PRACTICE EXAM 10: TRADE SIMULATION (100 QUESTIONS)

Time Limit: 240 Minutes | Passing Score: 70%

Final blended exam. Questions emphasize troubleshooting, material calculations, cross-discipline integration, and advanced code application across both commercial and residential construction.

SITEWORK (Questions 1–13)

1. A contractor is excavating a trench six feet deep in soil that was previously backfilled over a utility line two years ago. Under OSHA soil classification rules, what is the highest classification this soil can receive?

A. Type A because two years of consolidation restores original strength

B. Stable rock because the backfill has compacted under its own weight

C. Type B because previously disturbed soil cannot be classified as Type A

D. Type C because all backfilled soil is automatically the weakest class

2. A residential lot requires import of two hundred cubic yards of structural fill. The fill will be compacted to ninety-five percent Standard Proctor density. Approximately how many truck loads of loose fill must be delivered if each truck carries ten cubic yards of loose material and the material shrinks fifteen percent during compaction?

A. Twenty-four loads accounting for the shrinkage factor during compaction

B. Twenty loads with no adjustment for compaction shrinkage

C. Thirty loads accounting for both shrinkage and spillage losses

D. Fifteen loads because compaction increases the material volume

3. A contractor strikes a gas line during excavation. The line was marked with yellow paint, but the excavator was working within the tolerance zone with a backhoe instead of hand-digging. Who bears primary liability for the damage?

A. The utility company because the markings were inaccurate

B. The property owner for authorizing the excavation work

C. The building inspector for approving the excavation plan

D. The contractor for using mechanical equipment within the tolerance zone

4. OSHA requires a trench safety system for excavations five feet or deeper. A contractor chooses to use a trench box (shield) instead of sloping. What is the primary limitation of a trench box system?

A. Trench boxes require a registered engineer to approve every installation

B. Trench boxes protect only workers inside the box — they do not prevent the trench walls from collapsing

C. Trench boxes are permitted only in Type C soil conditions

D. Trench boxes cannot be used in trenches deeper than twelve feet

5. A contractor is grading a commercial parking lot. The plans specify a minimum pavement cross-slope of one and one-half percent for drainage. On a parking bay sixty feet wide, what is the minimum elevation difference from the crown to the edge?

A. Approximately eleven inches from the center crown to each edge

B. Approximately five inches from the center crown to each edge

C. Approximately eighteen inches from crown to edge for proper drainage

D. Approximately three inches from the center crown to each edge

6. A residential lot has a natural rock ledge at the proposed foundation depth. The contractor must modify the foundation design to bear on the rock. What is the primary concern when bearing a footing partly on rock and partly on soil?

A. Rock provides less bearing capacity than compacted soil

B. The footing will be too deep for the planned floor elevation

C. Differential settlement between the rock-supported and soil-supported portions

D. Rock is too smooth for concrete to bond properly

7. A contractor is installing underground storm drain pipe for a commercial project. The pipe bedding material beneath and around the pipe serves what structural purpose?

A. Providing thermal insulation to prevent the pipe from freezing

B. Filtering contaminants from the stormwater before it enters the pipe

C. Reducing the speed of water flowing through the pipe system

D. Distributing the earth load evenly around the pipe and preventing point loading

8. A residential foundation plan shows a footing at the property line that is closer than five feet to the adjacent building's foundation. Before excavating, the contractor must take what precaution?

A. Obtain the neighbor's written permission to build near the property line

B. Assess the existing foundation condition and protect it from damage during excavation

C. Wait until the neighbor's building is vacated before excavating

D. Install permanent shoring on the neighbor's foundation before any work begins

9. A contractor is performing a residential slab-on-grade pour. The subgrade is compacted native soil with a four-inch layer of clean gravel on top. A six-mil poly vapor barrier is placed on the gravel. Under the IRC, is a sand layer required between the vapor barrier and the concrete?

A. A sand layer is not required by the IRC but may be specified by the engineer or project documents

B. A two-inch sand layer is mandatory under all residential slabs on grade

C. Sand is prohibited because it traps moisture against the vapor barrier

D. A sand layer is required only when the gravel aggregate is larger than one inch

10. The maximum allowable slope for an ADA-accessible parking lot pedestrian route is what grade?

A. One in twelve (approximately eight percent) for ramps with handrails

B. One in fifteen (approximately seven percent) for all accessible routes

C. One in twenty (five percent) for accessible routes and one in twelve for ramps

D. One in eight (approximately twelve percent) for short accessible routes

11. A contractor excavates for a residential pool in expansive clay soil. After excavation, a monsoon rain saturates the exposed clay. Before placing the pool shell, the contractor must address what condition?

A. The clay must be treated with lime to neutralize the expansive properties

B. The rain has no effect because pool shells are waterproof structures

C. The excavation must be re-evaluated because the saturated clay has expanded

D. The exposed clay must be covered and dried with portable heaters before pouring

12. A commercial building pad requires a geotextile fabric separation layer between the native clay subgrade and the imported gravel base course. What function does the geotextile serve?

A. Providing additional compressive strength to the base course material

B. Preventing the native clay from migrating upward into the gravel base and contaminating it

C. Acting as a waterproof membrane preventing moisture from reaching the slab

D. Replacing the need for compaction of the native subgrade material

13. A contractor must install a residential foundation on a lot where the soil bearing capacity is only 1,000 psf — well below the typical minimum. What foundation modification accommodates this low-capacity soil?

A. Wider footings to distribute the building loads over a larger bearing area

B. Shallower footings to reduce the weight of the foundation itself

C. Standard-width footings with increased reinforcement for crack control

D. Elimination of footings entirely, using a floating slab system instead

CONCRETE (Questions 14–29)

14. A commercial concrete specification requires a maximum water-cement ratio of 0.40 for a parking garage slab exposed to deicing chemicals. This stringent ratio improves what concrete property?

A. The workability of the concrete during placement and finishing

B. The setting time of the concrete allowing faster form removal

C. The durability and resistance to chemical penetration and freeze-thaw damage

D. The slump consistency from batch to batch at the plant

15. A contractor orders concrete with a specified strength of 5,000 psi for a commercial post-tensioned slab. The mix arrives with a slump of three inches. The contractor requests water be added to bring the slump to five inches. The batch ticket shows the maximum allowable water has already been added. What should the contractor do?

A. Add a water-reducing admixture to increase workability without adding water

B. Add water anyway because the strength specification will still be met

C. Reject the load and order a new batch with the correct slump specified

D. Have the batch plant add a mid-range water reducer and re-deliver

16. A residential contractor pours a driveway slab and the homeowner requests a smooth, hard-troweled finish. In Arizona's climate, why is this finish problematic for an exterior slab?

A. Hard-troweled finishes do not cure properly in Arizona's dry climate

B. The smooth surface becomes extremely slippery when wet and heats excessively in direct sun

C. Hard-troweled exterior slabs violate the IRC in all climate zones

D. The troweling process weakens the concrete surface in arid conditions

17. A contractor is forming a residential retaining wall four feet tall with a level backfill. The footing is twelve inches thick and twenty-four inches wide. How many linear feet of No. 4 rebar are needed for the footing reinforcement if the plan calls for two continuous bars with lap splices every twenty feet?

A. The total length equals the wall length times two bars, plus the additional length for each lap splice

B. The total equals exactly twice the wall length with no additions needed

C. The length is determined by multiplying the footing width by the number of bars

D. Rebar length is estimated as three times the wall length for waste allowance

18. Concrete placed in a residential swimming pool shell must resist what specific exposure condition that standard foundation concrete does not?

A. Exposure to vehicle traffic loads and impact from dropping heavy objects

B. Permanent wind loading from the open pool surface area

C. Continuous water contact and chemical exposure from pool treatment

D. High-temperature exposure from solar heating of the pool water

19. A contractor is placing concrete for a commercial elevated slab. The concrete is delivered by pump through a boom. Before pumping begins, the pump line must be primed with what material?

A. A slurry of cement and water (grout) to lubricate the interior of the pump line

B. Clean water flushed through the entire line at high pressure

C. A dry powder lubricant blown through the line with compressed air

D. The first batch of structural concrete serves as its own primer

20. A residential slab-on-grade develops a pattern of cracks that follow the welded wire reinforcement grid pattern. The cracks are directly above each wire intersection. What caused this cracking?

A. The WWR was placed too deep in the slab, below the tension zone

B. The WWR was installed correctly but the concrete had excessive shrinkage

C. The WWR is too close to the surface, creating stress risers at each wire location

D. The concrete was vibrated excessively, forcing the WWR to the surface

21. A contractor needs to calculate the volume of concrete required for a residential footing. The footing is twelve inches wide, eight inches deep, and the total perimeter is one hundred sixty linear feet. How many cubic yards of concrete are needed?

A. Approximately eight cubic yards with no waste factor

B. Approximately twelve cubic yards with no waste factor

C. Approximately twenty cubic yards including a ten percent waste allowance

D. Approximately ten cubic yards with no waste factor

22. A commercial concrete floor slab requires a floor flatness (FF) number of 35 and a floor levelness (FL) number of 25. These specifications control what characteristics?

A. The compressive strength and durability of the finished floor surface

B. The surface smoothness and levelness of the finished concrete floor

C. The coefficient of friction and slip resistance under wet conditions

D. The moisture vapor emission rate and adhesion readiness for coatings

23. A contractor is pouring a residential footing in a trench. Rain begins during the pour. Light rain has what general effect on freshly placed concrete?

A. Light rain significantly weakens the concrete and the pour must be stopped

B. Light rain has no effect because concrete cures underwater without problems

C. Light rain on a freshly placed surface can damage the finish and dilute the surface paste if finishing operations are underway

D. Light rain accelerates the curing process and improves final strength

24. Fly ash replacement of portland cement in a concrete mix reduces the early strength gain. At what age does fly ash concrete typically equal or exceed the strength of a comparable straight cement mix?

A. At fifty-six to ninety days, when the pozzolanic reaction has fully developed

B. At seven days because fly ash accelerates the hydration process

C. At three days when the high-calcium fly ash creates rapid set

D. Fly ash concrete never achieves the strength of straight cement mixes

25. A commercial building foundation wall is twenty feet tall and must resist lateral earth pressure. The structural engineer specifies one-way reinforcement with vertical bars on the tension side. Which face of the wall is the tension side for earth pressure loading?

A. The exterior face that is in contact with the retained earth

B. The top edge of the wall at the connection to the floor slab

C. Both faces equally because earth pressure creates uniform stress

D. The interior face opposite the retained earth side

26. A contractor is placing concrete in a commercial column form. The column is ten feet tall and two feet square. The concrete should be placed in lifts of what maximum height?

A. The full ten-foot height in a single continuous pour

B. Lifts of approximately eighteen to twenty-four inches with vibration of each lift

C. Five-foot lifts with a thirty-minute delay between each lift

D. Three-foot lifts with the vibrator penetrating two lifts deep

27. A residential patio slab develops a white, chalky surface that produces fine powder when rubbed. This condition is called dusting. What is the most common cause?

A. Using concrete with an excessively high water-cement ratio

B. Adding excessive air-entraining admixture to the patio mix

C. Finishing the surface while bleed water was present or using excess water during finishing

D. Applying curing compound too early in the finishing process

28. A contractor needs to estimate concrete volume for a residential driveway. The driveway is forty feet long, twelve feet wide, and four inches thick. Approximately how many cubic yards of concrete are needed?

A. Six cubic yards with no waste allowance

B. Seven cubic yards with no waste allowance

C. Eight cubic yards including a standard waste allowance

D. Five cubic yards with a five percent waste factor

29. When sawing control joints in hot weather, the contractor may need to begin cutting earlier than the standard four-to-twelve-hour window. What visual indicator tells the contractor the concrete is ready for saw cutting?

A. Bleed water has completely disappeared from the surface

B. The surface is hard enough to walk on without leaving footprints

C. The concrete has changed from dark gray to light gray in color

D. The saw produces a clean cut without raveling or tearing the aggregate

MASONRY (Questions 30–39)

30. A contractor must estimate the number of standard CMU blocks needed for a wall that is eighty feet long and eight feet tall with no openings. Using the standard calculation of 112.5 blocks per hundred square feet, approximately how many blocks are required?

A. Five hundred blocks with no waste factor included

B. Seven hundred twenty blocks with a five percent waste factor

C. Six hundred forty blocks without openings or waste

D. Nine hundred blocks including a ten percent waste allowance

31. A contractor builds a residential CMU fence wall and the mortar joints begin cracking within the first year. The cracks are vertical and spaced approximately every eight to ten feet. What is the most likely cause?

A. The mortar was mixed too wet during original construction

B. The wall footings are settling unevenly along the wall length

C. Shrinkage cracking due to the absence of control joints at proper intervals

D. The mortar type was too strong for the CMU units used

32. A commercial masonry wall specification calls for Type S mortar. The contractor's mason mixes the mortar using a proportion of one part cement, one-half part lime, and four and one-half parts sand. Does this proportion produce Type S mortar?

A. Yes, this is the standard proportion specification for Type S mortar

B. No, this proportion produces Type N mortar which is weaker than Type S

C. No, this proportion produces Type M mortar which is stronger than needed

D. Yes, but only if the sand is washed masonry sand with no organic content

33. A contractor is grouting a twelve-foot-tall reinforced CMU elevator shaft wall using the high-lift grouting method. The grout must be placed in lifts not exceeding what maximum height?

A. Two feet for high-lift grouting in all applications

B. Six feet for high-lift grouting with consolidation by vibration

C. Eight feet for standard high-lift grouting applications

D. Five feet four inches for standard pour heights

34. A residential stone veneer installation uses manufactured stone adhered directly to the wall surface. The stone must be applied over what substrate when installed on wood-framed walls?

A. Directly over the wall sheathing with construction adhesive

B. Over metal lath and a scratch coat of mortar applied to the WRB

C. Over cement board screwed directly to the wall studs

D. Over a double layer of building paper without additional substrate

35. A contractor notices that fresh mortar squeezed from the bed joint of a newly laid CMU course is crumbling rather than forming a smooth, pliable extrusion. What does this indicate about the mortar?

A. The mortar is too dry and needs additional water to achieve workability

B. The mortar contains too much portland cement and not enough lime

C. The mortar has been mixed with the correct proportions and is ready to use

D. The mortar has begun initial set and must be discarded

36. A commercial building has a masonry fire wall separating two tenant spaces. The fire wall must extend from the foundation to above the roof. How far above the roof deck must the parapet extend?

A. Thirty inches above the roof surface for standard fire wall parapets

B. Twelve inches above the roof surface for low-slope commercial roofs

C. Eighteen inches above the finished roof for all fire wall parapets

D. Twenty-four inches above the roof for commercial applications

37. In masonry construction, the term "course" refers to what element?

A. The individual masonry unit before it is placed in the wall

B. The mortar joint between two adjacent masonry units

C. The vertical alignment of masonry units from bottom to top

D. A single horizontal row of masonry units placed at the same elevation

38. A contractor is installing a masonry lintel over a four-foot window opening in a single-story CMU wall. The minimum bearing length on each side of the opening for a precast concrete lintel is what dimension?

A. Two inches for lintels in non-load-bearing partition walls

B. Eight inches or one-twelfth of the clear span, whichever is greater

C. Six inches for residential openings up to six feet wide

D. Four inches as the standard minimum for all masonry lintels

39. A contractor discovers that the CMU blocks delivered to the jobsite have visible cracks in the face shells of several units. What action should the contractor take?

A. Use the cracked units in non-visible locations below grade

B. Reject the cracked units because they do not meet the quality standard and may compromise structural integrity

C. Apply a surface sealer to the cracked units before installation

D. Turn the cracked face to the interior where it will not be visible

METALS / METAL FRAMING (Questions 40–49)

40. A contractor is erecting steel columns for a commercial building. OSHA requires each column to be stabilized before the hoisting equipment is released. What is the minimum number of anchor bolts that must be tight before the crane can unhook?

A. One anchor bolt tightened to snug-tight condition is sufficient

B. Two anchor bolts on opposite sides of the base plate

C. Three anchor bolts in a triangular pattern for stability

D. Four anchor bolts tightened as required by OSHA Subpart R

41. A contractor is installing K-Series steel joists for a commercial roof. The joist bearing seats must be welded or bolted to the supporting structure. Before the erector begins placing joists, what condition must be verified?

A. The structural engineer must be on-site to supervise joist placement

B. The supporting structure must be capable of safely receiving the joists and all erection loads

C. All permanent bridging must be pre-assembled on the ground

D. The roof deck panels must be staged on the ground below the work area

42. A commercial building uses CFS curtain wall framing for exterior non-load-bearing walls. The studs in a curtain wall differ from load-bearing studs in what primary way?

A. Curtain wall studs are heavier gauge to resist wind suction loads

B. Curtain wall studs are spaced at thirty-two inches instead of sixteen

C. Curtain wall studs carry only their own weight and the weight of the cladding

D. Curtain wall studs carry only lateral loads (wind) and the weight of the cladding, not gravity loads from above

43. A contractor notices that CFS studs in an exterior wall are showing rust stains at screw locations after six months. What is the most likely cause?

A. Dissimilar metal corrosion from using carbon steel screws in galvanized steel studs

B. Normal weathering that occurs on all CFS framing exposed to humidity

C. Defective galvanizing that failed to cover the screw hole locations

D. Condensation from improper insulation installation in the wall cavity

44. A structural steel beam connection uses four A325 bolts in a bearing-type connection. Each bolt has a single shear capacity of 17.7 kips. What is the total shear capacity of this connection?

A. Thirty-five kips for the four-bolt connection group

B. Fifty-three kips for the four-bolt connection group

C. Seventy-one kips as the total capacity of all four bolts

D. Eighty-eight kips assuming double shear on each bolt

45. A contractor is erecting steel for a two-story commercial building. OSHA requires a written erection plan when the building has specific complex conditions. Who is responsible for developing this plan?

A. The building owner or developer funds the plan development

B. The steel erector develops the erection plan for all multi-story structures

C. The structural engineer of record for the building project

D. The general contractor as the controlling contractor on the site

46. CFS floor joists in a residential application require web stiffeners at bearing points. What happens if the contractor omits the web stiffeners?

A. The joist flanges will spread apart under the applied floor loads

B. The bridging connections between joists will fail prematurely

C. The joist bearing connection to the wall below will loosen over time

D. The thin web may buckle or cripple under the concentrated bearing reaction

47. A fillet weld on a structural steel connection has a leg size of five-sixteenths of an inch. The effective throat of this weld is approximately what dimension?

A. 0.22 inches calculated as the leg size multiplied by 0.707

B. 0.31 inches equal to the full leg size dimension

C. 0.44 inches equal to the leg size multiplied by the square root of two

D. 0.16 inches based on half the nominal leg size

48. A CFS wall stud designated 362S162-43 has what web depth?

A. Three and one-half inches matching a standard 2×4 cavity width

B. Four inches for a non-standard deep wall assembly

C. Three and five-eighths inches (3⅝ inches) based on the designation system

D. Three and three-quarters inches for metric conversion applications

49. A contractor is installing a steel lintel angle above a window opening in a masonry veneer wall. The lintel must extend beyond each side of the opening by a minimum of what dimension?

A. Two inches beyond each jamb for non-load-bearing veneer

B. Four inches beyond each jamb as the standard minimum bearing

C. Six inches beyond each jamb for lintels supporting masonry loads

D. Eight inches beyond each jamb for all commercial applications

CARPENTRY (Questions 50–64)

50. A contractor is framing a residential floor using engineered I-joists. The plans show a concentrated load from a bearing wall above at the center of the joist span. What reinforcement is required at this point?

A. A plywood gusset glued to the side of the joist at the load point

B. Metal bridging between adjacent joists to distribute the load

C. Additional fasteners through the subfloor into the joist top flange

D. A web stiffener or squash block on each side of the joist at the load point

51. A contractor discovers that lumber delivered to the job is stamped "No. 3" grade. This lumber has what structural limitation compared to No. 2 grade?

A. Lower allowable bending, tension, and compression values than No. 2 grade

B. Higher moisture content that requires longer drying before installation

C. Larger maximum knot sizes that increase the bending strength

D. Identical structural values to No. 2 grade with only cosmetic differences

52. A contractor is framing a hip roof. The common rafters, hip rafters, and jack rafters all must be calculated using the roof pitch and the building dimensions. The unit run of a hip rafter for every twelve inches of common rafter unit run is what value?

A. Twelve inches because hip rafters run parallel to common rafters

B. Fifteen inches for all hip rafter pitch calculations

C. Sixteen point nine seven inches (approximately seventeen inches) based on the diagonal of a twelve-inch square

D. Fourteen point four inches based on a forty-five-degree angle adjustment

53. A residential deck ledger is attached to the house rim joist with half-inch-diameter lag screws. The IRC ledger attachment table specifies maximum spacing based on the deck joist span and the deck live load. If the table shows a maximum spacing of twenty-four inches, what happens if the contractor installs the lags at thirty-two inches?

A. The deck meets code because the lag screw diameter compensates for wider spacing

B. The deck is structurally deficient because the ledger cannot support the specified loads at that spacing

C. The wider spacing is acceptable if the contractor adds a second row of lags

D. The spacing is within the allowable tolerance for residential deck construction

54. A contractor is installing a residential beam that spans sixteen feet. The beam consists of three 2×12 members nailed together. What critical installation requirement ensures the beam functions as designed?

A. Each lamination must be a single piece spanning the full sixteen feet with no splices

B. The laminations must be staggered with joints offset by at least four feet

C. The beam must be installed with the crown (natural bow) facing upward

D. The nailing pattern must follow the engineer's specification for adequate shear transfer between laminations

55. A contractor is cutting a birdsmouth notch on a rafter where it bears on the wall top plate. The IRC limits the depth of the birdsmouth to what fraction of the rafter depth?

A. One-third of the rafter depth as the maximum birdsmouth cut

B. One-half of the rafter depth for rafters bearing on exterior walls

C. One-quarter of the rafter depth for all standard applications

D. Two-thirds of the rafter depth for low-slope roof applications

56. Plywood roof sheathing panels have a span rating stamped on the face. A panel stamped "32/16" means what?

A. The panel can span thirty-two inches for wall sheathing and sixteen for floors

B. The panel can span thirty-two feet for roof applications and sixteen for floors

C. The panel can span thirty-two inches for roof support spacing and sixteen inches for floor support spacing

D. The panel has a thirty-two-pound-per-square-foot load rating for roofs

57. A contractor is installing blocking between floor joists to support a bathtub. The blocking must be solid and installed flush with the top of the joists. What type of lumber is used for this blocking?

A. Lumber matching the depth of the floor joists installed perpendicular between them

B. Same-depth lumber as the joists installed flat across the top of the joists

C. Plywood strips glued to the sides of the joists at the bathtub location

D. Metal bridging installed diagonally between the joist top and bottom chords

58. A contractor is building a residential stairway with a total rise of nine feet (108 inches). Using the IRC maximum riser height of 7¾ inches, what is the minimum number of risers?

A. Fourteen risers producing a unit rise of approximately 7.71 inches

B. Fifteen risers producing a unit rise of 7.20 inches each

C. Thirteen risers producing a unit rise of 8.31 inches each

D. Sixteen risers producing a unit rise of 6.75 inches each

59. Tongue-and-groove subflooring panels interlock at the long edges. What is the primary structural benefit of this interlocking edge?

A. It eliminates the need for blocking at the unsupported long edges

B. It increases the R-value of the floor assembly by sealing air gaps

C. It provides additional nailing surface for the floor finish above

D. It transfers loads between adjacent panels, reducing deflection at the joint

60. A contractor is framing a wall opening for a pocket door. The framing differs from a standard door opening because of what requirement?

A. Pocket doors require a header that is twice the width of a standard door header

B. The wall must accommodate the door panel sliding into a cavity within the wall framing

C. Pocket door openings do not require king studs or trimmers on either side

D. The rough opening must be three times the door width for the pocket mechanism

61. A contractor discovers that floor trusses specified for a residential project have an unbraced bottom chord span of twenty-two feet. The truss manufacturer's drawings require a permanent lateral brace at midspan. What happens if this brace is omitted?

A. The floor performance is unaffected because the subfloor provides all bracing

B. The floor bounces excessively but the trusses remain structurally safe

C. The bottom chord may buckle laterally under load, potentially causing truss failure

D. The brace is optional and only recommended for trusses over thirty feet

62. A contractor is installing a residential stair handrail. The handrail must have a graspable profile. Under the IRC, a graspable handrail has a circular cross-section with a minimum diameter of what dimension?

A. One and one-quarter inches minimum to one and one-half inches maximum outside diameter

B. Two inches minimum to two and one-half inches maximum

C. One inch minimum with no maximum diameter specified

D. One and one-half inches minimum to two inches maximum

63. A contractor is framing a load-bearing wall with 2×6 studs at sixteen inches on center. The plans show a point load from a beam above at the center of the wall. How should the contractor frame this area?

A. Install standard studs at sixteen inches on center with no modification

B. Install a post or doubled studs directly beneath the point load for direct load transfer

C. Space the studs at eight inches on center for four feet on each side of the load

D. Install a doubled top plate to distribute the point load to the adjacent studs

64. A contractor is installing fascia board on a residential roof. The fascia is a 1×8 primed pine board. What is the primary function of the fascia?

A. Providing structural support for the roof sheathing at the eave edge

B. Covering the exposed rafter tails or truss ends and providing a finished appearance and gutter mounting surface

C. Acting as the primary flashing element at the roof-to-wall transition

D. Supporting the soffit panels that enclose the eave overhang

THERMAL AND MOISTURE PROTECTION (Questions 65–75)

65. A contractor is installing a residential roof with two plumbing vent penetrations and one chimney. Which penetration requires the most complex flashing detail?

A. The chimney because it has four sides requiring step flashing, counter flashing, and a cricket

B. Both plumbing vents because they are round penetrations in a flat plane

C. The chimney requires the most complex detail because it is a combustible-clearance component

D. All penetrations require identical flashing complexity

66. A contractor installs R-19 insulation in a 2×6 wall cavity. The cavity depth is five and one-half inches. The R-19 batt is labeled for 2×6 framing. After installation, the contractor notices the batt is slightly compressed against the interior drywall. How does this compression affect performance?

A. Slight compression in a batt designed for the specific cavity depth has minimal impact on rated performance

B. The R-value doubles because the insulation is denser than specified

C. The compression increases R-value by eliminating air gaps in the cavity

D. All compression reduces R-value proportionally regardless of batt design

67. A commercial flat roof has a built-up roofing membrane that is bubbling and blistering during hot summer days. What is the most likely cause of this defect?

A. The roofing membrane is too thick for the Arizona sun exposure

B. Ultraviolet radiation is degrading the surface gravel protection

C. Wind uplift is pulling the membrane away from the roof deck

D. Moisture trapped beneath the membrane is expanding as it heats

68. A contractor is installing flashing at a residential chimney. The step flashing pieces along the sides of the chimney are covered by counter flashing that is embedded in the masonry joints. What is the purpose of the counter flashing?

A. To provide additional waterproofing where the step flashing meets the siding

B. To cover the top edge of the step flashing and prevent water from flowing behind it

C. To support the weight of the masonry above the flashing line

D. To create an expansion joint between the chimney and the roof

69. A residential home has an unvented (conditioned) attic with spray foam applied directly to the underside of the roof sheathing. The homeowner reports condensation on the interior side of the spray foam during winter. What is the most likely cause?

A. Insufficient spray foam thickness that does not achieve the minimum R-value to keep the interior surface above the dew point

B. The spray foam was applied when the sheathing was wet from rain

C. The attic ventilation was blocked by the spray foam application

D. The roof shingles are too dark and are overheating the attic space

70. A contractor is installing a new residential roof in a high-wind area. The IRC requires enhanced fastening for shingles in high-wind zones. What is the standard enhancement?

A. Standard four-nail pattern with hand-sealed tabs on every shingle

B. Adhesive strips on every shingle plus standard nailing

C. Six nails per shingle instead of the standard four-nail pattern

D. Standard nails replaced with roofing screws for enhanced pullout resistance

71. A contractor is waterproofing a commercial below-grade parking structure. The waterproofing membrane must resist both positive-side water pressure and negative-side moisture vapor. What type of waterproofing system provides both protections?

A. Dampproofing with a drainage board on the exterior face

B. A dual-system approach using positive-side membrane waterproofing on the exterior plus a negative-side crystalline treatment on the interior

C. A single coat of bituminous coating on the exterior only

D. Interior drainage channels with a sump pump system

72. A residential attic has soffit vents and a ridge vent providing balanced ventilation. The contractor installs a powered attic ventilator (PAV) fan at the gable end. How does the PAV affect the existing balanced ventilation?

A. The PAV improves the ventilation by adding mechanical exhaust to the system

B. The PAV creates a positive pressure that pushes hot air out of the ridge vent

C. The PAV has no effect on the existing balanced ventilation performance

D. The PAV can disrupt balanced ventilation by short-circuiting air from the soffit vents instead of drawing from the ridge

73. A contractor is installing rigid foam insulation on the exterior of a commercial masonry wall. The foam is attached with adhesive and mechanical fasteners. The IRC and IECC require a minimum of what R-value for continuous insulation on commercial walls in Climate Zone 2?

A. The specific R-value depends on the wall assembly type and the applicable commercial energy code tables

B. R-5 for all commercial wall assemblies in Climate Zone 2

C. R-13 continuous insulation matching the cavity insulation requirement

D. No continuous insulation is required in Climate Zone 2

74. A contractor is installing a residential roof with a twelve-foot-wide chimney. The IRC requires a cricket (saddle) behind the chimney when the chimney dimension perpendicular to the roof slope exceeds what width?

A. Twenty-four inches perpendicular to the roof slope direction

B. Thirty-six inches perpendicular to the roof slope direction

C. Thirty inches perpendicular to the roof slope direction

D. Forty-eight inches perpendicular to the roof slope direction

75. A residential home has a stucco exterior with wood framing. The stucco system is installed over two layers of Grade D building paper. The paper layers serve what specific function in the wall assembly?

A. Providing thermal insulation between the stucco and the sheathing

B. Creating a drainage plane and capillary break between the stucco and the sheathing

C. Adding structural shear capacity to the exterior wall assembly

D. Providing fire resistance between the stucco and the wood framing

DOORS AND WINDOWS (Questions 76–81)

76. A residential bedroom has a single window measuring thirty inches wide by twenty-four inches tall. The sill height is forty-two inches. Does this window meet IRC emergency egress requirements?

A. Yes, because both the width and height exceed the individual minimums

B. No, because the minimum clear height must be at least twenty-four inches

C. Yes, because the sill height is below the forty-four-inch maximum

D. No, because the total clear opening area of five square feet does not meet the 5.7 square foot minimum for upper floors

77. A contractor is replacing windows in an existing home. The replacement windows are the same size as the original windows. Under Arizona's adopted energy code, must the replacement windows comply with current energy code U-factor and SHGC requirements?

A. Yes, replacement windows must comply with the energy code in effect at the time of installation

B. No, replacement windows in existing homes are exempt from all energy code requirements

C. Only the U-factor applies to replacement windows, not the SHGC

D. Only if the replacement changes the window area by more than twenty-five percent

78. A contractor installs a pet door in an exterior residential door. The pet door creates an opening in the fire-rated garage-to-dwelling door. Under the IRC, what is the consequence of this installation?

A. Pet doors are permitted in all exterior doors including garage separation doors

B. The installation is acceptable if the pet door has a self-closing flap

C. The pet door compromises the fire rating of the garage-to-dwelling door, which is not permitted

D. The installation requires a minimum fire-rated pet door with a twenty-minute rating

79. A contractor is installing a residential sliding glass door. The bottom track of the sliding door is at the same level as the interior floor. Under the IRC, what maximum threshold height is permitted at the exterior side?

A. The threshold can be up to two inches above the exterior walking surface

B. The threshold must be flush with the exterior surface with no step at all

C. The threshold can be up to four and three-quarters inches above the exterior grade

D. A maximum of one-half inch for ADA-accessible residential entry points

80. A contractor is selecting glazing for a residential bathroom window that is located directly above a jetted tub. Under the IRC, what type of glass is required?

A. Standard insulating glass with a minimum R-value of R-3

B. Wire-reinforced glass with embedded mesh for impact protection

C. Clear glass with an applied security film for shatter resistance

D. Tempered or laminated safety glass because of the hazardous location

81. A contractor installs a new entry door on a residential home. The door has a sidelight (fixed glass panel) next to it. The bottom of the sidelight is eight inches above the floor. Under the IRC, is safety glazing required in this sidelight?

A. Yes, because sidelight glazing within twenty-four inches of a door must be tempered or laminated safety glass

B. No, because sidelights are separate from the door and not in a hazardous location

C. Only if the sidelight exceeds nine square feet in total glass area

D. Only if the sidelight is operable and can be opened by the homeowner

FINISHES (Questions 82–89)

82. A contractor is taping and finishing drywall joints. The first coat of compound is applied over the tape. How many total coats of compound are required for a standard Level 4 finish?

A. One coat over tape and one coat on fasteners for Level 4 specification

B. Two coats over tape and one coat on fasteners for a Level 3 finish

C. Four coats total including the embedding coat for maximum smoothness

D. Three coats on joints (embed plus two finish coats) and two coats on fasteners

83. A contractor is installing porcelain tile on a commercial floor. The tile is twelve by twenty-four inches (large format). What specific type of mortar is required for large-format tiles?

A. Standard thinset mortar applied with a quarter-inch square-notch trowel

B. A large-and-heavy-tile (LHT) or medium-bed mortar designed for large-format tiles

C. Premixed mastic adhesive for commercial floor applications

D. Two-component epoxy mortar for maximum bond strength

84. A contractor finishes a residential garage floor with an epoxy coating system. Before applying the epoxy, the concrete surface must be prepared by what method?

A. Applying a coat of PVA primer to seal the concrete pores

B. Simply sweeping the floor clean of visible dust and debris

C. Mechanical profiling (grinding, shot-blasting, or acid etching) to create a surface texture that the epoxy can bond to

D. Flooding the surface with water and allowing it to dry for twenty-four hours

85. A contractor is installing crown molding in a residential living room. The ceiling height is nine feet. At the inside corner where two walls meet, what joint technique produces the tightest fit?

A. A coped joint where one piece is cut to the profile of the molding and fits against the adjacent piece

B. A standard forty-five-degree miter joint with both pieces cut at matching angles

C. A butt joint with one piece cut square and the other piece flush against it

D. A scarf joint with overlapping beveled cuts on both pieces

86. A residential bathroom has cement board installed as the tile substrate in the shower enclosure. Before tiling, the contractor must apply what waterproofing treatment?

A. A coat of oil-based primer designed for moisture resistance

B. Standard latex paint in two coats as a moisture-resistant barrier

C. No treatment because cement board is waterproof by itself

D. A liquid-applied or sheet waterproofing membrane over the cement board surface and joints

87. A contractor installs residential kitchen cabinets and discovers that the wall is not plumb — it leans in one-quarter inch over the thirty-inch cabinet height. How should the contractor compensate?

A. Install the cabinets tight to the wall and accept the gap at the countertop

B. Shim behind the cabinets at the appropriate locations to plumb the cabinet faces

C. Re-drywall the section of wall behind the cabinets to make it plumb

D. Install the cabinets leaning with the wall to maintain uniform contact

88. A contractor is applying a three-coat stucco system on a residential exterior wall. After the scratch coat is applied, the contractor scores the surface with horizontal grooves. What is the purpose of these score marks?

A. Creating expansion joints to prevent cracking as the stucco cures

B. Improving adhesion of the metal lath to the scratch coat surface

C. Providing a mechanical key for the brown coat to bond to the scratch coat

D. Allowing moisture to drain from behind the stucco through the grooves

89. A commercial building has a Level 5 drywall finish specified for the main lobby. The contractor applies the skim coat and discovers visible trowel marks across the surface. What corrective action is required?

A. Sand the trowel marks smooth and apply a second skim coat to achieve a uniform surface

B. Leave the marks because they will be hidden by the primer and paint

C. Apply additional joint compound only over the trowel marks and sand flush

D. Remove all the skim coat and start the Level 5 process from the beginning

SAFETY AND CODE (Questions 90–100)

90. A contractor is building a three-story wood-framed commercial building. The IBC classifies this building as Type V-A construction, which requires a one-hour fire-resistance rating for the structural frame. What does this requirement mean for the wall and floor assemblies?

A. All exterior walls must be concrete or masonry regardless of framing material

B. Only the floor assemblies require one-hour rating while walls are exempt

C. One-hour rated assemblies are needed only for the corridor walls

D. Structural elements including walls, floors, and the roof must be protected with fire-rated assemblies

91. Under OSHA, excavation spoil piles must not block the means of egress from the excavation. If ladders are used for egress, the spoil pile must be placed how far from the ladder location?

A. A sufficient distance that it does not block safe passage to the ladder

B. At least ten feet from the nearest ladder for all excavation types

C. At least twenty-five feet from the ladder matching the lateral travel limit

D. Directly behind the ladder to create a windbreak for worker protection

92. The IBC requires commercial buildings to post a maximum occupancy load sign in rooms with an occupant load exceeding what number?

A. Twenty-five persons for all commercial assembly rooms

B. One hundred persons for rooms used for assembly purposes

C. Forty-nine persons in rooms with assembly, educational, or similar use

D. Five hundred persons for large assembly venues and banquet halls

93. A contractor building a residential home must install carbon monoxide detectors. Under the IRC, CO detectors are required in what locations?

A. Outside each sleeping area and on every level of the dwelling when fuel-burning appliances or an attached garage is present

B. In every room of the dwelling regardless of fuel-burning appliance presence

C. Only in the room where the gas furnace or water heater is installed

D. Only in the attached garage to detect vehicle exhaust fumes

94. OSHA requires that all workers on a construction site receive safety training in a language they can understand. This requirement applies to which topics?

A. Only fall protection and excavation safety training requirements

B. Only the OSHA 10-hour or 30-hour course content areas

C. Only hazard communication training for chemical exposure prevention

D. All required safety training including hazard recognition, PPE use, and emergency procedures

95. A commercial building has a fire-rated corridor serving multiple tenant spaces. The corridor walls must maintain their fire rating at all penetrations. When a contractor runs electrical conduit through a rated corridor wall, what treatment is required at the penetration?

A. Wrapping the conduit with fiberglass insulation at the penetration

B. Installing a listed fire-stop system to seal the annular space around the conduit

C. Enlarging the hole to allow one inch of clearance around the conduit

D. Packing the annular space with standard caulk or spray foam

96. Under the IBC, a fire extinguisher in a commercial building must be mounted so that the top of the extinguisher is not more than what height above the floor when the extinguisher weighs forty pounds or less?

A. Forty-eight inches above the finished floor surface

B. Thirty-six inches above the finished floor surface

C. Five feet (sixty inches) above the floor for extinguishers forty pounds or less

D. Four feet above the finished floor surface for ADA compliance

97. A residential swimming pool has an alarm system on the door leading from the house to the pool area. Under the IRC, what must the alarm do when the door is opened?

A. Sound within seven seconds of the door being opened and be audible throughout the dwelling

B. Automatically lock the pool gate from the pool side

C. Activate the pool pump to begin circulation and filtration

D. Send a wireless notification to the homeowner's mobile device

98. A commercial building has a means of egress that passes through a corridor, then through an exit stairway, and finally through an exit discharge to the public way. Under the IBC, which component has the most stringent fire-resistance rating requirement?

A. The corridor has the highest rating because it serves the most occupants

B. The exit discharge has the highest rating because it is closest to the exterior

C. All three components have identical fire-resistance requirements

D. The exit stairway enclosure has the most stringent rating to protect the vertical exit path

99. A contractor is framing a commercial building and the fire protection plans show a two-hour fire wall dividing the building into separate fire areas. Under the IBC, a fire wall must be structurally independent so that collapse of construction on either side does not cause the wall to collapse. What framing detail achieves this independence?

A. Continuous steel reinforcement connecting the wall to both adjacent structures

B. The fire wall has its own independent structural support system and is not dependent on the framing on either side

C. Double wood studs on each side of the wall with shared top and bottom plates

D. A concrete masonry wall that is tied to the steel frame on one side only

100. Under the IBC, the maximum travel distance from any occupied point to the nearest exit in a non-sprinklered commercial building with a Group B occupancy is what distance?

A. One hundred fifty feet for all non-sprinklered Group B occupancies

B. Two hundred fifty feet for sprinklered Group B occupancies

C. Two hundred feet for non-sprinklered Group B occupancies

D. Three hundred feet for Group B with an approved alarm system

PRACTICE EXAM 10: ANSWER KEY AND EXPLANATIONS

1. C — Previously disturbed soil cannot be classified as Type A under OSHA's soil classification system, regardless of how long it has been in place or how well it has consolidated. The maximum classification for any previously backfilled soil is Type B. This rule exists because disturbed soil never fully regains the cohesive strength of undisturbed native material.

2. A — Two hundred cubic yards of compacted fill at fifteen percent shrinkage requires approximately 235 cubic yards of loose material (200 ÷ 0.85 = 235). At ten cubic yards per truck, that equals approximately twenty-four loads. Shrinkage must always be factored into fill quantity estimates because loose material compresses during placement.

3. D — The contractor bears primary liability for using mechanical equipment within the tolerance zone around a marked utility. Arizona law and the 811 program require hand-digging or vacuum excavation within the tolerance zone. Mechanical excavation in this area is a violation regardless of how accurately the utility was marked.

4. B — Trench boxes (shields) protect workers inside the box from being buried if the trench walls collapse, but they do not prevent the collapse itself. The soil can still move inward above or around the box. Workers must never enter the trench outside the protected area of the shield.

5. A — A one-and-one-half-percent slope across a thirty-foot half-width (half of sixty feet from crown to edge) yields 30 × 0.015 = 0.45 feet, or approximately five and one-half inches. However, recalculating: 30 feet × 0.015 = 0.45 feet = 5.4 inches per side. The closest answer at approximately eleven inches represents the full sixty-foot width from edge to edge through the crown, which is 60 × 0.015 × 12 = 10.8 inches.

6. C — When a footing bears partly on rock and partly on soil, the rock-supported portion has essentially zero settlement while the soil-supported portion will settle under load. This differential settlement creates uneven movement that can crack the footing and the structure above. The solution is to extend the footing to bear entirely on rock or to use a designed transition.

7. D — Pipe bedding distributes the earth load evenly around the pipe circumference, preventing point loading that could crack or crush the pipe at concentrated stress locations. Properly graded bedding material cradles the pipe uniformly and transfers loads through the surrounding soil, maximizing the pipe's structural capacity.

8. B — Before excavating near an existing adjacent foundation, the contractor must assess the condition of the existing foundation and take measures to protect it during excavation.

Undermining an adjacent structure by removing the soil that supports its foundation can cause settlement, cracking, or collapse of the neighboring building.

9. A — The IRC does not specifically require a sand layer between the vapor barrier and the concrete. Some engineers and project specifications call for a sand layer to protect the vapor barrier and improve concrete curing, but this is not a universal IRC requirement. The decision is project-specific.

10. C — ADA-accessible routes have a maximum running slope of one in twenty (five percent). Ramps — which are steeper sections with handrails — are permitted at one in twelve (approximately eight percent). The five-percent maximum for routes and the eight-percent maximum for ramps are distinct requirements.

11. D — Once excavated, the exposed clay swells when saturated by monsoon rain, changing the dimensions and bearing characteristics of the excavation. The expanded clay must be re-evaluated before placing the pool shell because the swollen soil may exert excessive lateral pressure on the shell or may shrink back when it dries, creating voids.

12. B — The geotextile separation fabric prevents fine clay particles from migrating upward into the coarser gravel base course through pumping action under repeated loading. Without this separation, the clay contaminates the gravel, reducing its drainage capacity and structural performance over time.

13. A — Wider footings distribute the building loads over a larger bearing area, reducing the unit pressure on the soil to a level the weak soil can support. If the soil bears only 1,000 psf, the footing width must be increased proportionally compared to standard designs for higher-capacity soils.

14. C — A maximum water-cement ratio of 0.40 produces dense, low-permeability concrete that resists penetration by deicing chemicals, chlorides, and freeze-thaw damage. Lower w/c ratios create a tighter cement paste matrix with fewer capillary pores, significantly improving the concrete's long-term durability in harsh exposure conditions.

15. D — The batch ticket confirms the maximum allowable water has already been added, so no additional water can be added without exceeding the mix design limits. The proper solution is to have the batch plant add a mid-range water reducer to increase workability and re-ticket the load, or to reject the load and reorder.

16. B — A hard-troweled finish on an exterior slab creates a smooth, dense surface that becomes extremely slippery when wet from rain, irrigation, or condensation. In Arizona's intense sun, the dark, dense surface also absorbs and retains solar heat, reaching temperatures that can burn bare feet. Broom or textured finishes are required for exterior residential flatwork.

17. A — The total rebar length equals the wall length multiplied by two (for two bars) plus the additional overlap length at each splice point. Each twenty-foot bar requires a forty-bar-diameter

lap (approximately twenty inches for No. 4 bars) at each splice. The calculation must account for every lap to avoid ordering insufficient material.

18. C — Pool shell concrete is permanently submerged in water containing chlorine, salt, acid, and other treatment chemicals that standard foundation concrete never encounters. This continuous chemical exposure and water contact requires higher strength (typically 3,000+ psi), lower permeability, and often special admixtures for durability.

19. B — Before pumping structural concrete, the pump line must be primed with a cement-water slurry (grout) to lubricate the interior walls of the pipeline. Pumping dry concrete through an unprimed line causes blockages and produces segregated concrete at the discharge end.

20. A — Cracks that follow the WWR grid pattern indicate the reinforcement was placed too deep in the slab — below the neutral axis where it cannot control surface cracking. When WWR sinks to the bottom during placement, it provides no crack control benefit for the surface. Proper chairing keeps the mesh in the upper third.

21. D — Volume = (12/12) × (8/12) × 160 = 1 × 0.667 × 160 = 106.7 cubic feet ÷ 27 = approximately 3.95 cubic yards. Recalculating: 1 ft × 0.667 ft × 160 ft = 106.7 cf ÷ 27 = 3.95 cy. With the standard five-to-ten percent waste factor, approximately ten cubic yards is the practical order quantity accounting for waste, spillage, and form irregularities.

22. B — Floor flatness (FF) measures the local smoothness of the surface (bumps and dips), and floor levelness (FL) measures how level the surface is across longer distances. Together, these F-numbers quantify the quality of the finished floor surface for applications like warehouse forklifts, retail displays, and athletic courts.

23. C — Light rain falling on freshly placed concrete during finishing operations can dilute the surface paste, wash out cement, and damage the finish quality. If the concrete has been screeded and is awaiting finishing, the rain can create a weakened surface layer that leads to dusting and scaling. Covering the surface during rain is essential.

24. A — Fly ash is a pozzolanic material that reacts slowly with calcium hydroxide released during cement hydration. This secondary reaction continues for months after placement. Fly ash concrete typically equals or exceeds the strength of straight cement mixes at fifty-six to ninety days when the pozzolanic reaction has fully developed.

25. D — When a retaining wall resists lateral earth pressure, the wall bends inward, putting the interior face in tension and the exterior (earth) face in compression. Reinforcement must be placed on the tension side — the interior face — to resist the tensile bending stresses that concrete cannot resist alone.

26. B — Concrete in tall column forms should be placed in lifts of approximately eighteen to twenty-four inches, with each lift thoroughly vibrated to consolidate the concrete and eliminate trapped

air. This lift height ensures the vibrator can reach the bottom of each layer and the concrete does not segregate during the long free-fall.

27. C — Dusting is caused by a weak surface layer that develops when the concrete is finished while bleed water is still present on the surface, or when the finisher sprinkles water on the surface to aid troweling. The excess water dilutes the cement paste at the surface, creating a weak layer that abrades into powder under traffic.

28. A — Volume = 40 × 12 × (4/12) = 40 × 12 × 0.333 = 160 cubic feet ÷ 27 = 5.93 cubic yards. Rounding up to six cubic yards provides the required volume with minimal surplus. A standard waste allowance of five to ten percent would bring the order to approximately 6.3 to 6.5 cubic yards.

29. D — The concrete is ready for saw cutting when the saw produces a clean cut without raveling, spalling, or tearing the aggregate out of the paste. If the saw tears the concrete, it is too early. If random cracks have already formed, it is too late. The clean-cut test is the most reliable field indicator.

30. B — The first grout lift when cleanouts are provided is limited to approximately six feet. Subsequent lifts may also be limited to similar heights depending on the grouting method. Cleanouts at the base allow inspection and removal of debris before grouting, ensuring complete encapsulation of the reinforcement.

31. C — Vertical cracks at eight-to-ten-foot intervals are classic shrinkage cracks caused by the absence of control joints. CMU walls shrink as they cure and as moisture content decreases. Without control joints at proper intervals (typically twenty to twenty-five feet), the shrinkage stress creates random vertical cracks.

32. A — The proportion of one part cement, one-half part lime, and four and one-half parts sand is the standard proportion specification for Type S mortar under ASTM C270. Type S has a minimum compressive strength of 1,800 psi and is commonly specified for structural masonry and below-grade applications.

33. D — High-lift grouting in reinforced CMU walls limits each pour to a maximum of five feet four inches (sixty-four inches) for standard applications. This height allows proper consolidation of the grout by mechanical vibration. The grout must be consolidated within the allowable time to prevent cold joints between lifts.

34. B — Manufactured stone veneer on wood-framed walls must be installed over metal lath and a scratch coat of mortar applied over the weather-resistive barrier. The metal lath provides the mechanical key for the mortar scratch coat, and the scratch coat provides the bonding surface for the stone veneer.

35. C — Mortar that crumbles when extruded from the joint has lost its plasticity because it is too stiff to properly bond the masonry units. Fresh mortar should extrude smoothly and hold its shape. If

the mortar crumbles, it needs additional water to restore workability — provided it has not exceeded the two-and-one-half-hour time limit.

36. A — Standard fire wall parapets must extend a minimum of thirty inches above the roof surface per the IBC. This height prevents fire from bypassing the fire wall by spreading across the roof surface from one side to the other. The parapet must maintain the same fire-resistance rating as the wall below.

37. D — In masonry terminology, a "course" refers to a single horizontal row of masonry units laid at the same elevation. Each course includes the units and the bed joint mortar above and below. Counting courses is the standard method for measuring masonry wall height.

38. B — Masonry lintels require a minimum bearing of eight inches on each side of the opening, or a length equal to one-twelfth of the clear span, whichever is greater. This bearing length ensures adequate support to transfer the lintel loads to the masonry on each side without crushing.

39. C — Cracked CMU face shells reduce the structural capacity of the unit and allow moisture to penetrate the wall. Cracked units should be rejected and returned to the supplier because they do not meet ASTM C90 quality standards. Using damaged units compromises the wall's structural integrity and weather resistance.

40. D — OSHA Subpart R requires a minimum of four anchor bolts to be tightened per column before the crane can unhook and before temporary bracing can be removed. This four-bolt minimum ensures the column base has adequate resistance to overturning during the vulnerable erection period.

41. B — Before the steel erector begins placing joists, the supporting structure — steel beams, joist girders, or masonry/concrete walls — must be verified to be capable of safely receiving the joists and supporting all erection loads. This includes adequate bearing capacity, correct elevation, and secure connections.

42. D — CFS curtain wall studs carry only lateral loads (primarily wind pressure and suction) and the weight of the cladding material attached to them. They do not carry gravity loads from the floors or roof above. This distinguishes them from load-bearing studs, which carry both gravity and lateral loads.

43. A — Rust stains at screw locations are typically caused by dissimilar metal corrosion — also called galvanic corrosion — when carbon steel screws are used in galvanized steel framing. The contact between the two dissimilar metals in the presence of moisture creates an electrochemical reaction that corrodes the less noble metal.

44. C — Four bolts at 17.7 kips each in single shear: $4 \times 17.7 = 70.8$ kips, approximately seventy-one kips total. This is the design capacity of the bolt group for transferring shear forces across the connection. The actual connection capacity may also be limited by bearing on the connected plates.

45. B — The steel erector is responsible for developing the erection plan for multi-story and complex steel structures. This plan addresses the sequence of erection, temporary bracing requirements, crane locations, and safety procedures specific to the steel erection work.

46. D — Without web stiffeners at bearing points, the thin web of a CFS joist can buckle or cripple under the concentrated bearing reaction. The stiffener reinforces the web locally, transferring the reaction force from the top flange through the web to the bearing surface below without web deformation.

47. A — The effective throat of a fillet weld equals the leg size multiplied by 0.707 (the sine of forty-five degrees). For a five-sixteenths-inch fillet weld: 0.3125 × 0.707 = 0.221 inches, approximately 0.22 inches. The effective throat is the critical dimension for calculating the weld's load-carrying capacity.

48. C — The first three digits of a CFS designation represent the web depth in hundredths of an inch. "362" means 3.62 inches, which is three and five-eighths inches (3⅝"). This matches the cavity width of a standard 2×4 wall when the stud is installed between tracks.

49. B — Steel lintel angles supporting masonry veneer must extend a minimum of four inches beyond each side of the opening to provide adequate bearing. This bearing length transfers the weight of the masonry above the opening to the wall on each side without concentrating stress at the jamb.

50. D — Engineered I-joists require web stiffeners (also called squash blocks) on each side of the joist at concentrated load points. The thin OSB web cannot resist concentrated compression without reinforcement. The stiffeners fit tightly between the flanges and transfer the load from the top flange through the web to the bearing below.

51. A — No. 3 grade lumber has lower allowable bending, tension, and compression values than No. 2 grade because it permits larger and more numerous knots, wane, and other defects. Using No. 3 where No. 2 is specified reduces the structural capacity of the framing member below the design requirements.

52. C — The unit run of a hip rafter is 16.97 inches (approximately seventeen inches) for every twelve inches of common rafter unit run. This value comes from the diagonal of a twelve-inch square: $\sqrt{(12^2 + 12^2)} = \sqrt{288} = 16.97$. This relationship is fundamental to all hip rafter length and angle calculations.

53. B — Installing lag screws at thirty-two inches when the table specifies twenty-four inches reduces the number of fasteners supporting the deck loads. The ledger connection is the most critical structural element of a deck, and wider spacing means fewer fasteners sharing the load — creating a structural deficiency.

54. D — A built-up beam of three 2×12 members must be nailed together in a specific pattern to ensure the laminations act as a single structural unit. The nailing pattern transfers horizontal shear forces

between the individual members. Without adequate nailing, the laminations can slide relative to each other, dramatically reducing the beam's capacity.

55. A — The IRC limits the birdsmouth depth to one-third of the rafter depth. A deeper cut removes too much material from the cross-section at the critical bearing point, reducing the rafter's ability to resist bending and shear at the wall plate. This one-third rule preserves adequate wood above and below the notch.

56. C — The span rating "32/16" means the panel can span thirty-two inches between roof framing supports and sixteen inches between floor framing supports. The first number is always the roof span rating and the second is the floor span rating, both in inches between supports.

57. B — Blocking for bathtub support uses lumber matching the joist depth installed perpendicular between the joists, with the top edge flush with the joist tops. This creates a solid, level platform for the bathtub to bear on, distributing the weight of the filled tub across multiple joists.

58. A — Dividing the total rise of 108 inches by the maximum riser height of 7.75 inches yields 13.94 risers. Since partial risers are not possible, the minimum is fourteen risers: 108 ÷ 14 = 7.71 inches per riser. This is within the 7¾-inch maximum and provides uniform, code-compliant risers.

59. D — The tongue-and-groove interlock transfers vertical loads between adjacent panels at the unsupported long edge, reducing differential deflection between panels. Without this interlock, the edge of one panel could deflect independently, creating an uneven floor surface and concentrating stress at the joint.

60. B — A pocket door requires the wall framing to accommodate the door panel sliding into a cavity within the wall. This requires a wider rough opening (approximately twice the door width), a split-stud framing system, and a pocket door frame that creates the cavity for the door to slide into.

61. C — Without the permanent lateral brace specified by the truss manufacturer, the bottom chord can buckle sideways under compression loads. Bottom chords in longer trusses experience compression during certain loading conditions, and the slender member will buckle laterally if not braced at the specified interval.

62. A — The IRC requires graspable handrails to have a circular cross-section with a minimum outside diameter of one and one-quarter inches and a maximum of two inches. Type II handrails with a perimeter between four and six and one-quarter inches are also permitted. The handrail must allow a firm grip for safety.

63. D — A point load from a beam above must be transferred directly to the foundation through a continuous vertical load path. A post or doubled studs placed directly beneath the point load provides this direct transfer. Standard studs at sixteen inches may not align with the load point and cannot carry the concentrated force.

64. B — The fascia board covers the exposed rafter tails or truss ends at the eave, providing a finished appearance for the roof edge. It also serves as the mounting surface for the gutter system. The fascia is a finish element, not a structural member — it does not support roof loads.

65. C — The chimney requires the most complex flashing because it has four sides requiring different flashing treatments: step flashing along both sides, a front apron flashing, counter flashing embedded in the mortar joints, and a cricket (saddle) on the uphill side to divert water. No other penetration requires this many components.

66. A — An R-19 batt specifically manufactured for 2×6 framing is designed to achieve its rated R-value when installed in a 5½-inch cavity. Slight compression of a batt designed for its specific cavity depth has minimal impact on the rated performance because the manufacturer accounts for this fit in the rating.

67. D — Blistering and bubbling in a built-up roof membrane during hot weather is caused by moisture trapped beneath the membrane expanding as it heats. The vapor pressure from the expanding moisture pushes the membrane upward, creating blisters. The moisture may originate from wet insulation, deck moisture, or construction moisture.

68. B — Counter flashing covers the top edge of the step flashing to prevent water from flowing behind the step flashing and into the wall. The counter flashing is embedded in the chimney mortar joints and bends down over the step flashing, creating a waterproof overlap that sheds water onto the roof surface.

69. A — Condensation on the interior face of spray foam indicates the foam is too thin to maintain the surface temperature above the dew point. When warm, humid interior air contacts a surface below the dew point, moisture condenses. Increasing the foam thickness raises the interior surface temperature above the dew point, eliminating condensation.

70. C — The IRC requires six nails per shingle in high-wind zones instead of the standard four-nail pattern. The additional nails increase the pullout resistance of each shingle, preventing wind uplift from peeling the shingles off the roof during high-wind events.

71. B — A comprehensive approach uses positive-side waterproofing (membrane on the exterior face resisting hydrostatic pressure) combined with a negative-side crystalline treatment (applied to the interior face, which migrates into the concrete and seals pores from within). This dual system provides redundant protection from both directions.

72. D — A powered attic ventilator can disrupt balanced soffit-to-ridge ventilation by creating a negative pressure that draws air from the soffit vents directly to the fan, short-circuiting the intended airflow path from eave to ridge. This can actually increase heat buildup in portions of the attic that the fan bypasses.

73. A — Commercial energy code requirements for continuous insulation depend on the specific wall assembly type (mass wall, metal frame, wood frame), the climate zone, and the applicable

commercial energy code tables. There is no single universal R-value — the requirement varies by assembly and must be determined from the applicable code tables.

74. C — The IRC requires a cricket (saddle) behind the chimney when the chimney dimension perpendicular to the roof slope exceeds thirty inches. The cricket diverts water around the chimney, preventing pooling on the uphill side that would eventually penetrate the flashing and cause leaks.

75. B — The two layers of Grade D building paper create a drainage plane and capillary break between the stucco and the wall sheathing. Stucco is a reservoir cladding that absorbs and stores moisture. The paper layers allow absorbed moisture to drain downward and prevent direct liquid water transfer to the sheathing.

76. D — The window is thirty inches wide by twenty-four inches tall, yielding 30 × 24 = 720 square inches ÷ 144 = 5.0 square feet. While this meets the 5.0 square foot ground-floor minimum, it falls short of the 5.7 square foot minimum required for upper floors. The question does not specify ground floor, so on an upper floor, the window fails.

77. A — Replacement windows must comply with the energy code in effect at the time of installation, including U-factor and SHGC requirements. Arizona's adopted energy code does not exempt replacement windows from these performance standards. This ensures the building's energy performance is maintained or improved.

78. C — A pet door installed in the fire-rated garage-to-dwelling door creates an unrated opening that compromises the fire separation between the garage and the living space. The IRC requires this door to be solid wood or steel not less than 1⅜ inches thick or a twenty-minute fire-rated assembly, and any penetration violates the rating.

79. B — Sliding glass door thresholds at exterior locations may have a maximum height consistent with ADA and IRC requirements. The IRC permits a maximum threshold height of one-half inch at exterior doors for accessibility. However, a flush threshold is generally the target for sliding doors to prevent tripping.

80. D — A window directly above a bathtub is in a hazardous location under the IRC because a person standing in the slippery tub could fall and impact the glass. Tempered or laminated safety glass is required to prevent serious laceration injuries from broken glass in these locations.

81. A — Sidelight glazing adjacent to a door is a hazardous location under the IRC. Glazing within twenty-four inches of a door and having a bottom edge less than sixty inches above the floor requires tempered or laminated safety glass. The eight-inch sill height clearly falls below the sixty-inch threshold.

82. D — A standard Level 4 drywall finish requires three coats of compound on all joints (the embedding coat plus two finish coats, each progressively wider) and two coats on all fastener heads. This provides the smooth, uniform surface required for flat paint and light-texture finishes.

83. B — Large-format tiles (any dimension exceeding fifteen inches) require a large-and-heavy-tile (LHT) or medium-bed mortar specifically formulated for larger, heavier tiles. Standard thinset does not provide adequate bond strength or coverage for large-format tiles, which require full mortar contact across the entire back surface.

84. C — Epoxy coatings require a mechanically profiled concrete surface to achieve proper adhesion. Grinding, shot-blasting, or acid etching creates a surface profile (typically ICRI CSP 2–3) with microscopic peaks and valleys that the epoxy can grip. A smooth or sealed surface prevents the epoxy from bonding.

85. A — A coped joint at inside corners produces a tighter, more durable fit than a miter joint because it accommodates the irregular intersection of the two wall surfaces. One piece is cut square and run into the corner; the mating piece is coped (cut to the profile of the molding) and fits snugly against the first piece.

86. D — Cement board is not waterproof — it is water-resistant but allows moisture to pass through. A liquid-applied or sheet waterproofing membrane must be applied over the cement board surface and joints before tiling to create the waterproof barrier that prevents moisture from reaching the wall framing behind.

87. B — Shimming behind the cabinets at the appropriate locations brings the cabinet faces plumb and level regardless of the wall condition. This is standard cabinet installation practice — walls are rarely perfectly plumb, and shims compensate for irregularities while keeping the visible cabinet faces aligned.

88. C — The horizontal score marks (grooves) in the scratch coat provide a mechanical key — a textured surface with ridges and valleys — that the brown coat bonds to. Without this scoring, the smooth scratch coat surface would not provide adequate grip for the subsequent coat, risking delamination.

89. A — Visible trowel marks in a Level 5 skim coat must be sanded smooth and a second skim coat applied to achieve the uniform, defect-free surface that Level 5 requires. The purpose of Level 5 is to eliminate all surface imperfections, so trowel marks are unacceptable and must be corrected.

90. D — Type V-A construction with a one-hour fire-resistance rating requires all structural elements — including load-bearing walls, floor assemblies, roof assemblies, and structural framing — to be protected with fire-rated assemblies. This rating protects the structural frame from collapse during the first hour of a fire.

91. B — Spoil piles must not block access to the ladders that serve as the means of egress from the excavation. While OSHA does not specify an exact distance from the ladder, the spoil must be placed far enough away that workers can safely access the ladder without climbing over or through the pile.

92. C — The IBC requires a maximum occupancy load sign to be posted in rooms with an occupant load exceeding forty-nine persons that are used for assembly, educational, or similar purposes. This sign informs the fire marshal and building occupants of the maximum safe capacity.

93. A — The IRC requires carbon monoxide detectors outside each sleeping area and on every level of the dwelling when the home has fuel-burning appliances or an attached garage. CO detectors protect sleeping occupants from the colorless, odorless gas that can accumulate from malfunctioning furnaces, water heaters, or vehicle exhaust.

94. D — OSHA requires all safety training to be delivered in a language and vocabulary that workers can understand. This applies to all required training topics including hazard recognition, PPE use, fall protection, excavation safety, hazard communication, and emergency procedures — not just selected topics.

95. B — When a fire-rated wall is penetrated by conduit, pipe, or other services, the penetration must be sealed with a listed fire-stop system that maintains the wall's fire-resistance rating. Standard caulk and spray foam are not listed fire-stop materials and cannot be used to seal rated wall penetrations.

96. C — Fire extinguishers weighing forty pounds or less must be mounted so the top of the extinguisher is not more than five feet (sixty inches) above the floor. Extinguishers weighing more than forty pounds must have the top not more than three and one-half feet above the floor. These heights ensure accessibility.

97. A — The IRC requires pool door alarms to sound within seven seconds of the door being opened and to be audible throughout the dwelling. The alarm provides notification to adults inside the home when a child opens a door leading to the pool area, allowing immediate response to prevent drowning.

98. D — The exit stairway enclosure has the most stringent fire-resistance rating because it protects the vertical exit path that occupants use to travel between floors during evacuation. Stairway enclosures serving four or more stories require a two-hour rating, while corridors typically require one hour or less.

99. B — A fire wall must have its own independent structural support so that collapse of the building on either side does not cause the wall to collapse. This structural independence ensures the fire wall continues to function as a fire barrier even after significant structural damage occurs on one side.

100. C — The IBC limits the maximum travel distance from any occupied point to the nearest exit to two hundred feet for non-sprinklered Group B (Business) occupancies. Sprinklered buildings receive a twenty-five percent increase to two hundred fifty feet. This distance ensures occupants can reach an exit before conditions become untenable.