil particles) and sheet erosion (which carries loosened particles downslope). The blanket material allows grass seed to germinate and grow through the fabric, establishing permanent vegetative cover that provides longterm erosion protection after the blanket degrades.

32. D — The contractor must immediately notify the structural engineer and the geotechnical engineer so the foundation design can be evaluated and potentially modified before concrete is placed. Placing a foundation on soil that differs from the design assumptions can result in inadequate bearing capacity, excessive settlement, or structural failure.

33. A — A sudden loss of driving resistance after normal resistance indicates the pile has passed through a competent layer and entered a void, soft soil zone, or underground cavity. This condition requires evaluation by the geotechnical engineer, who may recommend driving additional piles, extending the pile to a deeper bearing stratum, or redesigning the foundation.

34. B — The IBC and industry standards typically require a minimum 6mil polyethylene vapor barrier or a Class A vapor retarder beneath concrete slabs on grade. Some specifications require 10mil or 15mil for greater durability during construction. The vapor barrier prevents ground moisture from migrating upward through the slab by capillary action.

35. D — Underground pipes must be placed on a uniform granular bedding material (sand or fine gravel) compacted to a minimum of 4 inches beneath the pipe. The granular bedding distributes the pipe's weight evenly, preventing point loading that could cause cracking, ovalization, or joint failure from resting on irregular native soil.

36. C — A preconstruction condition survey documents the existing condition of the adjacent structure — including photographs, crack measurements, and elevation surveys — before vibrationgenerating work begins. This baseline record is essential for evaluating any damage claims that arise after construction, determining whether damage was preexisting or caused by construction activities.

37. A — Inlet protection devices prevent sedimentladen stormwater runoff from entering storm drain inlets during construction. Without inlet protection, sediment flows directly into the underground storm drainage system and is discharged into receiving waterways, causing environmental damage and violating Clean Water Act and NPDES permit requirements.

38. B — OSHA requires atmospheric testing in excavations where oxygen deficiency or hazardous atmospheres could exist — such as near landfills (methane gas), chemical plants, fuel storage facilities, or areas with significant decaying organic material. These conditions can create oxygendeficient, toxic, or explosive atmospheres that are immediately dangerous to workers entering the trench.

39. D — The primary function of the curb and gutter system is to control surface water by channeling stormwater runoff along the pavement edge and directing it to storm drain inlets for collection. The curb prevents water from flowing off the pavement into landscaped areas or adjacent properties uncontrolled, and the gutter creates a defined drainage channel.

40. A — A proof roll is a quality verification procedure in which a loaded vehicle (typically a fully loaded dump truck or water truck) is driven slowly across the compacted fill surface while an observer watches for deflection, pumping, or rutting. Soft or inadequately compacted areas deflect visibly under the wheel loads, identifying zones that require additional compaction before foundation work begins.

DOMAIN 3: CONCRETE (Questions 41–46)

41. B — Lower watercement ratios produce higher compressive strength because less excess water means a denser cement paste matrix with fewer capillary voids after hydration. Conversely, higher watercement ratios produce weaker, more porous concrete with reduced durability and increased permeability. The watercement ratio is the single most important factor controlling concrete strength.

42. D — Contraction joints must be cut to a minimum depth of onequarter of the slab thickness. For a 6inch slab, onequarter equals 1½ inches. This depth creates a weakened plane that induces the shrinkage crack to form at the planned joint location rather than randomly across the slab surface.

43. A — Retarding admixtures slow the rate of cement hydration, extending the concrete's setting time and workability. They are specified in hot weather when concrete would otherwise set too quickly before placement and finishing can be completed, and in large pours where extended workability is needed to prevent cold joints between successive placements.

44. C — Welded wire reinforcement must be positioned at middepth or slightly above middepth of the slab to be effective for crack control. WWR resting on the bottom of the slab (on the vapor barrier) is in the wrong position — shrinkage cracks develop from the top surface downward, and reinforcement at the bottom cannot intercept them. The WWR must be pulled up on chairs during the pour.

45. A — The specified compressive strength (f'c) at 28 days is a property of the hardened concrete and does not directly affect the lateral pressure exerted by fresh concrete on formwork. Lateral pressure is determined by the rate of placement, the concrete temperature, the unit weight, the use of retarders, and the consolidation method — all properties of the fresh concrete during placement.

46. D — Concrete gains strength through hydration, which is a temperaturedependent chemical reaction. At temperatures below 40°F, hydration slows dramatically, and concrete takes much longer to reach the strength needed to safely support its own weight and construction loads. Form stripping times must be extended to ensure the concrete has achieved adequate strength before support is removed.

DOMAIN 4: MASONRY (Questions 47–50)

47. B — The first course establishes the alignment, level, and dimensional accuracy for the entire wall. Every subsequent course is built relative to the first course, so any error in level, alignment, or position in the first course is carried upward and magnified as the wall rises. A wall that starts out of level by ¼ inch at the first course may be inches out of level at the top.

48. C — Type M mortar has the highest compressive strength of the four standard types at a minimum of 2,500 psi. It is specified for belowgrade applications (foundations, retaining walls, manholes) where maximum compressive strength is needed and where the mortar will be in contact with soil and moisture. Type S (1,800 psi) is the alternative for structural abovegrade work.

49. A — A lintel is a horizontal structural member installed above a window, door, or other opening in a masonry wall. The lintel spans the opening and transfers the weight of the masonry above to the jamb supports (king studs, pilasters, or reinforced cells) on each side. Lintels may be reinforced masonry bond beams, steel angles, or precast concrete members.

50. D — Brick masonry requires expansion joints because clay bricks undergo permanent moisture expansion after firing and also expand and contract with temperature changes. Unlike CMU (which shrinks), bricks grow slightly over time. Expansion joints with compressible filler accommodate this growth without cracking the wall. CMU walls use control joints for shrinkage.

DOMAIN 5: METALS (Questions 51–56)

51. C — AISC specifies an anchor bolt placement tolerance of ±⅛ inch from the center of the bolt group. This tight tolerance ensures that the column base plates align properly with the anchor bolt patterns. Misaligned anchor bolts can prevent the steel from being erected, requiring costly corrective measures such as drilling new holes or installing modified base plates.

52. B — Class A faying surfaces must be unpainted clean mill scale or blastcleaned surfaces with a Class A coating that achieves the required minimum slip coefficient of 0.30. The surface preparation is critical because the friction capacity of a slipcritical connection depends entirely on the condition of the surfaces in contact — contamination, paint, or lubricants reduce the slip coefficient.

53. D — A puddle weld (burnthrough weld) is a spot weld made by melting through the thin metal deck sheet and fusing it to the structural steel beam flange below at discrete locations. The welder positions the electrode on the deck surface and burns through to the beam, creating a fused connection that secures the deck to the supporting structure.

54. A — Light surface rust on highstrength bolts does not affect their structural capacity and is generally acceptable as long as the threads are clean enough for the nut to be installed and rotated freely. Heavy corrosion, pitting, or damage to the threads that prevents proper nut engagement requires the bolts to be rejected and replaced.

55. C — The AISC tolerance is 1/500 of the column length. For a 20foot (240inch) column: 240 ÷ 500 = 0.48 inches maximum deviation. At ¾ inch (0.75 inches), the column exceeds the 0.48inch tolerance and does not comply. The column must be adjusted to bring it within tolerance before final bolt tightening.

56. D — The CFS designation "600S16254" indicates a stud with a 6inch (600 in hundredths of an inch) web depth, 15/8 inch (162 in hundredths of an inch) flanges, and 54mil (0.054 inch) material thickness. This standardized designation system enables contractors and suppliers to identify the exact size and gauge of coldformed steel framing members.

DOMAIN 6: WOOD (Questions 57–61)

57. D — A 6foot span in a loadbearing wall typically requires a doubled 2×10 or larger header, or an engineered lumber header (LVL), sized by the structural engineer for the specific span,

load, and species. A flat 2×4 or single member would be grossly undersized. Header size increases with span and load — wider openings require deeper headers.

58. A — IBC Section 718 accepts several materials for fire blocking, including 2× nominal lumber (the most common), two layers of 1inch nominal boards, ½inch gypsum board, ¼inch cementbased millboard, and other approved noncombustible materials. The fire blocking must fill the cavity completely to prevent the passage of fire and gases.

59. B — Board feet = (Thickness × Width × Length) ÷ 12. For a single 2×8 at 12 feet: (2 × 8 × 12) ÷ 12 = 16 board feet. For 50 pieces: 16 × 50 = 800 board feet. Board foot calculations always use nominal dimensions, not actual dimensions, which is a convention unique to the lumber industry.

60. C — PSL (Parallel Strand Lumber) is manufactured from long, thin wood strands (approximately ½ inch wide and up to 8 feet long) bonded under pressure, producing an extremely dense, strong product. LVL uses thin continuous veneers peeled from logs. PSL's strandbased construction makes it particularly wellsuited for columns and heavy beam applications where very high loads must be carried.

61. D — Unbraced trusses can topple laterally in a dominochain collapse. When one truss falls sideways, it pushes the adjacent truss, which pushes the next, and so on, potentially bringing down the entire roof system in seconds. Temporary bracing must be installed during and after erection to prevent this lateral instability until permanent sheathing and bridging are in place.

DOMAIN 7: THERMAL AND MOISTURE PROTECTION (Questions 62–66)

62. A — A rainscreen wall system separates the cladding from the waterresistive barrier with a drainage cavity (air space). The cladding serves as the primary rain deflector, shedding the majority of water. Any water that penetrates the cladding enters the cavity and drains downward to weep holes. The WRB behind the cavity serves as the secondary waterproofing line of defense.

63. C — Polyisocyanurate rigid insulation exhibits reduced Rvalue at very low temperatures. The rated Rvalue (typically R6.0 per inch) is measured at a mean temperature of 75°F. At colder mean temperatures, the blowing agent in the foam cells may condense, reducing the insulating capacity. This is an important consideration for coldclimate roof applications.

64. B — SBS stands for StyreneButadieneStyrene, a synthetic rubber modifier blended into the asphalt to improve the membrane's flexibility, elasticity, and lowtemperature performance. SBSmodified bitumen membranes remain flexible at temperatures where unmodified asphalt would become brittle and crack. APP (Atactic Polypropylene) is the other common modifier type.

65. D — In Alabama's hot, humid climate, the vapor drive during summer pushes moisture from the hot, humid exterior inward toward the cool, airconditioned interior. A Class I vapor barrier (polyethylene) on the interior traps this inwardmigrating moisture inside the wall, where it condenses on the cool interior surface of the poly. Class II or III vapor retarders allow the wall to dry toward the interior.

66. C — EPDM membrane seams are bonded with contact adhesive or specialized seam tape rather than welded. The adhesive or tape creates a waterproof bond at the overlap. TPO and PVC membranes use hotair welding because their thermoplastic composition allows heat fusion, while EPDM is a thermoset rubber that cannot be heatwelded.

DOMAIN 8: DOORS, WINDOWS, AND GLAZING (Questions 67–70)

67. A — Leverstyle handles comply with ADA and IBC accessibility requirements because they can be operated with one hand, without tight grasping, pinching, or twisting of the wrist. A person with limited hand strength or dexterity can depress a lever handle with a closed fist, forearm, or elbow. Round knobs require grasping and twisting and do not comply.

68. D — ADA standards require a minimum closing time of 5 seconds for the door closer to move the door from 90 degrees open to 12 degrees from the latch. This slow closing speed gives wheelchair users and persons with mobility impairments adequate time to pass through the doorway before the door closes against them.

69. B — Window performance specifications apply to the total assembly Ufactor, which includes the glass, frame, spacer, and edge effects — not just the centerofglass value. The total assembly Ufactor of 0.38 exceeds the specified maximum of 0.35, so the window does not meet the specification despite the favorable centerofglass performance.

70. C — When an operable window has a sill less than 36 inches above the floor and opens to a drop of 72 inches or more, the IBC requires fall protection consistent with guardrail requirements — either a guardrail, a window opening limiter that restricts the opening to 4 inches, or other approved fall prevention device. This protects occupants from falling through low windows.

DOMAIN 9: FINISHES (Questions 71–75)

71. A — Gypsum board screws should be driven so the head is slightly recessed below the paper surface — just enough to allow the joint compound to cover the head — without breaking through the paper. A flush installation is acceptable and maintains holding capacity. Breaking through the paper (overdriving) eliminates the screw's pullthrough resistance.

72. D — A mortar bed tile installation uses a thick layer (¾ inch to 1¼ inches) of sandcement mortar to create a level substrate on an uneven surface. Thinset installation uses a thin adhesive layer (3/16 inch to ¼ inch) applied with a notched trowel to an alreadylevel substrate. Mortar bed is used when the substrate requires significant leveling.

73. B — A primer coat must be applied to seal the porous gypsum board surface before the topcoat. Unprimed gypsum board absorbs paint unevenly — the paper face and the joint compound have different porosity levels, causing visible differences in sheen and color uniformity called "flashing" or "banding." Primer creates a uniform, sealed surface for consistent topcoat adhesion and appearance.

74. A — Healthcare flooring requires a heatwelded seam system (such as sheet vinyl with welded seams) that creates a monolithic, seamless surface. Seamless floors eliminate joints where bacteria can harbor and fluids can penetrate, supporting the infection control protocols essential in medical facilities. This is more important than cost, texture, or aesthetics in healthcare applications.

75. C — The Noise Reduction Coefficient (NRC) of 0.70 indicates that the ceiling tile absorbs approximately 70% of sound energy striking its surface and reflects the remaining 30%. Higher NRC values indicate greater sound absorption, which reduces reverberation and echo in open office environments, improving speech intelligibility and acoustic comfort.

DOMAIN 10: MECHANICAL AND PLUMBING SYSTEMS (Questions 76–81)

76. D — Fan coil units in a hydronic heating system blow room air across coils containing hot water from the boiler. The heat transfers from the hot water through the coil walls into the air, which is then distributed into the room by the fan. The cooled water returns to the boiler for reheating. Fan coil units may also include chilled water coils for cooling.

77. B — The current maximum flow rate for standard commercial toilets is 1.6 gallons per flush (gpf), with many jurisdictions now requiring 1.28 gpf highefficiency toilets (HETs). The 1.6 gpf standard replaced the older 3.5 gpf standard in the 1990s as part of federal water conservation requirements under the Energy Policy Act.

78. A — In a deluge system, all sprinkler heads are open — they have no heatsensitive elements. The system is activated by a separate detection system (smoke or heat detectors), which opens the deluge valve and releases water from every head simultaneously. This drenches the entire protected area instantly, providing maximum suppression for highhazard occupancies.

79. C — A building automation system (BAS) is a centralized computerbased control system that monitors and controls the building's HVAC, lighting, and other systems from a central workstation. The BAS optimizes system operation for energy efficiency, maintains comfort conditions across all zones, generates alarms for equipment malfunctions, and provides trend data for performance analysis.

80. D — IPC Table 403.1 provides the minimum plumbing fixture requirements — toilets, lavatories, drinking fountains, and service sinks — for each occupancy type based on the calculated occupant load. This table is the primary reference for determining how many restroom fixtures, drinking fountains, and service sinks a commercial building must provide.

81. A — A partially closed OS&Y valve restricts the flow of water to the sprinkler system, potentially delivering insufficient water to activated sprinkler heads during a fire. If the restriction is severe enough, the system may be unable to control the fire, leaving the building effectively unprotected. This is why tamper switches are required to monitor valve position and alarm immediately if the valve is moved.

DOMAIN 11: ELECTRICAL SYSTEMS (Questions 82–84)

82. B — 277 volts is one phasetoneutral voltage of the standard 480/277volt wye service used in larger commercial buildings. Using 277V for lighting avoids the need for stepdown

transformers to convert to 120V, reducing equipment cost, installation labor, and energy losses associated with transformer conversion. LED and fluorescent fixtures are readily available in 277V configurations.

83. D — Overcurrent protection devices (circuit breakers and fuses) detect excessive current flow in a circuit and interrupt the circuit before the wiring overheats to the point of insulation failure, fire, or equipment damage. Every circuit in a commercial building must be protected by an overcurrent device sized to match the wire's ampacity.

84. C — OSHA requires GFCI protection for all 120volt, singlephase, 15 and 20ampere receptacle outlets on construction sites. The GFCI detects current leakage of 5 milliamps or more (indicating current flowing through an unintended path, possibly through a person) and trips the circuit within milliseconds, preventing electrocution.

DOMAIN 12: PROCUREMENT AND CONTRACTING REQUIREMENTS (Questions 85–115)

85. A — When the estimator identifies a conflict between drawings, the correct action is to submit an RFI or prebid question to the architect before completing the bid. Bidding on conflicting documents without seeking clarification creates risk for the contractor regardless of which dimension is used. The architect's clarification, typically issued as an addendum, resolves the conflict for all bidders.

86. C — The standard requirement for both performance bonds and payment bonds is 100% of the contract price. The performance bond guarantees that the contractor will complete the project, and the payment bond guarantees that the contractor will pay all subcontractors and suppliers. Both bonds at 100% provide the owner and the subcontractors with full financial protection.

87. D — Before terminating a contractor for cause under AIA A201, the owner must provide written notice to the contractor and the contractor's surety, identifying the default and giving the contractor an opportunity to cure the default within the time specified. Termination without proper notice and opportunity to cure may be deemed wrongful termination.

88. B — The owner evaluates whether the lowest bidder is responsive (the bid complies with all submission requirements) and responsible (the bidder has the financial capacity, experience, workforce, and equipment to perform the work). Both conditions must be met before award. A low price alone does not guarantee award — the bidder must also demonstrate the ability to perform.

89. A — Under AIA A201 Section 9.7, the contractor may stop work if the owner fails to make a certified payment within the contractually specified timeframe, provided the contractor has given 7 days' written notice to the owner and the architect. This right protects the contractor from being forced to finance the owner's project indefinitely without payment.

90. C — The contractor must perform a detailed scope comparison of each subcontractor bid against the specifications before incorporating any bid into the estimate. Scope gaps between the subcontractor's bid and the specifications become the general contractor's responsibility. The contractor must identify and price any excluded items to ensure the estimate covers the complete scope.

91. B — Liquidated damages are a preagreed fixed amount per day of delay specified in the contract, substituting for the calculation of actual damages. They are appropriate when actual damages from delay would be difficult to calculate at the time of contracting. The amount must be a reasonable forecast of actual harm — if it functions as a penalty, courts may refuse to enforce it.

92. D — A "paywhenpaid" clause makes the general contractor's payment obligation to the subcontractor contingent on the general contractor first receiving payment from the owner for the subcontractor's work. The clause creates a timing mechanism — the subcontractor gets paid when the contractor gets paid. Courts in some jurisdictions interpret this as establishing a reasonable time for payment rather than an absolute condition.

93. A — The contractor's construction means, methods, techniques, sequences, and procedures are the contractor's sole responsibility under AIA A201. The architect may not direct how the contractor performs the work. The architect's authority is limited to determining whether the completed work conforms to the contract documents, not how the work is executed.

94. D — This is a Type I differing site condition — the actual subsurface conditions (rock) differ materially from those indicated in the contract documents (the geotechnical report showed no rock at foundation depth). Type I conditions involve discrepancies between the contract documents and what is actually encountered. Type II involves conditions that are unusual for the type of work.

95. B — The contract requires the contractor to submit shop drawings, product data, and samples to the architect for review before procurement and installation. This review process verifies that the proposed materials and products conform to the design intent and meet the specification requirements before they are ordered and incorporated into the building.

96. C — A "nodamagefordelay" clause in the prime contract limits the contractor's remedy for ownercaused delays to a time extension only — the contractor receives additional time but no additional money for the extended general conditions, escalated material costs, or lost productivity resulting from the delay. These clauses shift the financial risk of delays to the contractor.

97. A — Under the standard oneyear warranty, the contractor must investigate reported defects and, if they are caused by defective workmanship or materials (as opposed to owner misuse or normal wear), repair them at no cost to the owner. Window leaks caused by improper flashing installation or defective sealant application are workmanship defects covered by the warranty.

98. D — LEED certification imposes specific requirements on the contractor including the use of specified sustainable materials, construction waste diversion (recycling a minimum percentage of C&D debris), indoor air quality management during construction, commissioning of building systems, and detailed documentation of compliance. These requirements affect the contractor's scope, cost, and schedule.

99. B — Under AIA A201, the contractor is generally responsible for obtaining and paying for the building permit and other permits required for the construction work, unless the contract specifically assigns this responsibility to the owner. Permit fees are typically included in the contractor's bid as part of the general conditions cost.

100. C — The general contractor should review the subcontractor's payment history, verify whether the payment is legitimately due, and take steps to resolve the dispute before a lien is filed. Filing a lien encumbers the owner's property title, which can prevent financing, sale, and create legal complications. Prompt resolution protects all parties.

101. D — Final completion occurs when every contractual requirement has been fulfilled: all punch list items corrected, all closeout documentation delivered (asbuilt drawings, O&M manuals, warranties, lien waivers), all training completed, and the architect issues the final Certificate for Payment releasing all remaining retainage to the contractor.

102. A — Value engineering savings are typically shared between the owner and the contractor under a negotiated sharing arrangement, often 50/50. This incentivizes the contractor to propose costsaving alternatives because the contractor receives a portion of the savings. Without a sharing arrangement, the contractor has no financial motivation to invest effort in finding VE opportunities.

103. B — Deductive alternates must be accurately priced to reflect the actual cost savings of deleting the specified scope. Pricing them too low cheats the owner out of legitimate savings; pricing them too high makes the deductions unattractive. Accurate pricing allows the owner to make informed budget decisions about which alternates to accept.

104. D — Under AIA A201, if the contractor fails to perform work after proper notice, the owner may engage a separate contractor to perform the work and deduct the cost from payments due to the contractor. The owner may also add a reasonable amount for administrative costs incurred in managing the remedial work.

105. C — Designbuild requires the contractor to provide both design and construction services under a single contract. The designbuild contractor typically engages the architect or engineer as a member of the designbuild team (as a subconsultant or employee). This singlesource responsibility is the fundamental distinction from designbidbuild.

106. A — Asbuilt drawings (record drawings) document the actual installed conditions of all building systems, including any deviations from the original design, field changes, RFI resolutions, and change order modifications. These drawings must be maintained throughout construction and delivered to the owner as part of the closeout documentation package.

107. B — A construction mockup is a fullscale sample of the specified assembly built onsite (or at a testing facility) to establish the acceptable standard for quality, appearance, and workmanship. The architect, owner, and contractor evaluate the mockup and agree on the acceptable standard before fullscale production begins. Mockups may also be performancetested.

108. D — Upon substantial completion, the owner takes possession and may occupy or use the building for its intended purpose. The warranty period begins running from this date. The owner assumes responsibility for maintenance, utilities, security, and insurance. The contractor's remaining obligation is to complete punch list items and deliver closeout documentation.

109. A — Testing and inspection services engaged directly by the owner (such as concrete testing, soil testing, and structural steel inspection) are paid for by the owner as a project cost.

The contractor facilitates access for the testing agency but does not pay for ownerengaged testing. Testing required by the contractor for their own quality control is the contractor's cost.

110. C — Retainage reduction improves the contractor's cash flow in two ways: it releases a portion of previously withheld retainage (for example, reducing 10% retainage to 5% on alreadycompleted work releases the difference) and reduces the percentage withheld from all future progress payments. This injects cash into the contractor's operations during the second half of the project.

111. B — Before receiving final payment, the subcontractor must typically provide a final unconditional lien waiver (releasing all lien rights), warranty documentation for the installed work, asbuilt drawings showing actual installed conditions, O&M manuals for any equipment installed, and documentation of any required training provided to the owner's staff.

112. D — The warranty for repaired work typically restarts for a reasonable period from the date the repair is completed, ensuring that the owner has adequate warranty coverage on the repaired item. The original warranty on unaffected portions of the work continues to expire at the oneyear mark from substantial completion as originally scheduled.

113. C — A waiver of subrogation prevents the insurance company from suing other parties to the construction contract to recover amounts paid on a claim. Without this waiver, an insurance company that pays a claim could sue the other contracting parties to recover its loss, creating costly litigation among project participants who are contractually required to work together.

114. A — The general contractor bears the responsibility for coordinating all subcontractor work and ensuring proper sequencing. If a coordination failure between subcontractors causes damage to completed work, the general contractor is financially responsible for the repair. The contractor may seek reimbursement from the subcontractor(s) whose work caused the damage, but the primary obligation lies with the GC.

115. B — Costloading assigns the dollar value from each schedule of values line item to the corresponding activity in the CPM schedule. This enables the generation of monthly cash flow projections (showing when money will be spent and earned), provides the basis for progress payment applications tied to schedule progress, and allows earned value analysis.