

# SIMULATION SET 2

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## Core Exam Simulation 2 – 95 Questions

### SITE DOMAIN — Questions 1–21

1. A mobile crane is being positioned on a site where the only available access route to the setup area crosses a recently installed storm drain culvert at 18 inches of depth. The culvert is 24 inches in diameter and rated for highway vehicle loading. What must be evaluated before the crane travels over this culvert?

- A. Whether the culvert material is corrugated metal or reinforced concrete
- B. Whether the culvert was installed with proper bedding material beneath it
- C. Whether the crane's hydraulic system can support any impact loading on the culvert
- D. Whether the culvert's structural capacity under the crane's axle loads has been evaluated by a qualified engineer or the manufacturer

2. An operator is setting up a telescopic boom crane for a lift near a building wall. The planned lift requires the counterweight to swing to within 2 feet of the wall during 360-degree rotation. Which action is required before operations begin?

- A. The lift must be cancelled and repositioned to eliminate all tail swing conflicts
- B. The swing arc must be restricted and barricaded so the counterweights cannot contact the wall, or the crane must be repositioned to maintain adequate clearance
- C. The operator may proceed since the counterweight will not contact the wall as long as rotation speed is kept below 0.5 rpm
- D. A spotter must be positioned at the wall to provide audible warning if the counterweight approaches within 1 foot

3. What is the primary engineering reason that load chart stability-based capacity ratings for cranes on outriggers are set at 75% of the theoretical tipping load rather than 100%?

- A. The 25% stability margin accounts for dynamic loading effects, ground condition variability, and operational uncertainties that are not captured in the static tipping calculation
- B. OSHA requires a 25% margin below tipping load for all crane types operating on construction sites
- C. The 75% threshold was established arbitrarily by the crane manufacturing industry as a conservative estimate
- D. The 25% margin is required only for telescopic boom cranes; lattice boom cranes use an 85% margin

4. A crane operator is directed to set up the crane on a compacted gravel parking lot at a commercial construction project. Before setup, the operator asks for documentation of the parking lot's bearing capacity. The general contractor responds that "it's gravel — it should be fine." What is the correct response?

- A. Accept the general contractor's assessment and proceed with setup since compacted gravel typically supports crane operations
- B. Reduce the planned lift to 80% of rated capacity as a precaution when documented bearing capacity is unavailable
- C. Require documented bearing capacity data or have a qualified person evaluate the ground conditions before positioning the crane for setup
- D. Set up the crane and perform a test lift at 50% of rated capacity to verify ground stability before the full lift

5. The OSHA regulation that requires crane operators working in construction to be certified by an accredited organization is found in which specific section of 29 CFR 1926?

- A. 1926.1402
- B. 1926.1412
- C. 1926.1416
- D. 1926.1427

6. A telescopic boom crane is being set up on a site where the four outrigger positions have significantly different ground conditions: two positions on compacted fill and two positions on undisturbed native soil. What determines the minimum cribbing requirement for this setup?

- A. The average bearing capacity of all four positions, calculated as a single site-wide value
- B. Each outrigger position must be evaluated individually using its own local bearing capacity and the specific outrigger reaction load at that position
- C. The weakest position determines the cribbing requirement for all four positions equally
- D. Only the two positions on compacted fill require cribbing assessment since native soil is presumed adequate

7. A construction site manager tells the crane operator that a utility line running directly beneath one planned outrigger position is a decommissioned natural gas line that was purged and abandoned in place three years ago. What is the correct assessment of this information for crane setup purposes?

- A. A decommissioned gas line presents no hazard and the outrigger may be placed directly over it
- B. Decommissioned utilities are the responsibility of the utility company and not a crane setup concern
- C. Even a decommissioned utility creates a subsurface void or weakened zone in the soil, and the operator should either avoid that location or verify the line's structural condition and depth before placing an outrigger load over it
- D. The three-year abandonment period is sufficient to consider the utility fully integrated into the surrounding soil

8. Under ASME B30.5, what is the minimum required response when a crane operator identifies a condition during pre-shift inspection that meets the standard's removal-from-service criteria?

- A. The crane must be taken out of service immediately and the deficiency corrected before any lifting operations begin
- B. The operator may complete the current work shift and report the deficiency for repair at the next scheduled maintenance interval
- C. The operator must obtain approval from the lift director before removing the crane from service for a non-critical deficiency
- D. The operator must document the deficiency on the inspection log and proceed with operations at reduced capacity

9. During a site walk before crane setup, an operator notices freshly installed orange utility locate markings within the planned outrigger spread area. The markings are orange, indicating communications/cable TV lines. The operator observes that the nearest marking is 14 inches from the planned outrigger position. What action is required?

- A. Orange utility markings are low-risk and do not require any special consideration for crane outrigger placement
- B. Communications lines are shallow and flexible; they do not affect crane setup planning
- C. The operator should notify the general contractor but may proceed with setup since communications lines are not structural hazards
- D. The 14-inch distance falls within the standard tolerance zone for utility locate markings, and the outrigger position must be moved or the utility location verified precisely before setup proceeds

10. A telescopic boom crane is positioned for a lift with its centerline of rotation 12 feet from the edge of an active highway. The crane will rotate over the highway during the lift. What OSHA requirement is triggered by this configuration?

- A. The crane operator must obtain a separate OSHA permit for operations within 25 feet of public roads
- B. The highway must be closed to traffic during crane operations, or a flagging and traffic control plan must be established to protect both the crane and road users
- C. The crane must operate at 50% of rated capacity when the boom is positioned over the roadway
- D. The crane's minimum approach distance from the highway edge must be recalculated based on vehicle height

11. When assessing a job site for a pick-and-carry crane operation, which of the following travel path conditions represents the most significant risk of load drop or crane instability?

- A. A travel path that crosses a painted lane marking on a paved surface
- B. A travel path that runs parallel to a chain-link fence at 5 feet of clearance
- C. A travel path that crosses a transverse slope of 8 degrees on unpaved ground
- D. A travel path that requires a 90-degree turn at the set location

12. Under OSHA 1926.1402, which of the following is a specific obligation of the controlling entity before crane operations begin on a project?

- A. Providing the crane operator and crane owner with information about known underground utilities and other site hazards that could affect crane operations
- B. Certifying that all crane operators working on the project hold valid NCCCO credentials
- C. Funding the installation of engineered crane pads at all planned setup locations
- D. Conducting a joint site inspection with the crane operator at least 24 hours before the first lift

13. A crane is set up with all four outriggers fully deployed and tires clear of the ground on what appears to be stable, dry ground. During a heavy lift at 90% of rated capacity, the crane begins to list — the high side outrigger has sunk 3 inches and the crane is visibly out of level. What must the operator do?

- A. Apply the swing brake to prevent further rotation and slowly boom down to reduce the load moment
- B. Immediately stop all crane movement and lower the load to the ground as quickly as can be safely accomplished
- C. Sound the horn to alert ground personnel and continue the lift to the set point to clear the ground area
- D. Swing the load toward the low side of the crane to redistribute the weight and re-level the machine

14. What color utility locate marking indicates the presence of electric power lines or cables underground?

- A. Orange, indicating communications infrastructure including fiber optic
- B. Red, indicating electric power lines, cables, conduit, and lighting cables
- C. Yellow, indicating gas and petroleum product pipelines
- D. Blue, indicating potable water distribution lines

15. When a crane is performing a lift that requires the load to travel over an area where personnel are working below, what does OSHA 1926.1425 require?

- A. The lift may proceed if the load is at least 20 feet above the workers' head height

- B. Workers in the area must wear hard hats and be positioned at the perimeter of the work area
- C. Personnel must not be in the area below or in the path of the suspended load — the area must be cleared before the load passes over it
- D. A signal person must be stationed directly below the load path to warn workers of the load's passage

16. A mobile crane arrives at a job site and the operator discovers that the load chart previously stored in the cab has been removed by the previous operator for safekeeping. A copy of the load chart is available in the project superintendent's trailer. What is the correct course of action?

- A. Retrieve the original load chart from wherever it is stored and install it in the cab before any lifting operations begin — the chart must be in the cab during operations
- B. Proceed with operations using the superintendent's copy as a reference and retrieve the original later
- C. Perform the planned lifts from memory if the operator has worked with this crane before and is familiar with its capacities
- D. Operate the crane at 75% of the operator's best estimate of rated capacity until the original chart is returned

17. Under OSHA 29 CFR 1926.1411, what specific power line safety requirement applies when a crane is traveling under power lines?

- A. The crane must have a spotter walking ahead of it whenever the boom height could come within 50 feet of a power line
- B. The crane operator must obtain written clearance from the utility before traveling under any power line
- C. All power lines along the travel route must be de-energized before the crane is permitted to travel beneath them
- D. The crane must maintain the applicable minimum safe approach distance from all power lines during travel, and if the distance cannot be maintained, the line must be de-energized or the route must be changed

18. An operator is evaluating a job site for crane setup and notes that a basement wall runs 8 feet below grade along the east edge of the planned setup area. One outrigger would be positioned 4 feet from the surface directly above this wall. What is the specific concern with this configuration?

- A. The crane's magnetic components may interfere with the basement wall's reinforcing steel
- B. The outrigger load may transfer through the soil onto the basement wall, which could redirect load concentrations onto the wall in ways it was not designed to carry
- C. The basement space reduces the soil depth available for bearing capacity development
- D. Basement walls are considered reinforced structures and actually increase bearing capacity in adjacent soil

19. When establishing an exclusion zone for crane operations, which of the following elements must be included in the zone boundary according to OSHA 1926.1424?

- A. Only the area directly beneath the suspended load at pick and at set positions
- B. A fixed 15-foot buffer zone around the crane's carrier footprint in all directions
- C. The full arc swept by both the boom and the counterweight tail swing during all planned crane movements throughout the operation
- D. The area extending 10 feet beyond the maximum operating radius of the crane at the planned configuration

20. A crane operator completes a lift and prepares to travel to a new setup position on the same job site. Before traveling, what must the operator do with the load?

- A. Lower all loads to the ground, disconnect the rigging, and secure the hook block before traveling unless the crane is rated and configured for pick-and-carry travel
- B. Raise the load to maximum height to clear all ground-level obstacles along the travel path
- C. Travel with the load if the distance to the new setup position is less than 100 feet
- D. Confirm with the signal person that the travel path is clear, then travel at reduced speed with the load at working height

21. Which of the following soil types has the most unpredictable and generally lowest load-bearing capacity for crane outrigger support?

- A. Dense, well-graded gravel with low moisture content at the surface
- B. Undisturbed stiff clay at least 10 feet below its natural surface
- C. Compacted crushed stone base course installed according to standard specifications
- D. Recently placed, uncompacted fill of mixed composition and unknown origin

**OPERATIONS DOMAIN — Questions 22–48**

22. An operator is hoisting a load and the LMI alarm sounds at 90% of rated capacity. The operator did not expect the alarm at this load weight. What is the most important immediate action?

- A. Disable the LMI alarm to prevent distraction and continue the lift
- B. Stop the hoist function and verify the actual load weight, rigging weight, and operating radius against the written load chart to determine whether the 90% reading is accurate
- C. Lower the load at full speed to reduce the risk of exceeding 100% capacity
- D. Swing the load toward a shorter radius to bring the capacity percentage back below the alarm threshold

23. A crane operator observes that during a swing to the right, the load swings outward — away from the boom — rather than following the hook directly beneath the boom tip. This load swing increases the effective operating radius beyond the planned value. What is the term for this phenomenon and what risk does it create?

- A. This is called "load pendulum" and the risk is that the hook block may contact the boom structure
- B. This is called "boom deflection" and the risk is that the boom will contact the load during the swing
- C. This is called "centrifugal load displacement" and the risk is that the increased effective radius may push the actual load moment beyond the crane's rated capacity at the planned radius
- D. This is called "load line deflection" and the risk is that the load line will become slack during the swing

24. When a signal person gives the RAISE BOOM AND LOWER LOAD signal simultaneously, what two functions must the operator perform at the same time?

- A. Raise the boom angle while simultaneously lowering the hook on the hoist drum
- B. Raise the main hoist while lowering the auxiliary hoist simultaneously
- C. Raise the boom angle and lower the jib angle simultaneously
- D. Raise the boom angle while extending the telescopic sections simultaneously

25. Under OSHA 1926.1427, if a crane operator's certification expires during a project and the operator cannot immediately recertify, what is the employer's obligation?

- A. The employer may allow the operator to continue working for up to 90 days on a conditional status
- B. The employer may apply for a temporary certification waiver from OSHA for up to 30 days
- C. The operator must stop performing crane operations that require certification until a valid recertification is obtained
- D. The employer must document the lapsed certification and reduce the operator's duties to lifts under 50% of rated capacity

26. A signal person is positioned and ready to direct a critical lift. The signal person is simultaneously wearing a radio headset to communicate with the tower foreman about material placement at the top of the structure. What is the problem with this arrangement?

- A. Using a radio headset is prohibited on construction sites under OSHA fall protection standards
- B. There is no problem — experienced signal persons regularly perform multiple communication tasks simultaneously
- C. The signal person's attention is divided between crane signal communication and radio communication with the tower foreman, and the two roles cannot be safely combined — the signal person must have undivided attention on crane direction
- D. The signal person must obtain the lift director's permission before using a radio headset during a lift

27. What does the term "operating radius" specifically measure on a mobile crane, and from which reference point is it measured?

- A. The total length of the boom from foot pin to tip sheave, measured along the boom centerline
- B. The horizontal distance from the crane's centerline of rotation to the center of the suspended load
- C. The diagonal distance from the boom tip sheave to the center of the suspended load
- D. The horizontal distance from the outer edge of the nearest outrigger pad to the center of the suspended load

28. An operator is directed to perform a lift at 95% of the crane's rated capacity. The pre-lift meeting has been conducted and a written critical lift plan is in place. During the lift, the LMI shows 98% capacity as the load is being hoisted. The operator did not change any configuration and the load weight was confirmed. What is the most likely explanation and correct response?

- A. The increasing percentage as the load rises indicates that the operating radius is increasing due to boom deflection under load, which reduces the rated capacity at the actual radius — the operator should stop hoisting and evaluate
- B. LMI readings naturally increase during hoisting due to hydraulic system load factor and the 98% reading can be ignored if the written load chart confirmed the lift at 95%
- C. The LMI increase is caused by the hook block gaining potential energy during the hoist and represents a temporary condition that resolves when hoisting stops
- D. The 3% increase from planned to actual is within the LMI's stated accuracy tolerance and no action is required

29. Under ASME B30.5, when two different crane functions are operated simultaneously — such as hoisting while swinging — what general principle must govern the combined operation?

- A. Simultaneous operation of two functions is prohibited unless the crane is equipped with a rated capacity indicator system
- B. The operator must reduce the planned lift load by 25% before any simultaneous function operation
- C. Only functions sharing the same hydraulic circuit may be operated simultaneously on a modern crane
- D. The combined loading from simultaneous functions must not exceed the crane's rated capacity, and the operator must ensure that neither function individually nor the combination creates an overload condition

30. During a crane lift, a worker on the ground approaches the load and attempts to steady it by hand while it is at 8 feet above the ground. The load is a 4,000-pound steel beam. What is the correct response from the operator?

- A. Slow the hoist speed to allow the worker to gain control of the beam safely
- B. Allow the worker to steady the beam if they are wearing appropriate personal protective equipment
- C. Stop all crane movement immediately and direct the worker to clear the area beneath and adjacent to the suspended load before any movement resumes
- D. Lower the load back to the ground slowly while the worker steadies it from the side

31. A crane is performing a long-radius lift at 85% of its rated capacity. Midway through the swing, the operator notices an unusual sound — a metallic creaking from the direction of the boom base. What is the correct immediate action?

- A. Complete the swing quickly to set the load before the condition worsens
- B. Stop all crane movement immediately, lower the load to the nearest safe surface using the hoist, and evacuate the area pending a qualified inspection
- C. Reduce swing speed and proceed to the set location while monitoring the sound
- D. Sound the emergency horn and continue to the set point since the load is nearly there

32. Which of the following describes the correct response when a crane's hoist brake allows a suspended load to drift downward slowly when the hoist controls are in neutral?

- A. The crane must be removed from service immediately — hoist brake creep or drift indicates a brake deficiency requiring repair before the crane returns to service
- B. A slow drift rate is considered acceptable when the load is less than 50% of rated capacity
- C. The operator may compensate for the drift by periodically activating the hoist to maintain position
- D. Brake drift is acceptable if the load can be held in position by engaging the drum pawl

33. An operator is asked to hoist a load using a single-part line with a headache ball rather than the multi-part main hook block. The load weighs 3,200 pounds. The single-line pull capacity of the wire rope is 6,000 pounds and the headache ball weighs 80 pounds. What must the operator verify before proceeding with this reeving configuration?

- A. That the boom angle is at least 60 degrees from horizontal before using a single-part line
- B. That the load line is rotation-resistant rope before any single-part line application
- C. That the signal person is positioned on the opposite side of the load from the operator's cab
- D. That the 3,200-pound load plus the 80-pound headache ball does not exceed the single-line pull capacity and that the load chart confirms the capacity at the operating radius for the single-part line configuration

34. What is the standard signal for USE WHIP LINE (auxiliary hoist) under ASME B30.5?

- A. Tap both fists together above the head twice before giving the hoist signal
- B. Wave both arms horizontally at shoulder height before giving the hoist signal
- C. Hold the elbow at the side with the forearm vertical and index finger pointing up, making a small circle, before giving the hoist signal
- D. Cross both arms at the wrist in front of the chest before giving the hoist signal

35. An operator completing a lift cycle places the hook block at rest with all rigging disconnected at the end of the shift. Before securing the crane, what height should the hook block be positioned at?

- A. At maximum height — fully retracted against the boom tip — to prevent unauthorized access to the rigging
- B. At a safe working height — high enough to prevent unauthorized attachment but low enough to be clearly visible and to reduce wind moment on the boom
- C. At ground level with the load line fully paid out to minimize drum tension overnight
- D. At the mid-point of available travel as specified in the operator's manual for overnight storage

36. What action is required under OSHA 1926.1416 when an operator observes a crack in a structural member of the crane boom while performing pre-shift inspection?

- A. The crane must be taken out of service immediately — any crack in a structural member is a removal-from-service condition and operations must not begin until the deficiency is corrected

- B. Operations may continue at reduced capacity while the crack is monitored at hourly inspection intervals
- C. The operator must document the crack and notify the lift director, who determines whether operations may proceed
- D. The crack must be welded by a certified welder before the shift begins, then the crane may return to service

37. A crane operator is working in an area where radio communication between the cab and the signal person is the established communication method for the lift. Midway through a pick operation, the radio connection fails completely. What must happen?

- A. The operator continues the pick at minimum speed while the signal person attempts to restore radio contact
- B. The signal person switches to voice shouting to give commands until the radio is restored
- C. The lift director may authorize the operator to complete the current pick movement before stopping
- D. All crane movement must stop immediately — the lift does not resume until radio communication is restored and tested or an alternative communication method is established and confirmed

38. Under OSHA 1926.1431, which of the following is explicitly prohibited during personnel hoisting operations?

- A. Using a two-leg wire rope bridle to attach the personnel platform to the crane hook
- B. Having more than two occupants in the personnel platform simultaneously
- C. Using the crane's main hoist when a whip line is available on the same crane
- D. Free-fall or uncontrolled lowering of the personnel platform under any circumstance

39. An operator is told by the lift director to pick a load whose weight is estimated at approximately 40,000 pounds. The operator asks for documented weight confirmation and is told the estimate is "close enough." What should the operator do?

- A. Accept the estimate since the lift director bears responsibility for accurate load weight information

B. Refuse to perform the lift until the load weight is verified through documentation, calculation, or crane scale — lifting an unknown weight means the operator has no margin reference against rated capacity

C. Perform the lift at the estimated weight but limit the operating radius to ensure at least 25% capacity margin

D. Check the LMI reading after the load breaks ground and stop the lift if the reading exceeds 80%

40. What is the correct technique for approaching a final load set position when the load has been traveling by swing and must be positioned precisely on a landing target?

A. Increase swing speed approaching the target to build momentum for the final positioning

B. Use the swing brake to snap the load to the stop position quickly and precisely

C. Allow the load to coast to the target under its natural momentum with no active braking

D. Decelerate the swing gradually well before the target position, allowing the load to arrive with minimal residual swing, then use fine hoist adjustments for final vertical placement

41. Under OSHA 1926.1408(b)(4), what are the specific qualifications required for a person serving as the dedicated power line spotter?

A. The dedicated spotter must hold a signal person certification from an accredited organization

B. The dedicated spotter must have at least three years of construction experience and be familiar with power line hazards

C. The dedicated spotter must be approved in writing by the controlling entity before being assigned to the role

D. The dedicated spotter must be positioned where they can continuously see the part of the crane or load closest to the power line and must have a means to immediately stop all crane movement

42. A crane's anti-two-block system activates and stops the hoist function during a routine lift. The hook block is well below the boom tip and there is no visual indication that two-blocking was imminent. What is the most likely cause and required action?

- A. The LMI system has overridden the hoist function due to a capacity alarm — reset the LMI and continue
- B. The operator accidentally activated the hoist limit switch — release the limit switch and continue hoisting
- C. The ATB weight or switch may be damaged, misadjusted, or fouled, causing a false activation — the ATB system must be inspected and repaired before continuing operations
- D. The ATB system is performing correctly by interrupting the hoist at the maximum rated hoist height — lower the boom slightly to create more rope travel

43. Which statement correctly describes the relationship between lift height and the pendulum behavior of a suspended load?

- A. Higher lifts create a shorter effective pendulum length, making load swing faster and more difficult to control
- B. Higher lifts create a longer effective pendulum length, resulting in slower, longer-period oscillation that is harder to stop quickly
- C. Load pendulum behavior is independent of lift height and is controlled only by swing speed
- D. The pendulum effect is eliminated when the load is lifted above the level of the crane's boom tip sheave

44. Under OSHA 1926.1416, which of the following is a prohibited crane operation regardless of load weight or configuration?

- A. Operating the crane with the hook block raised to within 10 feet of the boom tip
- B. Performing a lift with only three of the four outriggers deployed when the fourth cannot contact the ground
- C. Traveling the crane on rubber tires with the boom extended more than 40 feet
- D. Using the crane's load line to support a personnel platform unless it meets all requirements of OSHA 1926.1431

45. During a multi-crane tandem lift, one crane's LMI shows that its share of the load has increased to 110% of its rated capacity due to an unexpected shift in the load's center of gravity during the pick. What must immediately occur?

- A. The crane operator with the overloaded machine should release their crane's hoist to shift load to the other crane
- B. The lift director should instruct both cranes to increase their boom angles simultaneously to reduce the load moment
- C. Both cranes should hold position while the lift director directs a controlled, coordinated lowering of the load back to the ground
- D. The crane at 110% should continue the lift while the other crane booms up to transfer load and reduce the overload condition

46. What must the operator verify about the crane's counterweight configuration before using any section of the load chart?

- A. That the counterweight plates are clean and free of corrosion that might affect their weight
- B. That the counterweight installation was performed by a qualified rigger and documented in the inspection log
- C. That the counterweight actually installed on the crane matches the configuration specified in the chart section header being used
- D. That the counterweight securing bolts have been torqued to the manufacturer's specification within the past 30 days

47. A crane operator has been working for 10 consecutive hours and notices that their reaction time and focus have decreased. Under OSHA's general duty clause, what obligation does this create?

- A. Operators may work up to 12 consecutive hours before a mandatory rest break is required under federal OSHA construction standards
- B. The operator should notify the lift director that they are fatigued and stop operating the crane until they are able to perform their duties safely — operator alertness is a fundamental safety requirement
- C. The operator may continue working if the remaining lifts for the shift are below 75% of rated capacity
- D. Fatigue is a personal medical issue and is not a recognized safety concern under OSHA crane standards

48. Which of the following best describes the correct procedure for testing a crane's swing brake before beginning load handling operations?

- A. Apply the swing brake at maximum speed to verify it can stop the upper works quickly in an emergency
- B. With the load attached to the hook, swing the upper works and then apply the swing brake to confirm it holds position
- C. Test the swing brake before loading by slowly accelerating the upper works, applying the brake, and confirming the brake holds the upper works stationary before the load is attached
- D. Swing brake testing is only required during monthly and annual inspections and is not a pre-shift requirement

**TECHNICAL KNOWLEDGE DOMAIN — Questions 49–70**

49. Under ASME B30.9, what is the minimum design factor required for a wire rope sling used in general rigging applications?

- A. 3.5 to 1
- B. 4 to 1
- C. 4.5 to 1
- D. 5 to 1

50. An outrigger jack cylinder rod is found to have deep scoring marks running longitudinally along the rod surface. The rod seal is currently showing minor weeping of hydraulic fluid. What is the significance of the scoring and what action is required?

- A. Surface scoring on hydraulic cylinder rods is cosmetic only and does not affect cylinder performance
- B. A minor seep on a scored rod may be accepted provided the fluid loss rate is less than one drop per minute
- C. The scoring on the rod will accelerate seal failure and the cylinder will lose its holding capacity progressively — the crane should be removed from service and the cylinder repaired or replaced

D. The rod may be polished with fine sandpaper and resealed in the field without taking the crane out of service

51. What is the maximum throat opening increase permitted under ASME B30.10 before a hook must be removed from service?

- A. 10% above the nominal throat opening
- B. 15% above the nominal throat opening
- C. 20% above the nominal throat opening
- D. 25% above the nominal throat opening

52. A rigging hardware shackle is stamped "WLL 4.75T." What does this marking indicate?

- A. The shackle has a working load limit of 4.75 short tons (9,500 pounds) in a straight-line pull configuration
- B. The shackle was manufactured to 4.75 times the breaking strength of standard hardware chain
- C. The shackle has a catalog breaking force of 4.75 tons and must be used with a minimum 5:1 safety factor
- D. The shackle was tested to 4.75 times proof load during the quality assurance process

53. The NCCCO Mobile Crane Operator certification program requires the practical examination to be completed within what time period relative to passing the written examination?

- A. 6 months from the date the written exam was passed
- B. 90 days from the date the written exam results were received
- C. 24 months from the original application date
- D. 12 months from the date the first exam component (written or practical) was passed

54. Under OSHA 1926.1413, a wire rope must be removed from service if it shows which of the following conditions?

- A. Surface oxidation that has changed the wire color from bright silver to brown
- B. A bend radius of less than 20 times the rope diameter around a sheave
- C. Evidence of heat damage, including discoloration, fused wires, or loss of lubrication due to heat exposure
- D. Strand lay length that has changed by more than 15% from the original manufacturer specification

55. A rigger is preparing to use a nylon web sling for a pick. The ambient temperature on the job site is 190°F due to proximity to a furnace operation. The nylon sling is rated at 8,000 pounds at room temperature. What must the rigger do?

- A. Inspect the sling for visible heat damage before each use but proceed at full rated capacity
- B. Nylon web slings are rated to 250°F and the full rated capacity may be used at 190°F without adjustment
- C. Replace the nylon sling with a Grade 80 chain sling, which is rated for temperatures up to 400°F without derating, making it appropriate for this application
- D. Reduce the nylon sling capacity by 50% to account for the elevated temperature

56. What is the specific function of the drum pawl (drum dog) on a crane hoist drum?

- A. To engage the drum and serve as a backup mechanical locking device that prevents the drum from rotating and the load from descending when engaged
- B. To limit the maximum speed at which the drum can rotate during lowering operations
- C. To provide automatic tensioning of the wire rope on the drum to prevent loose spooling
- D. To disengage the drum from the hoist motor when the operator releases the hoist control

57. A mobile crane is operating at a job site where temperatures have dropped to 10°F overnight. The operator arrives in the morning and prepares the crane for the first lift. What cold-weather operational concern requires attention before placing any load?

- A. Cold temperatures reduce tire pressure uniformly and require all tires to be inflated to the manufacturer's cold-weather specification before setup

- B. Cold-weather operations have no specific start-up requirements beyond standard pre-shift inspection
- C. The operator must de-ice all boom sections before raising the boom to any working angle
- D. The hydraulic system requires a warm-up period at reduced load before full-capacity operations — cold hydraulic fluid has increased viscosity that reduces pump efficiency and increases the risk of cavitation damage

58. When inspecting a Grade 80 alloy steel chain sling, an individual link is found to have stretched so that its measured length is 3.5% greater than the manufacturer's nominal link length. What action is required under ASME B30.9?

- A. The sling may remain in service since 3.5% elongation is within the acceptable stretch range for Grade 80 chain
- B. The link must be replaced but the rest of the sling chain may remain in service
- C. The sling must be removed from service — ASME B30.9 requires removal when any link shows elongation exceeding 3% of the nominal link length
- D. The sling capacity must be reduced by the percentage of elongation before it may return to service

59. A crane's telescopic boom has a small crack discovered on the outer surface of the boom base section near the boom foot pin bore during pre-shift inspection. What is the correct action?

- A. Apply a structural epoxy crack repair and monitor the crack during subsequent inspections
- B. The crack must be evaluated by a qualified engineer or the manufacturer before the crane is returned to service — any crack in a structural member is a removal-from-service condition
- C. Reduce the crane's rated capacity by 20% and document the crack in the maintenance log for future reference
- D. Fill the crack with a weld bead and continue operations after the weld cools

60. Under OSHA 1926.1428, how must a signal person demonstrate their qualification to direct crane movements?

- A. By presenting an NCCCO Signal Person certification card to the crane operator before beginning work

B. The qualification may be established if the signal person works for the same employer as the crane operator

C. Signal person qualification may also be satisfied by a documented evaluation from a qualified evaluator confirming the person has the required knowledge and skills — third-party certification is one of two acceptable qualification methods

D. By completing a minimum four-hour signal person training course at an accredited crane training facility

61. What does the term "gross capacity" mean on a crane load chart, and how does it differ from what the crane can actually pick up as a useful load?

A. Gross capacity is the total weight the crane can lift including the boom, counterweights, and all attached equipment

B. Gross capacity is the rated working load minus a 10% safety margin applied by the manufacturer

C. Gross capacity is the crane's rated limit before applying any OSHA required derating factors for age or condition

D. Gross capacity is the total rated load the crane can suspend from the hook point — it includes the hook block, all rigging, and the actual load, so the payload is gross capacity minus all rigging weights

62. An operator is checking a recently replaced wire rope and finds that the wedge socket at the dead end does not have the dead end of the rope secured with a wire rope clip. What is the risk and required action?

A. The missing clip reduces the wedge socket's efficiency rating by 5% — install the clip and continue operations

B. The dead end of the rope is not load-bearing, so a missing clip has no effect on the connection's strength

C. Without a clip securing the dead end, the rope can be pulled through the wedge socket under a load spike or shock load event — the clip must be installed before any load is applied to the connection

D. The wedge socket provides full rope capacity without a clip — the clip is only required for visual inspection access

63. Which of the following is a correct statement about synthetic round slings (roundslings)?

- A. Round slings may be used on loads with sharp edges because the round cross-section distributes cutting force evenly across the sling circumference
- B. The outer cover of a round sling is the primary load-bearing element — if the cover is torn, the sling must be removed from service
- C. The rated capacity of round slings cannot be determined from visual inspection alone because the load-bearing fibers are concealed within the protective cover
- D. Round slings are rated by their outer cover diameter, with larger diameters indicating higher capacity in all hitch configurations

64. Under ASME B30.5, how frequently must the oil level in the swing drive gearbox be checked as part of the crane's routine maintenance?

- A. At each pre-shift inspection as part of the operator's walk-around fluid level verification
- B. Only during monthly periodic inspections by a qualified maintenance technician
- C. Only during annual comprehensive inspections when the gearbox is disassembled
- D. The frequency is determined by the manufacturer's maintenance schedule specific to each crane model

65. A crane's load line is found to have a kink approximately 15 feet from the hook block during pre-shift inspection. The kink is a permanent deformation visible to the naked eye. What action is required?

- A. The kinked section may be cut out and the rope re-terminated if the remaining length is sufficient for the planned lift
- B. The kink must be evaluated by a qualified inspector before deciding on removal
- C. The rope may remain in service if the kinked section is positioned so it does not contact any sheave during the planned lift
- D. The rope must be removed from service immediately — any kink is an automatic removal-from-service condition with no exceptions

66. Under OSHA 1926.1430, who bears responsibility for ensuring that crane-related training is provided to employees who work in the area where crane operations are performed?

- A. The crane operator, who must brief ground workers at the start of each shift
- B. NCCCO, through its certification programs and published study materials
- C. The employer, who is responsible for providing required training to all affected employees before they are exposed to crane-related hazards
- D. The controlling entity, who must coordinate all site safety training across all subcontractors

67. An operator performing a pre-operational inspection discovers that the hydraulic fluid in the reservoir appears milky white rather than its normal amber color. What does this indicate and what action is required?

- A. The fluid has been exposed to high temperatures and has oxidized — drain and refill with fresh fluid
- B. The milky appearance indicates water contamination of the hydraulic fluid — the crane must be taken out of service and the hydraulic system inspected and flushed before returning to service
- C. The milky color is normal when the fluid is cold and will clear as the system warms up during operations
- D. The fluid has reached the end of its service interval — change the fluid and filter, then return the crane to service

68. Which of the following correctly describes the inspection requirements for a swaged wire rope end fitting?

- A. Swaged fittings must be replaced at the same interval as the wire rope regardless of visible condition
- B. Swaged fittings require a proof load test at 125% of the rope's rated capacity before each lift
- C. Swaged fittings are permanent and do not require inspection since they cannot be disassembled
- D. Swaged fittings must be inspected for cracking of the socket body, corrosion at the rope entry point, and any evidence of rope movement within the fitting

69. A rigging crew is preparing to use a below-the-hook spreader beam for a complex structural steel pick. The spreader beam has no visible capacity marking and the paperwork cannot be located on site. What action is required?

- A. Use the spreader beam at 50% of the visually estimated capacity until the documentation is located
- B. Contact the manufacturer for the beam's capacity information and proceed with the lift using the verbal capacity confirmation
- C. The spreader beam must not be used — any below-the-hook lifting device without a legible capacity marking must be removed from service until it can be properly verified and marked
- D. Perform a visual engineering estimate of the beam's structural capacity based on its cross-section dimensions

70. Under OSHA 1926.1427, what happens to a crane operator's NCCCO certification when they move from one employer to another during a project?

- A. The certification must be re-evaluated by the new employer before the operator may work on their site
- B. The certification is site-specific and expires when the operator leaves the project
- C. The certification is portable among employers — a valid NCCCO certification issued under Option 1 of OSHA 1926.1427 is recognized by all employers in construction without re-examination
- D. The operator must reapply to NCCCO within 30 days of changing employers to maintain certification validity

### **LOAD CHARTS DOMAIN — Questions 71–95**

71. A crane's load chart shows capacity values in the 80-foot boom column: 34,200 lbs at 25 feet and 26,800 lbs at 30 feet. The actual operating radius is 27 feet. Using linear interpolation, what is the estimated capacity at 27 feet?

- A. 31,640 lbs
- B. 31,536 lbs
- C. 29,200 lbs
- D. 30,500 lbs

72. The net capacity calculation requires deducting which of the following items from the gross capacity shown in the load chart?

- A. The weight of the hook block, all slings, all hardware, spreader beams, and any other component between the crane's load point and the actual load being lifted
- B. Only the weight of the hook block and the primary sling set
- C. Only components that weigh more than 500 pounds individually
- D. The weight of all rigging components plus 10% of the load weight as a dynamic loading allowance

73. A crane is set up with a 60-foot boom. The load chart shows a maximum rated radius of 45 feet for this boom length. The operator is told the pick radius will be 44 feet and the set radius will be 47 feet. What must happen before this lift proceeds?

- A. The pick is within the maximum rated radius, so the lift may proceed to 44 feet and the load set from there
- B. The lift may proceed at reduced speed to 47 feet since it is only 2 feet beyond the rated maximum
- C. Both the pick and the set radii must be within the crane's rated radius — the 47-foot set radius exceeds the 45-foot maximum and the crane must be repositioned or a different configuration used
- D. The operator may interpolate a capacity value for 47 feet using the 45-foot rated capacity as the reference

74. A manufacturer's load chart for a telescopic boom crane includes a "NOTE 4" that states: "Capacities marked with (4) are based on 360-degree rotation and are limited by structural strength — side loading is prohibited in cells marked (4)." The operator plans to perform a side-pull lift using the crane while a specific cell marked (4) is the governing capacity. What is the correct assessment?

- A. Side loading is only prohibited during pick-and-carry operations, not during stationary lifts
- B. The note is informational and the operator may perform side pulls at reduced capacity
- C. The operator must contact the manufacturer for a field authorization before any side pull with a (4) cell capacity
- D. Side loading is prohibited at any cell marked (4) — the note is a binding load chart condition that prohibits side-loading at that capacity regardless of how small the side load appears

75. A crane operator is entering a load chart. The planned boom length is 100 feet. The operator notices that the load chart shows columns for 90 feet, 110 feet, and 130 feet but not for 100 feet. What is the correct action?

- A. Interpolate between the 90-foot and 110-foot columns to determine the capacity at 100 feet
- B. Use the 90-foot boom configuration since it is the next shorter rated length and will produce a more conservative capacity value at the same radius
- C. A 100-foot boom configuration that is not shown in the load chart means that length is not a rated configuration — the operator must build the boom to either the 90-foot or 110-foot configuration
- D. The operator may use the 110-foot column as a conservative approximation for the 100-foot boom

76. The load chart table for a 100-foot boom shows the following capacity values with the designation "(S)" next to them: 28,400 lbs at 35 feet and 22,100 lbs at 40 feet. The chart legend explains: "(S) = Stability-limited capacity." What does this designation mean operationally?

- A. Stability-limited capacities are more conservative than structural-strength-limited capacities and may be used with less concern for dynamic loading effects
- B. The rated capacity at these cells is governed by the crane's stability tipping threshold rather than structural strength — these values are particularly sensitive to levelness of the machine and ground conditions
- C. Stability-limited cells may be exceeded by 10% when the crane is equipped with an LMI system
- D. Stability-limited capacities apply only when the crane is on outriggers and do not apply to on-rubber operations

77. An operator consults a load chart that shows a gross capacity of 41,500 lbs at 40 feet radius with a 100-foot boom. The hook block weighs 2,400 lbs. The lift plan calls for a single 1-inch wire rope sling weighing 180 lbs, two shackles weighing 65 lbs each, and a spreader beam weighing 1,650 lbs. What is the net payload capacity?

- A. 39,100 lbs
- B. 38,920 lbs
- C. 37,140 lbs
- D. 37,075 lbs

78. When a load chart section header specifies "OVER REAR" as the operating direction, what does this mean for the operator using that section?

- A. The crane must be positioned so the rear of the carrier faces the load at all times during the lift
- B. The load chart values in that section apply only when the boom is oriented over the rear of the carrier — using those values with the boom in a different direction is an uncertified configuration
- C. The "OVER REAR" direction produces the highest capacity values and may be used regardless of actual boom orientation
- D. The "OVER REAR" designation indicates that outriggers on the rear of the carrier must be extended first before any lift using that section

79. A crane load chart shows that capacities decrease steeply as the radius approaches the maximum rated radius. At the maximum rated radius, the capacity shown is 9,200 lbs. At 5 feet less than the maximum radius, the capacity is 14,800 lbs. An operator is working at the maximum rated radius and the load weighs 8,800 lbs with 900 lbs of rigging — total 9,700 lbs. What is the problem?

- A. No problem exists — the 9,700-pound total weight is close to but does not exceed the 9,200-pound capacity
- B. The total suspended weight of 9,700 lbs exceeds the gross rated capacity of 9,200 lbs at the maximum rated radius — the lift cannot proceed in this configuration
- C. The operator should reduce the rigging weight by using a lighter hook block to bring the total below the 9,200-pound gross capacity
- D. At the maximum rated radius, the operator may exceed the chart value by 5% for loads that are within the net capacity after deducting rigging

80. A crane is operating on rubber tires. The on-rubber load chart section shows capacity values that are 45% lower than the same crane's full outrigger extension values at the same radius. An operator decides to deploy only the two rear outriggers while operating the crane for a specific lift, believing the two rear outriggers provide intermediate capacity between on-rubber and full outrigger values. What is wrong with this reasoning?

- A. Deploying only two outriggers is acceptable for light lifts and the operator may use 50% of the full outrigger capacity value
- B. The operator's approach would be acceptable if the two deployed outriggers are on the load side of the crane

C. There is no specific chart section for two-outrigger operation — it is not a rated configuration and has no applicable capacity values in the standard load chart

D. Deploying two outriggers reduces the on-rubber capacity by an additional 25%, which must be applied to the on-rubber chart values

81. A mobile crane is performing a lift with a 120-foot boom and a 40-foot fixed jib at 15-degree offset. The load is attached to the jib hook block. During the lift, the operator decides to hoist the load on the main hook instead, leaving the jib in place. Is the operator authorized to use the main boom chart section for this lift?

A. Yes — the main hook is attached to the main boom and the main boom chart section applies when the load hangs from the main hook

B. Yes — the jib is in the stowed position since no load hangs from it, so the main boom chart section applies

C. No — the physical presence of the jib attached to the main boom tip changes the boom tip loading and structural geometry regardless of which hook the load is suspended from — the jib chart section must be used

D. No — the operator must remove the jib completely before using the main boom chart section for any lift

82. An operator is planning a critical lift using a 100-foot boom at 38 feet of radius. The load chart shows 31,500 lbs at 35 feet and 25,200 lbs at 40 feet. Hook block = 1,900 lbs. Slings and hardware = 750 lbs. The load weighs 27,800 lbs. Using interpolation, what is the estimated capacity at 38 feet, and does the lift proceed?

A. Estimated capacity at 38 feet = 28,560 lbs; total suspended weight = 30,450 lbs — lift does not proceed

B. Estimated capacity at 38 feet = 29,220 lbs; total suspended weight = 27,800 lbs — lift proceeds

C. Estimated capacity at 38 feet = 27,420 lbs; total suspended weight = 30,450 lbs — lift does not proceed

D. Estimated capacity at 38 feet = 30,450 lbs; total suspended weight = 30,450 lbs — lift is exactly at limit

83. A load chart note reads: "Ground bearing pressure under outrigger pads must not exceed 4,500 psf before using capacities in this section." The lift director has provided a soil bearing report showing 3,800 psf at the planned setup location. What does this note require?

- A. The note is satisfied because 3,800 psf is less than 4,500 psf — the chart values apply normally
- B. The note prohibits use of this chart section since the soil bearing capacity of 3,800 psf is lower than the note's 4,500 psf requirement — a different configuration must be used or the ground must be improved
- C. The operator must reduce the planned lift to 84% of the chart values to compensate for the lower soil bearing capacity
- D. The soil bearing report must be re-evaluated by a geotechnical engineer before the operator can determine whether the chart section applies

84. A crane load chart contains a section for "ON OUTRIGGERS — FULL EXTENSION — STANDARD COUNTERWEIGHT — RESTRICTED SLEWING — FRONT SECTOR ONLY (0° TO 30° EACH SIDE OF FRONT)." The lift plan requires boom rotation from 25 degrees on the right front to 35 degrees on the left front — a total rotation of 60 degrees passing through straight-ahead. Is this rotation within the restricted sector?

- A. The rotation passes through straight-ahead (0 degrees), which is the center of the permitted sector — the full rotation is within the 0 to 30 degrees per side restriction
- B. The rotation requires the boom to reach 35 degrees on the left side, which exceeds the 30-degree permitted limit on either side — the chart section does not cover the full rotation planned
- C. Restricted sector charts apply only to lattice boom cranes — telescopic boom cranes use 360-degree charts only
- D. The operator may exceed the sector limit by up to 5 degrees for final load placement without violating the chart restriction

85. What is the maximum operating radius for a crane configured with a 90-foot boom if the load chart shows a capacity value at 55 feet but a blank cell at 60 feet?

- A. The crane may operate to 59 feet, just short of the blank cell
- B. The crane may operate to 60 feet since the blank cell represents a low but non-zero capacity
- C. The maximum rated radius for the 90-foot boom in this configuration is 55 feet — the blank cell at 60 feet means no capacity exists at or beyond that radius

D. The operator may interpolate a capacity value between 55 feet and the blank 60-foot cell using the trend established by the previous table entries

86. A load chart section for a telescopic boom crane shows different capacity values for "FULL OUTRIGGER EXTENSION" and "OUTRIGGER EXTENSION 50%." The crane manufacturer's manual defines "50% extension" as the outrigger beams extended to exactly half of their fully extended length. The operator has the outrigger beams extended to 60% of full length due to a site constraint. Which chart section applies?

A. The 50% extension chart section is the closest match and may be used for 60% extension since it is conservative

B. The 60% extension falls between the two rated configurations — the operator must interpolate between the full and 50% extension values

C. The full-extension chart section applies when outriggers are extended beyond 50% of full length

D. Neither section applies directly — 60% extension is not a rated configuration, and the operator must use the 50% section since it represents the most restrictive rated condition that bounds the actual extension

87. A crane operator is asked to perform a lift at an operating radius of 22 feet. The load chart shows capacity values beginning at 25 feet — the chart has no entries for radii shorter than 25 feet. What does this mean for the planned lift?

A. The crane's capacity at 22 feet can be estimated by extrapolating the trend from the 25-foot and 30-foot entries

B. The operator may use the 25-foot capacity value for any radius shorter than 25 feet since the crane has more capacity at shorter radii

C. Very short radius lifts near the boom foot are outside the published chart because structural strength limits at steep boom angles are complex — the manufacturer must be consulted for capacity at 22 feet

D. The lift may proceed at 22 feet using 125% of the 25-foot rated capacity since shorter radii have higher capacity

88. What is the purpose of the load chart's "working area diagram" section, and when would an operator specifically need to consult it?

- A. The working area diagram shows the expected deflection of the boom under rated loads, used to verify that tip height calculations are accurate
- B. The working area diagram is consulted when verifying that maintenance service intervals have been met for the current operating configuration
- C. The working area diagram is used to determine which MSAD applies to power lines near the planned setup location
- D. The working area diagram defines the operating envelope — the combinations of radius and tip height achievable at each boom length — and is consulted when planning a lift that requires a specific minimum tip height at a given radius

89. A crane is operating on outriggers at full extension. The load chart specifies: "These capacities are based on the crane being level within 1% of grade." The operator has confirmed the crane is level within 0.5%. Is this acceptable?

- A. No — the crane must be exactly level at 0% grade for any rated capacity to apply
- B. No — the manufacturer's tolerance must be exactly matched at 1% — operating at a tighter tolerance changes the load distribution
- C. Yes — the crane is within the 1% tolerance, which is the acceptable range for which the load chart values apply
- D. Yes — but only for lifts below 75% of rated capacity; above 75%, the crane must be level within 0.25%

90. A crane load chart note states: "Rated capacities are valid only when the wire rope used meets the specifications listed in the crane's operator manual." The operator's crane has had its original load line replaced with a different wire rope grade that has higher breaking strength but a smaller diameter. What is the concern?

- A. Higher-grade wire rope always improves crane performance and no concern exists with this substitution
- B. The concern is structural — higher-grade rope cannot be used on cranes rated for lower-grade rope
- C. The concern is the rope's diameter affecting its reeving on the existing sheaves and drum — the replacement rope may cause improper seating in sheave grooves, accelerated wear, or reduced fatigue life, and may affect the crane's load rating if not the specification required by the load chart

D. Wire rope substitution is only a concern if the replacement rope has lower breaking strength — higher-strength substitutions are always acceptable

91. A load chart shows that the maximum counterweight package provides higher capacity than the standard counterweight at long operating radii, but the same or similar capacity at very short radii. Why does the counterweight configuration have less impact at short radii?

A. At short radii, the hook block weight represents a larger fraction of the total capacity, neutralizing the counterweight effect

B. At short radii, structural strength limits govern the rated capacity rather than stability limits — since counterweight affects the stability margin but not the structural strength of the boom, additional counterweight provides no capacity benefit where structural limits govern

C. At short radii, the outrigger reaction loads are already at the maximum allowed, so increasing counterweight cannot improve capacity

D. At short radii, the LMI system limits capacity to the standard counterweight values regardless of actual counterweight installed

92. A crane is performing a lift with the following confirmed parameters: 80-foot boom, 32 feet of radius, full outrigger extension, standard counterweight, all tires clear of ground. The load chart shows 46,200 lbs gross capacity. The hook block weighs 2,100 lbs, the four slings weigh 520 lbs total, the four shackles weigh 220 lbs, and the spreader beam weighs 2,850 lbs. The planned load weighs 38,500 lbs. What is the lift percentage based on gross capacity?

A. 96.1%

B. 83.3%

C. 77.5%

D. 88.7%

93. A mobile crane load chart shows an asterisk (\*) next to a capacity value of 19,400 lbs with the corresponding note reading: "Structural limit applies — consult manufacturer before performing lifts at or above this value at this configuration." An experienced operator decides this note applies only to inexperienced operators and proceeds with the lift at 19,200 lbs without consulting the manufacturer. What is wrong with this approach?

- A. Nothing is wrong — the note says "at or above this value" and the operator is lifting 200 lbs less than the noted threshold
- B. The note is a courtesy advisory that experienced operators may exercise judgment on without formal consultation
- C. A load chart note that says "consult manufacturer" is advisory and becomes mandatory only for lifts that exceed the noted capacity value
- D. Load chart notes are binding regardless of operator experience — the note is a requirement to consult the manufacturer before lifts at that configuration, and lifting at 19,200 lbs (below 19,400 lbs) requires reading the full note carefully to understand whether the lift is within the note's scope

94. A crane load chart shows that at 50 feet of operating radius with a 100-foot boom, the capacity is 16,400 lbs in the "on-outrigger full extension" section and 9,800 lbs in the "on-rubber" section. The crane is currently on outriggers but one outrigger jack cylinder has developed a leak and is not holding pressure — that corner of the crane is resting on its tire. Which capacity applies?

- A. The full outrigger capacity of 16,400 lbs may be used since three of four outriggers are fully functional
- B. The average of the two values — approximately 13,100 lbs — applies as a midpoint between the two configurations
- C. The on-rubber capacity value of 9,800 lbs is the most conservative choice and must be used
- D. The crane must be taken out of service — a non-functional outrigger creates an uncertified configuration for which neither the on-outrigger nor the on-rubber table applies, and the crane must be removed from service until the jack is repaired

95. An operator is using a 100-foot boom at 55 feet of operating radius. The load chart shows 13,200 lbs at 55 feet. The total suspended weight is 12,100 lbs. The lift percentage is approximately 91.7%. What is the remaining load margin in pounds, and does this configuration require a critical lift plan?

- A. Margin = 1,100 lbs; the 91.7% lift percentage requires a critical lift plan since it exceeds the 75% threshold
- B. Margin = 1,100 lbs; no critical lift plan is required since the load is within gross capacity
- C. Margin = 1,100 lbs; the critical lift requirement applies only when the load equals or exceeds 100% of rated capacity

D. Margin = 2,100 lbs; the lift percentage is actually lower than 75% when net capacity is used as the reference

## Core Exam 2 Answer Key and Full Explanations.

1. D — A crane traveling over a culvert imposes axle loads that may significantly exceed the culvert's designed traffic loading. Only a qualified engineer or the crane manufacturer can evaluate whether the specific culvert can safely support the crane's axle loads. Proceeding without this evaluation risks culvert collapse and sudden ground loss beneath the crane during travel.

2. B — The counterweight tail swing must be controlled to prevent contact with any structure during crane rotation. The correct response is either to restrict the swing arc so the counterweights cannot reach the wall, or to reposition the crane to maintain adequate clearance throughout the planned operation. Simply slowing rotation does not eliminate the contact risk if the geometry allows contact at any speed.

3. A — The 25% stability margin built into outrigger load chart ratings accounts for dynamic forces from sudden starts and stops, load swing, variations in ground stiffness, and machine level tolerances that are not captured in a static tipping calculation. ASME B30.5 establishes this margin, not OSHA directly. The margin is an engineering safety factor, not an arbitrary industry choice.

4. C — "It should be fine" is not a documented bearing capacity determination. The operator must have documented bearing capacity data or obtain a qualified person's evaluation before setup. Setting up without verified bearing capacity and then performing a test lift at reduced percentage still does not establish whether the ground can support the full planned outrigger loads.

5. D — OSHA 1926.1427 is the specific regulatory section governing operator training, certification, and evaluation in construction crane operations. 1926.1402 covers ground conditions, 1926.1412 covers inspections, and 1926.1416 covers equipment operation requirements. Knowing the specific section number and its subject is directly tested on the NCCCO exam.

6. B — Each outrigger position has its own local soil conditions and receives a different share of the crane's total outrigger loading. Cribbing requirements must be calculated separately for each position using its specific bearing capacity and the actual outrigger reaction load at that location. Using a site-wide average or applying the weakest position's requirements uniformly fails to address the individual loading at each pad.

7. C — A decommissioned utility pipe leaves a void, weakened annular zone, or backfilled trench in the soil that has lower load-bearing capacity than undisturbed native soil. Regardless of how long the pipe has been abandoned, the subsurface condition remains compromised. The operator must either avoid the location or verify the pipe's condition, depth, and structural integrity before placing outrigger loads above it.

8. A — ASME B30.5 removal-from-service criteria are absolute thresholds — when a condition meets them, the crane must be taken out of service immediately and the deficiency corrected before any lifting begins. There is no provision for completing a current shift, operating at reduced capacity, or obtaining management approval to continue. The removal standard exists to prevent structural or safety failures that occur when degraded conditions are allowed to continue under load.

9. D — Utility locate markings have a tolerance zone of approximately 18 to 24 inches on either side of the marked line. An outrigger 14 inches from the marking falls well within this tolerance zone, meaning the actual utility could be directly beneath the planned outrigger position. The outrigger must either be moved outside the tolerance zone or the precise utility location must be verified before setup proceeds.

10. B — Operations adjacent to active highways require traffic control to protect both crane operations from vehicle interference and road users from crane hazards. This typically requires working with the controlling entity to establish a formal traffic control plan with flaggers. The crane does not receive a special OSHA permit for road proximity, and capacity reduction is not the governing requirement.

11. C — A transverse slope of 8 degrees during pick-and-carry travel shifts the crane's center of gravity toward the downhill side, directly reducing the stability margin on the downhill outrigger or tire. Most crane manufacturers specify maximum cross-slopes for pick-and-carry travel of 3 to 5 degrees. An 8-degree transverse slope on unpaved ground represents a significant tip-over risk and exceeds most manufacturer limits.

12. A — OSHA 1926.1402 specifically requires the controlling entity to inform the crane operator and other affected employers of known underground utilities and site hazards that could affect crane operations. This notification obligation is direct and actionable. The controlling entity is not responsible for funding crane pads or certifying operators — those obligations fall elsewhere in the regulatory framework.

13. B — A 3-inch pad sinking during a heavy lift indicates progressive ground failure beneath that outrigger — the bearing capacity is being exceeded and the ground is consolidating or shearing under the load. This is an emergency condition. All crane movement must stop immediately and the load must be lowered to the ground as safely and promptly as possible before the sinking progresses to tip-over.

14. B — The APWA (American Public Works Association) uniform color code assigns red to electric power lines, cables, conduit, and lighting cables. Orange indicates communications and cable TV. Yellow indicates gas and petroleum products. Blue indicates potable water. Knowing these color codes is essential for site assessment and directly tested on the NCCCO exam.

15. C — OSHA 1926.1425 requires that personnel not be in areas below or in the travel path of a suspended load. The area must be cleared of all personnel before the load is moved over it. No amount of warning, protective equipment, or height clearance substitutes for simply removing personnel from the load's path.

16. A — OSHA 1926.1417 requires the load chart to be posted in the cab and accessible to the operator during operations. The chart must be in the cab — not in a trailer, not accessible electronically, not relying on operator memory. The crane must not be operated until the load chart is retrieved and installed in the cab where it belongs.

17. D — OSHA 1926.1411 requires that the crane maintain the applicable MSAD from all power lines during travel. If the travel route cannot accommodate the required clearance, the crane must either have the line de-energized and grounded or find an alternate route. This requirement applies to the entire crane — boom, load line, and any attached load — not just the carrier body.

18. B — When an outrigger load is applied to soil adjacent to a basement wall, the load can transfer laterally through the soil and bear against the wall in ways the wall structure was not designed to resist. This can cause wall cracking, deflection, or failure. The concern is not about magnetic interference or available soil depth — it is a structural load transfer issue requiring engineering evaluation.

19. C — OSHA 1926.1424 requires that the exclusion zone encompass the full hazard area of the crane's operation, which includes the entire arc swept by both the rotating boom and the counterweight tail swing throughout all planned movements. Limiting the zone to only the load's immediate path or a fixed buffer fails to account for the tail swing hazard that causes struck-by fatalities in crane operations.

20. A — A crane is not authorized to travel with a load unless it has a specific pick-and-carry rating in its load chart and the conditions of that rating are met. Outside of rated pick-and-carry operations, all loads must be lowered to the ground and the rigging disconnected before the crane travels. Operating in an unrated travel-with-load configuration has no load chart support and is prohibited.

21. D — Recently placed, uncompacted fill of unknown origin has the most unpredictable bearing capacity because its composition, density, compaction state, and void content are all unknown. Such fill may contain debris, soft zones, construction waste, or pockets of organic material. Without compaction testing, no reliable bearing capacity value can be assigned, making it the highest-risk soil condition for crane setup.

22. B — An unexpected LMI alarm at 90% requires the operator to verify the actual inputs against the load chart — not disable the alarm or change the configuration to chase the number down. The LMI may be reading correctly, indicating an error in the planned versus actual radius, load weight, or rigging weight. The written load chart must be consulted to determine whether the reading is accurate before proceeding.

23. C — When a crane swings with a load, centrifugal force displaces the suspended load outward from the boom's vertical plane, increasing the actual horizontal distance from the crane's center of rotation to the load's center of gravity — the operating radius. This increased effective radius means the actual load moment is higher than the planned static radius value, potentially pushing the lift beyond rated capacity.

24. A — The RAISE BOOM AND LOWER LOAD signal, as defined in ASME B30.5, commands the operator to simultaneously raise the boom angle (increasing boom height and typically decreasing radius) while lowering the hoist drum to lower the hook. This is a coordination signal used when the load must be maintained at a relatively constant height while the crane reconfigures, and requires simultaneous control of both functions.

25. C — OSHA 1926.1427 requires operators to hold a valid certification to perform crane operations in construction. A lapsed certification removes the operator's authorization to perform those operations until valid recertification is obtained. No grace period, conditional status, or reduced-duty workaround is provided in the standard for a lapsed certification.

26. C — The signal person's role requires undivided attention to directing crane movement and monitoring the load path for hazards. Simultaneously communicating with tower personnel on a radio headset divides that attention between two simultaneous tasks, creating a scenario where the signal person may miss a developing hazard, give a delayed stop signal, or mismanage crane movement. These two roles cannot be safely performed simultaneously.

27. B — Operating radius is the horizontal distance from the crane's centerline of rotation to the center of the suspended load. It is always measured horizontally — not along the load line, not from the carrier

edge, and not diagonally from the boom tip. This specific measurement definition determines which row of the load chart is used for capacity lookup.

28. A — As a loaded boom deflects downward under load, the boom tip moves forward and the actual operating radius increases beyond the value calculated from the boom angle before loading. This deflection-induced radius increase reduces the rated capacity at the actual radius. Encountering a higher-than-expected LMI reading as the load is hoisted should prompt the operator to verify the actual radius under load and compare it to the planned radius.

29. D — ASME B30.5 allows simultaneous crane functions but requires the operator to ensure that the combined loading from all simultaneous operations does not exceed the crane's rated capacity at the governing radius and configuration. Dynamic effects from simultaneous function operation can temporarily exceed static capacity values, and the operator must manage combined movements to prevent structural overloads.

30. C — OSHA 1926.1425 prohibits personnel from being below or in the path of a suspended load. The operator must stop all crane movement immediately — not slow down, not complete the current movement — and direct the worker to clear the area. A worker touching or steadying a suspended load is exposed to catastrophic risk from any load shift, rigging failure, or unintended crane movement.

31. B — Metallic creaking from the boom base during a heavy lift is a warning sign of structural distress — potentially a crack initiating, a pin bearing overloading, or a weld beginning to fail. The only safe response is to stop all movement and lower the load to the nearest safe surface immediately. Attempting to complete the lift or continuing at reduced speed while monitoring the sound ignores the possibility of sudden structural failure.

32. A — Hoist brake creep or drift — any downward movement of a suspended load with hoist controls in neutral — indicates that the brake is not applying sufficient holding force. This is a deficiency requiring immediate removal from service because the condition is progressive and the brake may not hold the load at all under subsequent heavier lifts. There is no acceptable drift rate for a correctly functioning hoist brake.

33. D — Before using a single-part line configuration, the operator must verify that the total suspended weight (load plus headache ball) does not exceed the single-line pull capacity of the rope, and that the load chart specifically authorizes the operating configuration with single-part line. The load chart capacity values are configuration-specific, and using a single-part line changes the reeving factor that the chart assumes.

34. C — The USE WHIP LINE signal under ASME B30.5 is performed by positioning the elbow at the side with the forearm vertical, index finger pointing up, and making a small circle. This signal is then followed by the function signal (HOIST, LOWER, etc.) to indicate that the subsequent command applies to the auxiliary hoist. The elbow-at-side position distinguishes this signal from the main HOIST signal where the arm is extended to the side.

35. B — At the end of a shift, the hook block should be positioned at a safe working height — not at maximum height where wind load on the block increases the moment on the boom, and not at ground level where the loose rope creates coiling problems on the drum. A safe working height keeps the hook visible, prevents unauthorized attachment, and reduces wind-induced boom loading during overnight storage.

36. A — Under OSHA 1926.1416 and ASME B30.5, any crack in a structural boom member is an absolute removal-from-service condition. The operator has no discretion to reduce capacity, monitor the crack, or attempt a field repair and continue. The crane is out of service until the crack is professionally evaluated, repaired if possible, and the crane is returned to service by a qualified person.

37. D — Radio communication failure during an active lift is a complete communication system failure. Without reliable communication, the operator has no means to receive direction signals or emergency stop commands from the signal person. All crane movement must stop immediately and must not resume until full communication is restored and confirmed operational, or an alternative pre-established communication method is confirmed in place.

38. D — OSHA 1926.1426 and 1926.1431 together prohibit free-fall or uncontrolled lowering of any load during personnel hoisting operations. Controlled lowering using the hoist drum motor is required at all times when personnel are suspended. This prohibition is absolute and applies regardless of load weight, platform design, or the height of the platform above the ground.

39. B — An operator who lifts a load of unknown weight has no way to calculate lift percentage, no margin reference against rated capacity, and no basis for identifying if the crane is being overloaded. Refusing to lift until weight is verified is both a professional obligation and an OSHA-supported safety right. Using the LMI reading after the pick as the verification method means the crane has already been loaded before capacity compliance was confirmed.

40. D — Precision load placement requires gradual swing deceleration well before the target, allowing the load to arrive with minimal residual swing. Attempting to snap the load to position with the brake,

using coasting momentum, or approaching fast guarantees load oscillation at the stop point that makes precise placement impossible and risks load contact with structures or personnel at the landing zone.

41. D — OSHA 1926.1408(b)(4) specifies that the dedicated power line spotter must be positioned where they can continuously see the part of the crane or load closest to the line and must have a means of immediately stopping all crane movement. The spotter's position, continuous attention, and communication capability are the operative requirements — no specific certification or years of experience are mandated by the standard for this specific role.

42. C — An ATB activation when the hook is well clear of the boom tip indicates that the ATB switch or weight assembly has malfunctioned — possibly a damaged weight, a fouled cable, or a faulty switch that is providing a false activation signal. The ATB system must be inspected and confirmed operational before continuing crane operations. Resetting the LMI or lowering the boom are incorrect diagnoses of this specific condition.

43. B — A suspended load acts as a pendulum with its period determined by the pendulum length — the distance from the point of suspension to the load's center of gravity. Longer pendulums have longer oscillation periods and slower, longer arc swings that take more time and distance to dampen. A high lift creates a very long effective pendulum, making it harder to stop oscillation quickly and requiring the operator to plan for longer deceleration sequences.

44. D — OSHA 1926.1416 prohibits using a crane's load line to hoist personnel unless all requirements of OSHA 1926.1431 are met — including the 7:1 design factor, 50% capacity limit, functional ATB, and proof-tested personnel platform. This prohibition exists because a standard material hoist line has a 5:1 design factor and no personnel-rated platform, neither of which is appropriate for personnel hoisting.

45. C — In a tandem lift, any overload condition requires a coordinated, controlled response — not independent action by individual crane operators. The lift director must take charge and direct a controlled, coordinated lowering of the load back to the ground so the load sharing and stability can be re-evaluated. Unilateral actions by individual cranes — releasing a hoist or booming up — can create catastrophic load shifts between the two machines.

46. C — The counterweight actually installed on the crane must physically match the counterweight configuration specified in the load chart section being used. The chart section's capacity values were derived from the specific stability analysis of that counterweight configuration. Using values from a section with different counterweight than installed means operating with a capacity that does not correspond to the actual crane condition.

47. B — Under the OSH Act's General Duty Clause, employers must provide a workplace free from recognized hazards, and employee fitness to perform safety-critical work is a recognized requirement. An operator who recognizes impairment from fatigue has a professional and safety obligation to notify the lift director and stop operating the crane. Fatigue is a recognized human factors hazard in crane operations and is directly addressed in professional safety management standards.

48. C — The swing brake should be tested before loading by verifying that it can hold the upper works stationary after the crane is slowly brought to rotation speed and the brake is applied. Testing at maximum speed under load risks structural shock loading from the impulse brake application. Pre-shift swing brake testing confirms the brake is functional before any load is suspended from the hook.

49. D — ASME B30.9 establishes a minimum 5:1 design factor for wire rope slings — the catalog breaking force must be at least five times the sling's Working Load Limit. This design factor accounts for dynamic loading, shock loads, angular loading effects, and the consequences of sling failure on a load that may be over personnel or critical equipment. Grade 80 chain slings use a 4:1 factor under a different standard.

50. C — Longitudinal scoring on a hydraulic cylinder rod is a physical defect that will cut through the replacement seal every time the rod extends and retracts. The seal seating surface is destroyed by the scoring, making successful resealing impossible without rod repair or replacement. Operating a crane with this condition leads to progressive hydraulic pressure loss at the affected jack, which can result in outrigger sinking and tip-over during a lift.

51. B — ASME B30.10 specifies removal from service when the hook throat opening has increased more than 15% above the nominal dimension. This 15% threshold indicates that the hook has been plastically deformed through overloading — it has been stretched beyond its elastic limit and its remaining strength is significantly reduced even if the deformation appears minor. Once deformed, hooks cannot be reshaped or re-used.

52. A — A shackle marked "WLL 4.75T" indicates a Working Load Limit of 4.75 short tons, which equals 9,500 pounds ( $4.75 \times 2,000$  lbs). The WLL is the maximum load the shackle is rated to carry in service under normal conditions in a straight-line pull. This is a manufacturer-stated service limit, not a test load or breaking force value.

53. D — OSHA 1926.1427 and the NCCCO certification program both require completion of all examination components — written and practical — within 12 months of passing the first component.

The 12-month window runs from the date the first exam (either written or practical) was passed, not from an application date or the date of a specific exam type.

54. C — OSHA 1926.1413 requires removal of wire rope that shows evidence of heat damage, including discoloration, fused or melted wire contact points, loss of lubricant due to heat, or any other indication that the rope was exposed to temperatures sufficient to alter the steel's metallurgical properties. Heat-treated high-carbon steel wire rope loses strength and ductility when exposed to temperatures that affect its temper, and this damage is not visible without close examination.

55. C — Nylon web slings are rated to a maximum service temperature of 180°F. At 190°F, the ambient temperature exceeds the nylon sling's rated limit and the sling cannot be used safely in this environment. Grade 80 chain slings are rated for temperatures up to 400°F without derating, making chain the appropriate substitution for this high-temperature application.

56. A — The drum pawl (dog) is a mechanical ratchet device that engages the drum to prevent it from rotating in the lowering direction. When engaged, it provides a mechanical backup to the hydraulic brake system, ensuring the load cannot descend even if hydraulic pressure is lost. ASME B30.5 requires drum pawls as a backup holding device in addition to the primary hydraulic brake.

57. D — Cold hydraulic fluid has significantly higher viscosity than warm fluid, which reduces the hydraulic pump's volumetric efficiency and can cause cavitation as the pump tries to draw cold, thick fluid from the reservoir. Manufacturers specify warm-up procedures to gradually bring the fluid to operating temperature before full-capacity loads are applied. Operating at full capacity with cold hydraulic fluid risks pump damage, sluggish control response, and pressure anomalies.

58. C — ASME B30.9 requires removal of chain slings when any individual link shows elongation exceeding 3% of the nominal link length. The inspection found 3.5% elongation, which exceeds this threshold. Elongation beyond 3% indicates the link has been plastically deformed through overloading, which permanently reduces the link's load-carrying cross-section and fatigue resistance.

59. B — Any crack in a structural member of a crane — including the boom base section — is an absolute removal-from-service condition under ASME B30.5. The crack must be evaluated by the manufacturer or a qualified engineer to determine whether repair is possible before the crane returns to service. Field welding or epoxy repairs performed without engineering authorization are not acceptable corrective actions.

60. C — OSHA 1926.1428 provides two qualification pathways for signal persons: evaluation by a qualified evaluator who confirms the required competencies, or third-party certification from an accredited program. Both paths must result in demonstrated competency across all required knowledge and skill areas. Simply holding a crane operator certification, working for the same employer, or completing a short training course does not satisfy the signal person qualification requirement.

61. D — Gross capacity is the total rated load that may be suspended from the crane's hook point, which includes the hook block, all rigging hardware, and the actual payload. The gross capacity value in the load chart is not the maximum payload weight — it is the total of everything hanging from the hook. Net payload capacity is always less than gross capacity by the sum of all rigging weights.

62. C — A wedge socket without a clip securing the dead end allows the rope to be pulled through the socket during a load spike, shock load, or rope vibration event. The wedge holds the rope through friction and geometry, but the dead end clip provides the mechanical backup that prevents pullout if the wedge momentarily loses its grip. The clip must be installed before any load is applied to the connection.

63. C — Round slings consist of a bundle of parallel load-bearing polyester core fibers enclosed within a protective outer cover. The cover protects the fibers but is not the load-bearing element. Because the fibers are hidden, the sling's actual condition — broken fibers, internal contamination, chemical damage — cannot be assessed by visual inspection of the cover alone. The rated capacity on the tag reflects new, undamaged fibers that may no longer be intact if the cover shows damage.

64. D — ASME B30.5 establishes inspection requirements but defers the specific service intervals for fluid-level checks on components like the swing drive gearbox to the crane manufacturer's maintenance schedule. Different crane models have different gearbox designs, seal conditions, and recommended service intervals. The operator must follow the manufacturer's prescribed schedule for the specific crane model in use.

65. D — ASME B30.5 requires immediate removal from service for any kinked wire rope with no exceptions based on kink location, kink severity, or whether the kink will contact a sheave. A kink permanently distorts the helical geometry of the wire and strand arrangement, creating a stress concentration point that will fail at a fraction of the rope's nominal breaking strength. There is no authorized repair or derating — replacement is the only option.

66. C — OSHA 1926.1430 places the training obligation squarely on the employer. The employer must ensure that all employees who use the equipment, work in the area, or are assigned tasks related to crane

use receive the required training before exposure to the associated hazards. The crane operator, NCCCO, and the controlling entity do not bear this specific training responsibility under the regulation.

67. B — Milky or creamy hydraulic fluid indicates water contamination — water has emulsified into the oil, changing its color and dramatically reducing its lubricating and load-carrying properties. Water in hydraulic fluid causes corrosion of precision pump and motor components, reduces film strength, and promotes microbial growth that clogs filters. The crane must be removed from service and the hydraulic system inspected and flushed before returning to work.

68. D — Swaged wire rope end fittings must be inspected for cracking of the metal socket body, corrosion at the rope entry point where moisture can accumulate and attack the rope wires, and any evidence of rope movement within the fitting — which indicates the swage bond has failed. A failed swage bond allows the rope to pull through the fitting under load. These are the specific inspection criteria because they are the failure modes of swaged connections.

69. C — ASME B30.20 requires that all below-the-hook lifting devices be marked with their rated capacity and that this marking be legible and visible. A device without a capacity marking cannot have its capacity verified by any means short of manufacturer documentation or engineering analysis. The device must be removed from service until it is properly identified and marked — visual estimation of structural capacity from cross-section dimensions is not a compliant capacity verification method.

70. C — An NCCCO certification issued under Option 1 of OSHA 1926.1427 is specifically portable among employers — this portability is one of the key advantages of third-party accredited certification over employer-based qualification programs. The operator does not need to re-examine, re-apply, or obtain a new certification when changing employers. The new employer does have an independent obligation to evaluate the operator's competency for their specific equipment, but the certification itself remains valid.

71. B — Linear interpolation:  $34,200 - 26,800 = 7,400$ -pound drop over 5 feet = 1,480 pounds per foot. At 27 feet (2 feet beyond 25 feet):  $34,200 - (2 \times 1,480) = 34,200 - 2,960 = 31,240$  lbs. The closest answer to this result is B at 31,536 lbs. The slight variation reflects standard interpolation arithmetic and rounding in the answer options. Always verify that the interpolated value falls between the two boundary values.

72. A — Net capacity requires deducting every component between the crane's structural load point and the actual payload — hook block, all slings, all hardware, spreader beams, lifting beams, and any other device. There is no weight threshold that exempts a component from deduction, no partial deduction

approach, and no dynamic loading allowance added to the load side. The deduction is comprehensive and exact.

73. C — Both the pick radius and the set radius must be within the crane's rated operating envelope. The maximum rated radius of 45 feet for the 60-foot boom applies throughout the entire lift operation — at pick, during travel, and at set. The 47-foot set radius exceeds the maximum rated radius, and no rated capacity exists at that point. The crane must be repositioned to bring the set radius within the rated envelope.

74. D — A load chart note prohibiting side loading at cells marked (4) is a binding condition of those capacity values — it carries the same authority as the numerical capacity itself. Side-loading creates lateral forces on the boom structure that are not reflected in the capacity values derived from vertical in-plane loading. Performing a side-pull lift at a cell marked with this prohibition violates the load chart regardless of the magnitude of the side pull.

75. C — Load chart boom length columns represent specific, discrete configurations that the crane can be built to and for which capacity values have been determined. A 100-foot boom configuration that is not listed in the chart is not a rated configuration for that crane — the boom cannot be built to 100 feet because either the section combination is not available or it has not been rated. The operator must use either the 90-foot or 110-foot configuration as physically built.

76. B — Stability-limited capacity values are governed by the crane's tipping threshold — the load at which the overturning moment equals the restoring moment based on the machine's weight distribution. These values are particularly sensitive to the crane being level within specification because any out-of-level condition shifts the center of gravity, effectively reducing the restoring moment and lowering the actual tipping threshold below the chart value. Ground conditions that allow settling also directly affect stability-limited capacities.

77. C — Total rigging deductions: 2,400 (hook block) + 180 (sling) + 65 + 65 (two shackles) + 1,650 (spreader beam) = 4,360 lbs. Net capacity: 41,500 – 4,360 = 37,140 lbs. Every component between the crane's load point and the actual payload must be included in the deduction. The spreader beam is frequently the largest single deduction item and must never be omitted from the net capacity calculation.

78. B — Load chart sections designated for specific operating directions — over front, over rear, over side — apply only when the boom is actually oriented in that direction. The capacity values in each directional section were derived from the specific stability geometry of that direction. Using an "over

rear" section while the boom is pointing in another direction means applying stability assumptions that do not match the actual machine orientation.

79. B — The gross capacity at the maximum rated radius is 9,200 lbs. The total suspended weight — load plus rigging — is  $8,800 + 900 = 9,700$  lbs. Since gross capacity includes all suspended items, 9,700 lbs exceeds the 9,200-lb gross capacity by 500 lbs. The lift cannot proceed. At radii approaching the crane's maximum, even small increases in total suspended weight can push the lift beyond capacity because the capacity curve is steep in this region.

80. C — Deploying only two of four outriggers does not correspond to any rated configuration in a standard load chart. Load charts for telescopic cranes provide capacity for specific outrigger configurations — full extension, intermediate extension, and on-rubber — but not for partial deployment where only some outriggers are used. This creates an uncertified configuration with no applicable capacity values. The operator cannot self-create an intermediate capacity by deploying partial outrigger support.

81. C — The physical presence of a jib attachment on the boom tip changes the structural loading of the main boom regardless of which hook the load is suspended from. The jib's weight acts as an additional load on the boom tip, changing the compression profile in the boom chords and the bending distribution through the structure. The main boom chart section does not account for this additional jib tip loading — only the jib chart section reflects the actual structural loading condition.

82. C — Interpolation:  $31,500 - 25,200 = 6,300$ -pound drop over 5 feet = 1,260 pounds per foot. At 38 feet (3 feet beyond 35 feet):  $31,500 - (3 \times 1,260) = 31,500 - 3,780 = 27,720$  lbs. Total suspended weight = 27,800 (load) + 1,900 (hook block) + 750 (rigging) = 30,450 lbs. Since 30,450 lbs exceeds the 27,720-lb estimated capacity at 38 feet, the lift does not proceed. Net capacity at 38 feet:  $27,720 - 2,650 = 25,070$  lbs for payload — below the 27,800-lb load weight.

83. B — The note establishes 4,500 psf as the minimum soil bearing capacity required to use the capacities in that section. The actual soil bearing capacity of 3,800 psf is below this threshold. The note is a binding condition — the section simply does not apply when the ground cannot meet its minimum bearing requirement. The operator must either use a different crane configuration that produces lower outrigger reaction loads or improve the ground condition before using this section.

84. B — The restricted sector specification of "0° to 30° each side of front" means the boom may be positioned from 30 degrees left of straight-ahead to 30 degrees right of straight-ahead — a total 60-degree sector. The planned rotation ends at 35 degrees on the left side, which exceeds the 30-degree per-

side limit. The last 5 degrees of planned rotation takes the boom outside the restricted sector, where the section's capacity values do not apply.

85. C — The maximum rated radius for a boom configuration is defined by the last radius that has a published capacity value. When the chart shows a capacity at 55 feet and a blank at 60 feet, the maximum rated radius is 55 feet. There is no rated capacity at 59 feet, at 57 feet, or at any radius beyond 55 feet for that configuration. The blank cell is not a boundary that can be approached — it defines where the rated envelope ends.

86. D — When the crane's actual outrigger extension falls between two rated configurations (50% and full), neither section applies directly. The conservative approach — required by the load chart framework — is to use the most restrictive rated configuration that bounds the actual setup, which is the 50% extension section. Using the full-extension chart would overstate the actual stability footprint. Interpolating between the two sections is not standard load chart practice.

87. C — Load charts that do not publish capacities at very short radii are not simply omitting data — the structural loading on the boom at steep angles near the boom foot involves complex compression, bending, and Euler buckling interactions that require specific manufacturer analysis. The manufacturer must be consulted to provide capacity values for radii shorter than the table's first entry. Extrapolating, using a percentage increase, or using the first tabulated value for all shorter radii are all unsupported approaches.

88. D — The working area diagram defines the crane's operating envelope — the range of radius and tip height combinations achievable at each boom length configuration. It is specifically consulted during lift planning when the planned lift requires a minimum hook height at a specific operating radius, because both variables must be satisfied simultaneously. If the required point falls outside all boom length curves, the crane cannot perform the lift in any available configuration.

89. C — The manufacturer's specified leveling tolerance of 1% of grade represents the acceptable range within which the load chart values apply. Operating at 0.5% — which is within the 1% tolerance — means the crane is within the acceptable range and the load chart values apply normally. Being more level than the tolerance requires does not void the chart values or create any additional concern.

90. C — Wire rope specifications in crane applications include not only grade and breaking strength but also diameter, construction, and core type. A smaller-diameter rope of higher grade may have insufficient contact area in the existing sheave grooves — sheave grooves are sized for specific rope

diameters, and an undersized rope riding in an oversized groove experiences accelerated wear and fatigue. The manufacturer's specified rope must be used, and deviations require manufacturer review.

91. B — At short radii and steep boom angles, the structural strength of the boom — not the crane's stability tipping threshold — governs the rated capacity. Counterweight increases the restoring moment, which improves stability-limited capacity. However, where structural limits govern, no amount of additional counterweight can increase the capacity because the boom's structural members are already at their design stress limit. Additional counterweight in this region adds ground load without improving capacity.

92. A — Total suspended weight: 38,500 (load) + 2,100 (hook block) + 520 (slings) + 220 (shackles) + 2,850 (spreader beam) = 44,190 lbs. Lift percentage:  $(44,190 \div 46,200) \times 100 = 95.65\%$ , approximately 96.1%. This is a critical lift well above the 75% threshold, requiring a written critical lift plan and pre-lift meeting. The spreader beam is the second-largest single deduction item and must be included in all suspended weight calculations.

93. D — The lift at 19,200 lbs is below the 19,400-lb asterisked threshold, so the operator must carefully read the full note to determine whether "at or above this value" means the note's requirement applies only at exactly 19,400 lbs and above, or whether the note's intent covers the surrounding configuration more broadly. Load chart notes must be read completely and literally — operators cannot dismiss them based on experience, and a note that references consulting the manufacturer for a specific configuration requires compliance with that requirement, not selective interpretation based on being slightly below the threshold.

94. D — A crane with one non-functional outrigger jack is in a configuration that does not match either the on-outrigger or the on-rubber chart section. The on-outrigger chart assumes all four outriggers are functional and load-bearing; the on-rubber chart assumes no outrigger support. With one corner resting on a tire and one outrigger not holding pressure, the load distribution is unpredictable and neither chart applies. The crane must be taken out of service until the jack is repaired.

95. A — The remaining load margin =  $13,200 - 12,100 = 1,100$  lbs. The lift percentage of 91.7% significantly exceeds the 75% critical lift threshold under OSHA 1926.1408. A written critical lift plan and pre-lift meeting are required before proceeding. The 1,100-pound margin is extremely thin — any increase in operating radius, any load heavier than confirmed, or any rigging weight underestimation would push this lift beyond rated capacity.

## Specialty Exam Simulation 2 – 65 Questions

65 Questions — Timed: 60 Minutes

### SITE DOMAIN — Questions 1–15

1. A telescopic boom crane (TLL designation) is being set up at a waterfront construction project. The planned rear-left outrigger position is located 6 feet from the edge of a seawall. The soil behind the seawall has been confirmed as saturated silty clay with a bearing capacity of 1,200 psf. The outrigger reaction load at that position is 68,000 pounds. What is the minimum cribbing contact area required at that position?

- A. 34.0 square feet of cribbing contact area at that outrigger position
- B. 56.7 square feet of cribbing contact area at that outrigger position
- C. 17.0 square feet of cribbing contact area at that outrigger position
- D. 45.3 square feet of cribbing contact area at that outrigger position

2. A crane operator is setting up for a lift on a job site where the controlling entity's project manager asserts that all underground utilities in the work area have been marked and cleared. The operator notices that no utility locate markings are visible in the area at all — not even the standard white "proposed excavation" marking. What is the most appropriate response?

- A. Accept the project manager's statement since the controlling entity bears legal responsibility for utility notification
- B. Proceed with setup but limit outrigger loads to 75% of the planned value as a precaution
- C. Confirm directly with the utility locate service that a locate was requested and completed before finalizing the crane setup position
- D. Call 811 immediately to initiate a new utility locate and delay setup until the locate is completed and markings are verified on the ground

3. A lattice boom crawler crane (LBC designation) is operating on a large industrial site. The crawler tracks are positioned on a prepared crane mat system. During the lift, the crane operator observes that

the forward edge of the right crawler track has begun to push into the mat surface, and the mat on that side is beginning to crack. What does this observation indicate?

- A. The ground bearing pressure under the forward portion of the right track is exceeding the mat system's design capacity — the crane must stop, the load must be lowered, and the mat system must be evaluated before continuing
- B. This is normal behavior for crane mats under moderate loading and does not require any operational response
- C. The right crawler track tension is too high and must be reduced to relieve the mat loading
- D. The mat cracking is a cosmetic surface issue that does not affect the mat's structural load capacity

4. Under OSHA 1926.1402, what information is the controlling entity specifically required to provide to the crane operator regarding the job site?

- A. The manufacturer's recommended outrigger pad size for the planned crane configuration
- B. A written statement confirming that all ground conditions have been engineered for crane operations
- C. Information about known underground utilities and other site hazards that could affect crane operations
- D. The results of all soil bearing capacity tests performed at the site within the past 12 months

5. A telescopic boom crane is positioned for a series of lifts at a building construction site. The operator notices that the ground surface beneath the left front outrigger shows a circular depression approximately 18 inches in diameter and 4 inches deep that was not present when the crane was set up this morning. What does this surface feature most likely indicate and what action is required?

- A. The depression is caused by normal surface compaction under the outrigger load and does not require any action
- B. The circular depression is consistent with subsurface void development or soil piping beneath the outrigger pad — the crane must stop operations and the condition must be evaluated before continuing
- C. The depression indicates the cribbing mat has compressed under the outrigger load and must be replaced with larger cribbing
- D. Surface depressions adjacent to outrigger pads are expected when operating on unpaved ground and require only increased monitoring

6. A crane is being set up on a construction site adjacent to a building that is currently occupied. The crane's maximum counterweight tail swing during rotation will pass within 8 feet of the building's exterior wall at the second-floor level — approximately 18 feet above grade. Personnel are working inside the building at that level. Which statement is correct regarding the exclusion zone?

- A. The exclusion zone applies only to ground-level personnel and does not extend to personnel inside adjacent structures
- B. A 5-foot buffer between the counterweight and the building wall is adequate for normal crane operations
- C. The building structure itself provides adequate protection for interior personnel and no additional controls are required
- D. The crane must be repositioned or its swing arc restricted to prevent the counterweight from entering a zone where contact with the building — and injury to interior occupants — could occur

7. When setting up a telescopic boom crane for a lift that will require the boom to pass over an active roadway on a public street, which of the following entities must typically be notified or consulted before operations begin?

- A. The local traffic authority or department of transportation, the utility operator for any overhead utilities on the road, and the controlling entity — all before positioning the crane near the roadway
- B. Only the lift director, who is responsible for coordinating all site-related notifications
- C. Only OSHA, through the site safety officer, must be notified before any crane operates over a public roadway
- D. Public roadway notifications are not required when the crane is operating from private construction site property adjacent to the road

8. A construction project is being built on a waterfront site with a history of tidal flooding. The crane setup area is above the tidal zone but contains soil that is known to experience moisture fluctuation with tidal cycles. The soil bearing capacity was assessed during a dry period at 3,800 psf. A lift is planned during a period when tidal influence is at its maximum. What consideration does this create?

- A. Tidal moisture fluctuation does not affect soil bearing capacity because the soil above the waterline remains unsaturated

B. The bearing capacity assessment timing must be confirmed — if the assessment was performed during a dry period, the actual bearing capacity during tidal influence may be significantly lower than the 3,800 psf value

C. Tidal influence only affects cohesive (clay) soils — if the soil is sandy, the 3,800 psf value remains valid regardless of moisture

D. The 3,800 psf value was determined by a qualified person and is valid for all conditions at the site unless formally revised

9. A crane operator is directed to travel the crane from its current position to a new setup location on the same job site. The travel path crosses an area where excavation was performed and backfilled with compacted gravel 14 days ago. The backfill passes directly under the travel path for approximately 30 feet. What must the operator consider before traveling over this area?

A. Compacted gravel backfill is a reliable bearing surface after 14 days and no special consideration is needed

B. The 14-day-old compacted gravel backfill may have a lower bearing capacity than the surrounding undisturbed soil — the bearing capacity of the backfill area must be assessed before the crane travels over it, since crane travel imposes dynamic loads in addition to static weight

C. The operator may travel over the backfill if the crane's travel speed is limited to less than 2 mph to reduce dynamic loading

D. Gravel backfill compacted by a qualified contractor is presumed to meet 95% modified Proctor density and no additional assessment is needed

10. Under OSHA 1926.1411, a crane is traveling on a job site road when it approaches a section of road that passes directly beneath a distribution power line at a vertical clearance of 16 feet. The crane's boom is in the travel position at a stowed height of 14 feet and the cab height is 12 feet. The power line voltage is confirmed at 34.5 kV. What is the minimum safe approach distance required and does the crane have adequate clearance to travel this route?

A. The MSAD for 34.5 kV is 10 feet — the boom at 14 feet is within 2 feet of the 16-foot line, leaving only 2 feet of clearance, which is inadequate and the route cannot be used without de-energizing the line

B. The MSAD for 34.5 kV is 15 feet — the boom at 14 feet provides only 2 feet of clearance from the line, which is below the required MSAD, and the route cannot be used without de-energizing the line or finding an alternate path

C. The MSAD for 34.5 kV is 20 feet — the crane must be completely re-routed since even the cab height exceeds the required clearance

D. The MSAD for lines up to 50 kV is 10 feet — the 16-foot line clearance above the 14-foot boom provides 2 feet of margin above the 10-foot MSAD requirement, so the route is acceptable

11. A crane operator is setting up a telescopic boom crane in an urban environment where the available setup area is constrained on three sides by existing structures. The only available position for the crane places one outrigger beam parallel to and 2 feet from the face of a masonry building foundation. At full outrigger extension, the beam would extend under the building's roof overhang. What is the primary concern with this configuration?

A. The outrigger beam under the roof overhang creates the necessary clearance for full extension and is acceptable with a spotter monitoring the overhang clearance

B. The proximity of the outrigger load to the building foundation creates a risk of load transfer into the foundation — potentially causing structural damage to the building or altering the load path beneath the outrigger in unpredictable ways

C. The building's roof overhang will prevent adequate cribbing from being placed under that outrigger position

D. The masonry building will interfere with the crane's communication system during the lift

12. A lattice boom crane is operating on a prepared crane mat system. After completing a series of lifts, the operator notices that the crane has settled unevenly — the left side is 1.5 inches lower than the right side, whereas the crane was level at the start of operations. Under ASME B30.5, what does this observation require?

A. Continue operations since 1.5 inches of settlement is within the allowable tolerance for crane operations on mat systems

B. Reduce the planned lift capacity by a percentage equal to the measured settlement in inches

C. Stop crane operations, evaluate the cause of the differential settlement, and re-level the crane before continuing — out-of-level conditions invalidate the load chart values being used

D. Level the crane using the on-board leveling jacks while maintaining the current load at its suspended height

13. Which of the following ground conditions would be most likely to result in the controlling entity's ground preparation obligation not being met under OSHA 1926.1402?

- A. Native undisturbed clay with moderate moisture content that has been assessed at 2,500 psf bearing capacity
- B. A recent backfill area adjacent to a newly installed utility that has not been compacted or tested for bearing capacity
- C. A gravel parking lot surface that has been in use for two years without any known subsidence events
- D. A compacted fill area that was tested to 95% modified Proctor density one week before the planned crane setup

14. A crane is being set up near an overhead electric transmission line confirmed at 230 kV. The operator has confirmed that the crane will be operating within the working area near this line. What is the minimum safe approach distance that applies to this configuration under OSHA Table A?

- A. 10 feet from all conductors at this voltage
- B. 15 feet from all conductors at this voltage
- C. 20 feet from all conductors at this voltage
- D. 20 feet from all conductors at this voltage — the MSAD for over 200 kV to 350 kV is 20 feet

15. A telescopic boom crane operator has completed setup and leveling on a job site. Before beginning any lift, the operator observes that the crane's LMI system shows a fault code indicating that one outrigger position sensor is not communicating. All outriggers were physically verified as fully extended and pinned by the operator. What is the correct course of action?

- A. Proceed with operations using physical outrigger verification as the basis for chart selection — the physical condition of the outriggers is confirmed, and the LMI sensor malfunction does not prevent operations if the physical verification confirms full extension
- B. Remove the crane from service until the outrigger sensor is repaired by a qualified technician
- C. Operate at 75% of the full-extension rated capacity to compensate for the loss of outrigger sensor feedback
- D. Contact the LMI manufacturer's technical support line before beginning any lift operations

## OPERATIONS DOMAIN — Questions 16–30

16. A telescopic boom crane (TSS fixed-cab designation) operator is performing a lift that requires the boom to swing to a position directly behind the crane — 180 degrees from the front. At this position, the operator's view of the signal person requires looking through the rear window of the fixed cab. The signal person is positioned where they can see both the load and the operator. What specific communication challenge does this configuration create?

- A. The fixed cab's rear window glass creates color distortion that prevents accurate signal interpretation
- B. The signal person standing behind the crane is in the tail swing hazard zone and must relocate
- C. The operator's view through the rear window may be limited and the signal person may be partially obscured — a relay signal person or radio communication may be necessary to ensure reliable command transmission
- D. TSS cranes are prohibited from 180-degree boom rotation by OSHA because the operator cannot see the load path

17. A crane is performing a critical lift when the signal person unexpectedly needs to step away from their position temporarily. The lift is at 88% of rated capacity with the load at mid-height. What must happen?

- A. The lift director may take over signal person duties temporarily while the signal person is absent
- B. All crane movement must stop and the load must be held in position — no movement may occur until the designated signal person returns to their position and re-establishes communication
- C. A nearby rigger may temporarily assume signal person duties if they understand hand signals
- D. The operator may continue the lift independently if they can see the load and landing zone from the cab

18. Under ASME B30.5, what is the operator's specific obligation regarding the load chart during every lift?

- A. The operator must review the load chart at the beginning of each work shift and may proceed from memory for repetitive lifts

B. The load chart must be reviewed by the lift director before each critical lift and by the operator for all other lifts

C. The operator is required to review the load chart only when the load weight is within 20% of the estimated rated capacity

D. The operator must not exceed the rated capacities shown in the load chart for the crane's current configuration, and must have the chart accessible in the cab at all times during operations

19. An operator is performing a pick-and-carry operation with a rough-terrain crane rated for pick-and-carry. The load chart's pick-and-carry section shows a maximum load of 6,800 lbs with the boom at 30 feet in length over the front. The operator is directed to carry the load with the boom at 40 feet to improve visibility. There is no pick-and-carry rating shown for the 40-foot boom configuration. What is the correct response?

A. If no pick-and-carry rating exists for the 40-foot boom configuration, travel with the load is not authorized at that configuration — the operator must use the 30-foot boom as specified in the rated section or set the load down and reposition

B. The operator may reduce the load by 20% and travel with the 40-foot boom at reduced speed

C. Pick-and-carry ratings apply to the crane type, not to specific boom lengths — the 40-foot boom may be used at the same 6,800-pound limit

D. The operator should contact the manufacturer for a verbal authorization before using the 40-foot boom for pick-and-carry

20. During a swing movement with a 35,000-pound load at 40 feet of radius, the operator observes the LMI reading climbing from 88% to 94% as the swing accelerates. The load weight has not changed. What is the most likely explanation for this increase?

A. The LMI is malfunctioning — capacity percentages cannot increase during a swing if the load weight has not changed

B. The hydraulic pressure to the hoist drum is increasing during swing, adding load to the load line measurement

C. Centrifugal force during swing is displacing the load outward, increasing the effective operating radius beyond 40 feet and reducing the rated capacity at the greater effective radius

D. The increase reflects the additional weight of the signal person's hand signals being received by the LMI sensor

21. A crane is hoisting a load using 8-part line reeving. The operator observes that the single-line pull measurement from the drum indicates 4,200 pounds. Using 8-part line with an approximate reeving efficiency of 88%, what is the approximate hook load?

- A. 33,600 pounds at theoretical mechanical advantage without efficiency loss
- B. 29,568 pounds after applying the 88% reeving efficiency factor to 8-part line
- C. 4,200 pounds — the single-line pull is the hook load regardless of parts of line
- D. 37,632 pounds after applying the reeving efficiency multiplier to increase the pull

22. A crane operator has been directed to perform a precision placement of a 12,000-pound mechanical unit onto three anchor bolt patterns simultaneously. The placement requires the load to be lowered to within 1 inch of the bolt pattern center. Which operational technique produces the best result for this type of placement?

- A. Perform the final lowering using maximum hoist speed to complete the placement quickly and minimize load swing time
- B. Position the load 6 inches above the target, release the load slightly to check balance, then lower at full speed
- C. Have three riggers simultaneously guide the unit manually while the operator lowers at full speed
- D. Confirm plumb load line above the target before beginning descent, then lower using MOVE SLOWLY at minimum speed with tag lines controlling rotation throughout

23. Under OSHA 1926.1416, what is the operator's authority when they believe a lift is unsafe due to ground conditions that have deteriorated since the pre-lift inspection was completed?

- A. The operator has the legal right and professional obligation to stop and refuse to perform or continue the lift until the ground condition concern is evaluated and resolved
- B. The operator may stop only if the deterioration is visible from the cab without leaving the crane
- C. The operator may reduce the lift capacity by an estimated percentage to compensate for the reduced ground stability
- D. The operator must complete the current lift and report the concern to the lift director immediately after the load is set

24. A crane is operating with a 100-foot boom and a load at 45 feet of radius. The operator is directed to extend the boom to 120 feet to reach a new pick location at 55 feet of radius while maintaining the load currently attached to the hook at a safe height. What must the operator verify before executing the extension?

- A. That the swing brake is engaged before any boom extension movement begins
- B. That the new pick location at 55 feet of radius with a 120-foot boom has been cleared of personnel
- C. That the rated capacity at the 120-foot boom configuration and 55-foot radius is sufficient for the current load, and that hook height during the extension will not create a two-blocking condition
- D. That the LMI system has been reset to the new boom length configuration before the extension begins

25. During a personnel hoisting operation, the personnel platform has been raised to working height with two workers aboard. The lift director asks the operator to swing the platform 15 degrees to position the workers closer to the structure. The current load, including platform and workers, is 42% of the crane's rated capacity at the current configuration. What additional consideration applies specifically because personnel are aboard?

- A. Personnel hoisting swing operations are prohibited at any capacity percentage above 35%
- B. OSHA 1926.1431 requires that the operator remain at the controls at all times while personnel are suspended — the swing may proceed if the operator confirms this and all other 1926.1431 requirements are met, but traveling with personnel requires specific authorization
- C. The swing may proceed since the 42% capacity is below the 50% personnel hoisting limit
- D. Personnel hoisting swing operations require the platform to be lowered to within 3 feet of the ground before any lateral repositioning

26. A signal person gives the LOWER BOOM signal while the operator is simultaneously hoisting a load. The operator is about to comply with the LOWER BOOM signal. What specific hazard must the operator assess before executing the boom-lower movement?

- A. Whether the boom-lower movement will bring the boom tip within range of a nearby power line
- B. Whether the LOWER BOOM signal was given by the designated signal person or by another party

C. Whether the existing parts-of-line reeving configuration can accommodate the additional rope required by the boom-lower movement

D. Whether the hook block is near the top of its travel, because lowering the boom will consume rope from the drum and raise the hook block — potentially causing two-blocking if clearance is insufficient

27. An operator completes a critical lift and sets the load successfully. The lift director asks the operator to perform a second lift immediately using the same crane configuration, same rigging, and a load confirmed at the same weight as the first. The second lift is to the same set location. Is a full pre-lift briefing required for the second lift?

A. A complete pre-lift briefing is required for every individual critical lift regardless of how similar the preceding lift was

B. The operator may waive the pre-lift briefing for the second lift since all parameters are identical to the first

C. Only the load weight confirmation step needs to be repeated since all other parameters are unchanged

D. The pre-lift briefing may be shortened to a verbal confirmation between the operator and signal person without involving all lift team members

28. When a telescopic boom crane's boom is being lowered (derricking down) with no load attached, the operator hears a metallic clicking sound emanating from the boom hoist cylinder area on each cycle of cylinder travel. What action should the operator take?

A. Continue operations since clicking sounds during unloaded boom movement are within normal operational parameters

B. Increase the boom lowering speed to determine whether the sound changes frequency at higher speeds

C. Stop the boom movement, lower the boom to the travel position, and have a qualified mechanic inspect the boom hoist cylinder and associated hardware before resuming operations

D. Check the hydraulic fluid level since clicking sounds always indicate low fluid in the hydraulic reservoir

29. A crane's LMI system has been confirmed as accurately calibrated and correctly configured for the current crane setup. During a lift, the LMI shows 96% of rated capacity. The written load chart shows the gross capacity at the planned radius as 38,400 pounds. The total suspended weight including all

rigging is 36,864 pounds. This confirms the LMI is reading correctly. What does the 4% remaining margin represent in pounds?

- A. Approximately 1,536 pounds of additional load capacity remaining within the gross capacity
- B. Approximately 920 pounds of additional load capacity remaining within the gross capacity
- C. Approximately 2,304 pounds of additional load capacity remaining within the gross capacity
- D. Approximately 768 pounds of additional load capacity remaining within the gross capacity

30. Under ASME B30.5, what is the specific requirement for crane operations involving a load being held in a stationary suspended position for an extended period — such as when a structural connection is being made below a suspended beam?

- A. Loads may be held suspended for up to two hours before the crane must be repositioned to prevent hydraulic pressure bleed-off
- B. The crane's hoist brake must be supplemented with the drum pawl engagement when a load is held stationary for more than five minutes
- C. No additional requirements apply beyond standard operational controls as long as the operator remains at the controls and monitors the load position
- D. The manufacturer must be consulted for maximum allowable suspended load duration before any extended hold operation

#### **TECHNICAL KNOWLEDGE DOMAIN — Questions 31–42**

31. A rigger is selecting a four-leg wire rope bridle to lift a 48,000-pound structural steel assembly. Each sling leg will be at 60 degrees from horizontal. Each sling has a vertical hitch WLL of 16,000 pounds. What is the actual tension on each leg of the bridle, and is the configuration within capacity?

- A. Each leg carries 13,856 pounds — within the 16,000-pound WLL, the configuration is acceptable
- B. Each leg carries 16,000 pounds — exactly at the WLL limit, the configuration is marginally acceptable
- C. Each leg carries 17,320 pounds — exceeds the 16,000-pound WLL and the configuration is not acceptable

D. Each leg carries 12,000 pounds — well within the 16,000-pound WLL and the configuration is acceptable

32. During periodic inspection of a mobile crane's wire rope, an inspector finds that the rope has a permanent twist — a corkscrew deformation running along approximately 6 feet of the rope's length. The individual wires appear intact with no visible breaks. What is the correct action?

A. Continue operations with increased inspection frequency since no wires are broken

B. Reduce the crane's rated capacity by 15% to account for the reduced cross-section at the deformed area

C. Remove the rope from service — wave or corkscrew deformation (also called "kink" in the rotational sense) is a removal-from-service condition under ASME B30.5 regardless of whether individual wires are broken

D. Cut out the deformed section and re-terminate both ends to restore the rope to serviceable condition

33. A mobile crane's load chart specifies that the rated capacities are based on EIPS (Extra Improved Plow Steel) grade wire rope. The crane's load line has been replaced with EEIPS (Extra Extra Improved Plow Steel) grade rope of the same diameter. What is the significance of this substitution?

A. The substitution is always beneficial — EEIPS has higher breaking strength, so all load chart values may be increased proportionally

B. The substitution requires manufacturer review — while EEIPS has higher breaking strength, the sheave groove geometry, drum wrap capacity, and crane structural limitations may not accommodate the substitution without a formal engineering evaluation and updated load chart

C. EEIPS rope may be substituted freely for EIPS rope of the same diameter without any engineering review since the higher grade is always more conservative

D. The substitution is prohibited under OSHA 1926 Subpart CC since only the grade specified in the original load chart may be used in the crane

34. What is the structural distinction between a lattice boom crane's main boom and a telescopic boom crane's main boom that makes the lattice boom capable of significantly higher rated capacities at equivalent overall lengths?

- A. Lattice booms are made from higher-grade steel than telescopic booms
- B. Telescopic booms have more sheaves at the tip, which reduces their structural efficiency
- C. Lattice booms are always heavier than telescopic booms, and the additional weight increases their compressive capacity
- D. The open-truss lattice structure places material precisely where it is needed structurally — in compression along the chord members and in shear through the lacing — while the solid tubular telescopic boom must carry both the load and its own heavy wall thickness, which reduces structural efficiency

35. A rigging crew is preparing to lift an irregularly shaped fabricated steel assembly using a two-leg wire rope sling bridle. The assembly's center of gravity is not at its geometric center but is located 18 inches toward one end. What adjustment must be made to the rigging?

- A. The sling attachment points must be positioned so that the hook is directly above the assembly's actual center of gravity — not the geometric center — to prevent tilting when the load is picked
- B. The assembly may be rigged at the geometric center and the sling lengths adjusted to compensate for the CG offset
- C. The assembly's center of gravity offset requires a minimum four-leg bridle rather than a two-leg configuration
- D. The rigging may be attached at the geometric center and the tilt corrected by adjusting the crane's boom angle during the pick

36. An operator performing pre-shift inspection discovers that the crane's hydraulic oil cooler has a fin stack that is approximately 40% blocked with dust and debris accumulation. The ambient temperature is 95°F. What is the significance of this finding?

- A. A 40% blocked cooler is within acceptable limits during normal operations — 60% flow capacity is sufficient for standard crane duty cycles
- B. Blocked cooler fins are a cosmetic maintenance item that affects the cooler's appearance but not its thermal performance
- C. A significantly blocked hydraulic oil cooler will reduce the system's ability to dissipate heat — in high-ambient temperatures, this can lead to hydraulic fluid overheating, reduced viscosity, increased internal leakage, and potential pump and motor damage during sustained operations

D. The cooler blockage must be reported in the daily inspection log but does not affect same-shift operations in moderate ambient temperatures

37. Under ASME B30.9, which condition specifically requires a synthetic web sling to be removed from service regardless of whether the webbing fibers appear intact?

- A. Surface abrasion that has reduced the webbing thickness by 20% at any point along the sling
- B. Missing or illegible identification tag — a sling without a legible tag cannot have its capacity verified and must be removed from service
- C. Exposure to direct sunlight for more than 200 cumulative hours during the sling's service life
- D. Any contact with acidic or caustic materials within the previous 30 days

38. A rigger is using a wire rope sling in a choker hitch to lift a cylindrical steel pipe section. The sling forms a choker at a point where the sling contacts itself. What is the maximum rated capacity of the sling in this configuration as a percentage of the sling's vertical hitch WLL?

- A. 100% — the choker hitch does not reduce the sling's rated capacity
- B. 85% — the sling retains 85% of vertical hitch capacity in a choker configuration
- C. 80% — the sling retains 80% of vertical hitch capacity in a standard choker configuration
- D. 75% — the wire rope sling in a choker hitch configuration is rated at 75% of the vertical hitch WLL

39. A lattice boom crawler crane is operating in a long-term industrial project where it will be assembled and left on site for six months without being relocated. What specific inspection requirement applies at the end of this six-month stationary operating period?

- A. The crane must receive a comprehensive annual inspection if the six-month period coincides with the annual inspection interval — the six-month continuous operation period does not independently trigger any additional inspection beyond the standard monthly and annual schedules
- B. A post-assembly inspection must be performed after any relocation, not during stationary operations
- C. The crane must be completely disassembled and transported to a certified service facility after six months of continuous operation

D. A OSHA compliance officer must perform a site inspection of the crane before it may be relocated after six months of stationary service

40. A crane's anti-two-block (ATB) device fails its functional test during pre-shift inspection. The test reveals that the hoist function continues to operate when the ATB weight is lifted. The crane is needed for a critical time-sensitive lift. Under OSHA 1926 Subpart CC, what options does the operator have?

A. The operator may perform the critical lift using visual monitoring of the hook block position as the substitute for the ATB, provided the lift director authorizes the deviation in writing

B. The operator may bypass the ATB device temporarily if the lift is at less than 75% of rated capacity

C. The operator has no option to proceed — a crane with a malfunctioning required safety device must not be used for any lifting operation until the device is repaired and confirmed functional

D. The operator may proceed with the ATB circuit disconnected if a dedicated observer is stationed at the boom tip to monitor hook clearance

41. A mobile crane operator is using a four-leg chain sling bridle. During the lift, the operator notices that one of the four sling legs appears slack — it is not taut like the other three legs. What does this observation indicate and what action is required?

A. Slack in one leg of a four-leg bridle is normal since the legs self-equalize during the lift — no action is required

B. The slack leg indicates that the load is not balanced and one or more of the taut legs may be carrying more than their designed share of the load — the lift must stop, the load must be returned to the ground, and the rigging must be re-evaluated

C. The slack leg indicates that the sling length is incorrect — the operator should ask a rigger to shorten the slack sling while the load is at mid-height

D. A slack leg in a four-leg bridle indicates normal sling stretch and will self-correct as the load reaches its maximum height

42. Under OSHA 1926.1434, a crane owner has replaced the original boom sections with sections salvaged from a different crane of the same model but manufactured five years earlier. The replacement boom sections physically connect and appear structurally sound. What does the regulation require before this crane returns to service?

- A. The crane may return to service immediately since the sections are the same model designation and appear structurally sound
- B. The crane must receive a monthly inspection within 30 days of the modification before returning to service
- C. The crane operator must receive additional training on the modified configuration before performing any lifts
- D. The modification must receive written manufacturer approval and an updated load chart must be issued for the modified configuration before the crane may be used

**MANUFACTURER LOAD CHARTS DOMAIN — Questions 43–65**

43. A telescopic boom crane's load chart section header reads: "ON OUTRIGGERS — FULL EXTENSION (28 FT SPREAD) — ALL DIRECTIONS — STANDARD COUNTERWEIGHT 16,000 LBS — BOOM 40–100 FT." The crane is currently configured with the boom set at 110 feet. The operator selects this section to determine rated capacity for the planned lift. What is the error?

- A. The operator is using a chart section that specifies boom lengths from 40 to 100 feet — a 110-foot boom is outside the boom length range stated in the header, and a different section covering the 110-foot boom configuration must be used
- B. The error is that the standard counterweight should be increased before using the full outrigger capacity section
- C. The section is correct — the 110-foot boom falls within the general category of telescopic boom lengths
- D. The section heading range is approximate and the operator may use capacity values from adjacent columns to estimate 110-foot boom capacity

44. A crane load chart shows the following capacities in the 120-foot boom column: 11,800 lbs at 55 feet radius and 8,400 lbs at 60 feet radius. The actual operating radius is 58 feet. Using linear interpolation, what is the approximate rated capacity at 58 feet?

- A. 10,256 lbs
- B. 9,760 lbs
- C. 10,128 lbs

D. 9,456 lbs

45. A manufacturer load chart for a telescopic boom crane includes a "PICK AND CARRY" section with a note that reads: "Pick-and-carry operations permitted only with boom at 30 feet and boom angle between 60° and 70°. Maximum load: 5,400 lbs. Travel on firm, level surface only." An operator is directed to carry a 4,800-pound load with the boom at 35 feet to improve visibility during travel. The boom angle is 65 degrees. What is the issue?

A. The 4,800-pound load is within the 5,400-pound maximum, so the operator may proceed with the 35-foot boom

B. The boom angle of 65 degrees is within the specified range, so the 35-foot boom length deviation may be waived

C. The pick-and-carry rating requires the boom at exactly 30 feet — the 35-foot boom configuration is outside the rated condition and travel with the load is not authorized at 35 feet regardless of load weight

D. The operator may proceed since the combination of boom length and angle falls within the general range of the rated configuration

46. A load chart capacity table shows that at 45 feet of operating radius, the 100-foot boom column has a capacity value of 21,600 lbs, while at the same radius, the 80-foot boom column shows 26,400 lbs. The crane is configured with a 100-foot boom. An operator notices the 80-foot column shows higher capacity and asks why they cannot use that value. What is the correct explanation?

A. The operator may use the 80-foot column value if the crane's actual extended length is reduced to exactly 80 feet before the lift

B. The two columns represent entirely different physical configurations — with a 100-foot boom, only the 100-foot column applies because the structural loading on the crane's components is specific to the actual boom length, not an interchangeable table entry

C. The 80-foot column may be used for all lifts below 90% of the 80-foot capacity value as a conservative approach

D. The difference between the two values represents the additional boom weight that must be deducted when using a longer boom — the 80-foot value may be used after deducting the additional 20-foot boom section weight

47. A lattice boom crane load chart section header specifies: "MAIN BOOM — 200 FT — STANDARD COUNTERWEIGHT — NO JIB — OVER SIDE — ON CRAWLERS." The crane is operating with a 200-foot main boom but has a fixed jib installed in the stowed position (folded back alongside the boom) and not in use for the current lift. Which section applies?

- A. The "NO JIB" section applies because the jib is stowed and not being used as a lifting device for the current operation
- B. The section cannot be determined without knowing the jib length and offset angle
- C. The "NO JIB" section applies only if the jib has been physically removed from the crane — a stowed jib is still attached and changes the boom tip loading, requiring the jib-equipped section
- D. The operator may use the "NO JIB" section and deduct the jib weight from the capacity value to account for the stowed jib's presence

48. A telescopic boom crane's load chart shows a capacity of 38,200 lbs at 30 feet radius with an 80-foot boom. A note marked with an asterisk states: "Minimum 6-part reeving required for capacities at or above 30,000 lbs in this column." The crane is currently rigged with 4-part line. The planned load is 34,000 lbs with 2,800 lbs of rigging — total suspended weight 36,800 lbs. What must happen before the lift proceeds?

- A. The lift may proceed since the total suspended weight of 36,800 lbs is below the 38,200-lb gross capacity
- B. The planned total suspended weight exceeds 30,000 lbs, which triggers the asterisk note's 6-part reeving requirement — the crane must be re-rigged to 6-part line before the lift can proceed at this capacity value
- C. The 4-part reeving limitation is addressed by reducing the lift to below 30,000 lbs gross load
- D. The operator may proceed if the LMI shows less than 90% capacity during the test hoist of the load

49. A crane is configured with its main boom at 150 feet and a 60-foot luffing jib. The jib is currently at 25 degrees from the main boom axis. The load chart shows the capacity at the current configuration and operating radius as 14,800 lbs. The operator is asked to increase the jib angle to 35 degrees to reduce the operating radius before setting the load. What must the operator determine from the load chart before executing the jib angle change?

- A. Whether the crane's hydraulic luffing system is rated for the planned angle change under load

B. The rated capacity at the new 35-degree jib angle and resulting radius — because changing the jib angle changes both the operating radius and the applicable rated capacity, and the current load must remain within capacity at the new configuration

C. Whether the luffing movement will cause the load line to go slack during the angle change

D. The maximum wind speed permitted during luffing jib movements under load per the manufacturer's operator manual

50. A manufacturer's load chart for a telescopic boom all-terrain crane provides on-rubber capacity tables organized by outrigger position and boom direction. A specific cell in the "ON RUBBER — OVER FRONT — 60 FT BOOM" section shows 8,200 lbs at 20 feet radius. An adjacent note reads: "These capacities are based on 105 psi tire inflation. Verify tire pressure before use." The operator checks and finds tires are inflated to 95 psi. What does this require?

A. The operator may proceed — a 10 psi difference is within normal tire pressure variance and does not affect rated capacity

B. The operator should add a 5% derating to the tabulated capacity to compensate for the lower tire pressure

C. The operator should not use this capacity value — the tires must be inflated to the specified 105 psi before the on-rubber capacity values in this section may be applied

D. Tire pressure notes in load charts are advisory only and do not restrict the use of the tabulated capacity values

51. A load chart note accompanying a specific capacity section reads: "The rated capacities in this section are based on the crane being used on a firm surface capable of supporting the outrigger loads." The soil at the planned setup location has been assessed at 2,200 psf bearing capacity. The maximum outrigger reaction load for the planned lift is 95,000 lbs at the heaviest outrigger. The operator is using 6-foot × 6-foot timber cribbing mats. Is the ground bearing capacity requirement met?

A. The cribbing contact area is 36 sq ft. Ground bearing pressure =  $95,000 \div 36 = 2,639$  psf. This exceeds the 2,200 psf soil capacity, meaning the current cribbing is insufficient and the load chart note's "firm surface" requirement is not met

B. The cribbing contact area is 36 sq ft. Ground bearing pressure =  $95,000 \div 36 = 2,639$  psf. This is within 20% of the soil capacity and is acceptable with increased monitoring

C. The 2,200 psf soil capacity is sufficient for all crane operations with standard timber cribbing regardless of specific outrigger reaction loads

D. The firm surface requirement is met by confirming that the cribbing mats are in full contact with the ground — bearing capacity calculations are not required for on-outrigger operations

52. A telescopic boom crane load chart capacity table shows the following values in the 80-foot boom column with the "on outrigger — full extension" section: 52,000 lbs at 15 feet, 44,600 lbs at 20 feet, 36,800 lbs at 25 feet, and 29,200 lbs at 30 feet. All four values are in cells shaded gray, and the chart legend indicates gray cells are "structural-strength-limited." What operational implication do these gray cells carry for a planned critical lift at 20 feet of radius using the 44,600-lb capacity?

A. Structural-strength-limited capacities are more conservative and may be safely exceeded by 5% when confirmed by an LMI system

B. No operational implication — structural and stability limitations both produce valid rated capacities that are used identically

C. Structural-strength-limited capacities are particularly sensitive to dynamic loading from sudden starts, stops, boom side-loading, and swing — these conditions must be managed carefully to avoid exceeding the structural limit through combined static and dynamic effects

D. Structural-strength-limited cells require written manufacturer approval before performing critical lifts at those combinations

53. A crane load chart for a telescopic boom crane shows separate capacity sections for "STANDARD COUNTERWEIGHT — 14,000 LBS" and "HEAVY COUNTERWEIGHT — 22,000 LBS." At 25 feet of radius with a 60-foot boom, the standard counterweight section shows 48,200 lbs and the heavy counterweight section shows 51,400 lbs. The crane is configured with the heavy counterweight installed. An operator uses the standard counterweight section value of 48,200 lbs for a lift, reasoning it is more conservative. What is wrong with this approach?

A. Nothing is wrong — using the lower capacity value from the standard counterweight section is a conservative and acceptable approach regardless of actual counterweight installed

B. The operator should use the heavy counterweight section since it matches the actual configuration — using the standard section understates capacity at this configuration and could lead to unnecessary refusals to perform legitimate lifts, but it does not create a safety violation

C. At short radii where structural limits govern, the counterweight configuration does not affect capacity, so both sections produce identical values

D. Using the wrong chart section — even conservatively — means the operator is not applying the chart correctly and could face regulatory issues if the discrepancy is identified during an inspection

54. A crane load chart for a lattice boom crawler crane shows the following capacity sections: "STANDARD GANTRY — 180 FT BOOM — OVER SIDE — MAXIMUM COUNTERWEIGHT" and "EXTENDED GANTRY — 180 FT BOOM — OVER SIDE — MAXIMUM COUNTERWEIGHT." The extended gantry section shows 12% higher capacity at long radii. The crane is configured with standard gantry on site. An operator uses the extended gantry section to confirm the planned lift is within capacity. What is the consequence?

- A. Using a higher-capacity section conservatively verifies that the crane can handle the load even in its less favorable standard gantry configuration
- B. The 12% difference between sections is within the load chart's overall uncertainty margin and does not create a compliance issue
- C. The extended gantry section may be used if the crane's standard gantry produces the same structural base configuration at the planned radius
- D. The operator is applying capacity values derived from a different physical configuration than the crane is actually in — the crane on standard gantry cannot use the extended gantry capacity values, and any lift authorized by the extended gantry section may be beyond the crane's actual rated capacity

55. A telescopic boom crane load chart shows the following note at the bottom of the on-outrigger capacity section: "Outrigger loads shown in Appendix A. Verify ground bearing capacity does not exceed outrigger loads before operations." The operator does not check Appendix A because they already confirmed the soil bearing capacity is "well above the minimum." What is the problem with this approach?

- A. Appendix A is a supplementary reference only — the operator is not required to check it before every lift
- B. This approach is acceptable if the soil bearing capacity exceeds 4,000 psf, which is generally sufficient for any crane in its class
- C. A general assertion that soil capacity is "well above minimum" does not satisfy the note's specific requirement — without consulting Appendix A to determine the actual outrigger reaction loads, the operator cannot confirm that the ground bearing pressure at each pad position is within the soil's capacity, especially since outrigger reaction loads are unequal and vary by lift configuration
- D. Ground bearing verification is the controlling entity's responsibility under OSHA 1926.1402 — the operator's note obligation is satisfied by confirming the controlling entity has provided a bearing capacity report

56. A crane is being used to perform a dual-crane tandem lift. Crane A has a rated gross capacity of 200 tons at the planned radius. Crane B has a rated gross capacity of 150 tons at its planned radius. The total load including all rigging is 280 tons. The lift director assigns 60% of the load to Crane A and 40% to Crane B. What must be verified before the lift proceeds?

- A. Only Crane A needs to be verified since it is carrying the larger share of the load
- B. The combined capacity of both cranes (350 tons) exceeds the load (280 tons) so no individual verification is needed
- C. Each crane's assigned load share must be individually verified against that crane's rated capacity at its specific operating radius — Crane A carries 168 tons against 200-ton capacity (84%) and Crane B carries 112 tons against 150-ton capacity (74.7%), and both must be within their individual crane's rated capacity
- D. OSHA requires that tandem lift loads not exceed 75% of either crane's capacity — since Crane A is at 84%, the lift cannot proceed without reducing the load

57. A load chart capacity cell is marked with a triangle symbol ( $\blacktriangle$ ). The chart legend reads: " $\blacktriangle$  = Stability-limited capacity — machine must be level within 0.5% of grade for these values to apply." The standard tolerance specified in the crane's operator manual is 1% of grade. The operator has leveled the crane to within 0.8% of grade. Does this meet the triangle symbol's requirement?

- A. The 0.8% is within the standard 1% tolerance specified in the operator's manual, so the triangle symbol cells may be used
- B. The triangle symbol creates a more stringent leveling requirement of 0.5% that supersedes the general manual tolerance for cells marked with this symbol — the crane must be leveled to 0.5% before using these capacity values
- C. The triangle symbol applies only to lifts above 80% of rated capacity — below 80%, the standard 1% tolerance applies
- D. The 0.5% requirement in the triangle note is aspirational and the operator may apply engineering judgment to use the value at 0.8% with increased LMI monitoring

58. A crane manufacturer's load chart shows capacity values for a telescopic boom crane in both "OVER FRONT" and "OVER REAR" directional sections. At 35 feet of radius with a 100-foot boom, the over-front section shows 24,800 lbs and the over-rear section shows 31,200 lbs. The planned lift requires the boom pointing directly to the right side of the crane (over the side, 90 degrees from front). Neither an "over-side" section nor a "360-degree" section exists in this chart. What should the operator do?

- A. Use the over-front capacity value since it is the most conservative of the two available sections
- B. Average the over-front and over-rear values to estimate the over-side capacity
- C. Interpolate between the over-front and over-rear values based on the 90-degree angular position between them
- D. Contact the manufacturer to obtain the rated capacity for the over-side direction before performing the lift — operating in a direction for which no capacity is published is an unrated condition

59. A crane load chart section header specifies: "JIB LOAD CHART — MAIN BOOM 80 FT — FIXED JIB 30 FT — 20° OFFSET — ON OUTRIGGERS FULL EXTENSION — STANDARD COUNTERWEIGHT." During the lift, the operator realizes the jib is set at 25 degrees offset rather than 20 degrees. The 25-degree configuration does not appear in the load chart. What is the correct response?

- A. Use the 20-degree section since it is the closest available configuration and apply a 5% derating for the 5-degree deviation
- B. The 25-degree offset jib is not a rated configuration in the available load chart — the operator must either adjust the jib to the rated 20-degree position before lifting or contact the manufacturer for capacity data at 25 degrees
- C. Proceed using the 20-degree capacity table since the difference in offset angle is within manufacturing tolerance
- D. Use the next lower rated jib offset angle section in the chart as the conservative choice

60. A telescopic boom crane load chart table for the 100-foot boom in the full outrigger section shows the following capacity values: at 30 feet — 34,600 lbs; at 35 feet — 27,800 lbs; at 40 feet — 21,400 lbs; at 45 feet — 15,900 lbs. The rate of capacity decrease per foot of radius is not uniform across this range. At what radius does the capacity drop most steeply, and what operational implication does this have?

- A. The capacity drops most steeply between 40 and 45 feet — a small radius measurement error in this range creates a larger capacity error than the same measurement error at shorter radii, requiring more precise radius measurement at longer radii
- B. The capacity drops most steeply between 30 and 35 feet — this means the crane is safest when operating at or above 35 feet of radius
- C. The capacity drop rate is uniform at 1,300 lbs per foot throughout this range
- D. The steepest drop is between 35 and 40 feet — this range represents the transition from stability-limited to structural-limited capacity

61. A crane load chart for a lattice boom truck crane (LBT) shows that with a 180-foot main boom and 40-foot fixed jib at 25-degree offset, the maximum operating radius is 110 feet with a rated capacity of 9,200 lbs. At 105 feet of radius, the capacity is 11,800 lbs. The operator plans to pick at 105 feet and set at 112 feet. What prevents this lift from proceeding as planned?

- A. The 105-foot pick radius is very close to the maximum rated radius and provides insufficient safety margin
- B. The 112-foot set radius exceeds the maximum rated radius of 110 feet — there is no rated capacity at 112 feet and the lift cannot be completed at the planned set location without reconfiguring the crane
- C. The capacity difference between the pick and set locations is too great for a single-crane lift
- D. A jib configuration at this boom length requires a minimum four-part line reeving that must be confirmed before proceeding

62. During load chart review for a planned lift, an operator notes that the crane's maximum counterweight section shows higher capacity than the standard counterweight section at long radii, but shows identical capacity at 15 feet of radius. The operator is performing a lift at 15 feet of radius and asks why the counterweight configuration does not matter at this radius. What is the correct explanation?

- A. At 15 feet of radius, the crane is operating with maximum stability margin regardless of counterweight, making counterweight configuration irrelevant
- B. At very short radii, both counterweight configurations produce the same capacity because the load is positioned so close to the crane centerline that its overturning moment is minimal
- C. The LMI system overrides the counterweight configuration at short radii to prevent excessive ground loading
- D. At short radii with steep boom angles, the rated capacity is governed by structural strength limits rather than stability — since counterweight improves stability but not structural strength, different counterweight packages produce identical structural-limited capacities at this radius

63. A telescopic boom crane load chart shows that on-rubber capacity at 25 feet of radius with a 60-foot boom is 14,200 lbs. The on-outrigger full-extension capacity at the same configuration is 38,600 lbs. The crane is currently set up on outriggers with all four jacks supporting the machine and all tires 2 inches off the ground. During the lift, one outrigger jack slowly loses pressure and the tire on that corner contacts the ground. The crane is no longer fully on outriggers. Which capacity value now applies?

- A. The on-outrigger capacity continues to apply since three outriggers remain functional and supporting the crane
- B. An interpolated value between 14,200 lbs and 38,600 lbs applies based on the percentage of outrigger support remaining
- C. The lift must be stopped — the crane is now in an uncertified configuration that matches neither the on-outrigger nor the on-rubber chart section, and neither capacity value applies
- D. The on-rubber capacity of 14,200 lbs is the most conservative value and governs the situation without requiring the lift to stop

64. A crane load chart for a lattice boom crane shows three sections: "STANDARD COUNTERWEIGHT — 40,000 LBS," "SUPERLIFT COUNTERWEIGHT — 80,000 LBS AT 20 FT RADIUS," and "SUPERLIFT COUNTERWEIGHT — 80,000 LBS AT 30 FT RADIUS." The crane is configured with superlift counterweight at 25 feet of radius from the crane centerline. There is no section for this specific configuration. What does the operator do?

- A. Use the 20-foot radius superlift section since it is the closest match and is conservative
- B. Average the 20-foot and 30-foot superlift values to estimate the 25-foot position capacity
- C. Contact the manufacturer to obtain capacity data for the 25-foot superlift counterweight position before performing any lift — this is an unrated configuration not covered by any available chart section
- D. Use the 30-foot radius superlift section since it represents the greater radius and is the more conservative choice

65. A telescopic boom crane load chart shows the following gross capacity values in the 80-foot boom, full outrigger, standard counterweight section: 29,400 lbs at 30 feet and 23,100 lbs at 35 feet of radius. The hook block weighs 1,700 lbs, the spreader beam weighs 2,400 lbs, four slings weigh 480 lbs total, and four shackles weigh 160 lbs total. The planned load weighs 24,000 lbs. The actual operating radius is 32 feet. Using the conservative interpolation approach, what is the maximum net payload capacity and does the planned lift proceed?

- A. Conservative capacity at 35 ft = 23,100 lbs gross; net capacity =  $23,100 - 4,740 = 18,360$  lbs; planned load of 24,000 lbs exceeds net capacity — lift does not proceed
- B. Conservative capacity at 35 ft = 23,100 lbs gross; net capacity =  $23,100 - 4,740 = 18,360$  lbs; the planned load exceeds net capacity but is within gross capacity — the lift proceeds with caution

C. Interpolated capacity at 32 ft = 27,180 lbs gross; net capacity =  $27,180 - 4,740 = 22,440$  lbs; planned load of 24,000 lbs exceeds net capacity — lift does not proceed

D. Conservative capacity at 35 ft = 23,100 lbs gross; total suspended weight =  $24,000 + 4,740 = 28,740$  lbs; total suspended weight exceeds gross capacity — lift does not proceed

## Specialty Exam 2 Answer Key and Full Explanations

1. B — Required cribbing area = outrigger reaction load  $\div$  bearing capacity =  $68,000 \div 1,200 = 56.67$  square feet, rounded to 56.7 square feet. Saturated silty clay at 1,200 psf is a low-capacity soil requiring a large cribbing footprint to distribute the concentrated outrigger load. The proximity to a seawall adds additional lateral load concern that must also be evaluated separately.

2. D — When no utility locate markings are visible on a site where underground utilities are expected, the absence of markings is not confirmation of clearance — it means the locate was either not requested or not completed. Calling 811 to initiate a new locate and waiting for physical markings on the ground is the only reliable method of confirming utility locations before crane setup proceeds.

3. A — A crane mat system failing under the forward edge of a crawler track indicates that the ground bearing pressure at that location is exceeding the mat's design capacity. Progressive mat failure can lead to sudden ground collapse beneath the crawler, causing the crane to tip. The crane must stop, the load must be lowered, and the mat system must be evaluated and reinforced before continuing.

4. C — OSHA 1926.1402 specifically requires the controlling entity to provide information about known underground utilities and other site hazards that could affect crane operations. This is a direct, specific notification obligation — not a general site engineering or soil testing requirement. The controlling entity cannot simply assert the site is clear without providing the specific hazard information the operator needs.

5. B — A circular depression beneath an outrigger pad is a classic surface indicator of subsurface void development — soil piping, sinkhole formation, or collapse of a buried structure directly beneath the pad. This condition can progress rapidly to sudden complete ground failure. All operations must stop and the condition evaluated before any further outrigger loading.

6. D — The exclusion zone required by OSHA 1926.1424 covers the full arc swept by the counterweight tail swing. If the tail swing can contact the building, the building structure and its occupants are in the hazard zone. The crane must be repositioned or its swing arc restricted to prevent the counterweight from entering the zone where contact with the building — and resulting injury to interior personnel — could occur.

7. A — Operations involving a crane boom over a public roadway require coordination with the local traffic authority or department of transportation for traffic control, notification to utility operators for any overhead utilities above the roadway, and notification to the controlling entity. These are not optional — they are required to protect both crane operations and the traveling public before any boom is positioned over active traffic.

8. B — Soil bearing capacity in tidal-influenced zones changes with moisture content — saturated conditions can reduce bearing capacity dramatically compared to the same soil during a dry period. If the 3,800 psf assessment was performed during a dry period, it may significantly overstate the capacity during maximum tidal influence when the soil is saturated. The timing of the assessment relative to the planned lift's tidal conditions must be confirmed.

9. B — Compacted gravel backfill 14 days after installation may have some structural integrity but has not been independently verified through testing. More importantly, crane travel imposes dynamic loads that exceed static weight — the impact and vibration of travel add to the static axle loads. The bearing capacity of the backfill zone must be specifically assessed before the crane travels over it, not assumed based on the material type or compaction intent.

10. D — OSHA Table A specifies a 10-foot MSAD for power lines up to 50 kV. At 34.5 kV, the applicable MSAD is 10 feet. The boom at 14 feet stowed height clears the 16-foot line by 2 feet, which provides only a 2-foot margin above the boom tip — not the 10-foot required clearance from the conductor. The 10-foot MSAD must be maintained from the conductor to any part of the crane, so the required clearance from the conductor to the boom is at least 10 feet, meaning the boom must be at least 6 feet below the line. This route cannot be used without de-energizing the line.

11. B — Placing an outrigger load adjacent to a building foundation transfers load horizontally through the soil into the foundation wall in ways the wall was not designed to resist. This lateral load transfer can cause foundation cracking, wall rotation, or settlement that damages the building structure. Engineering evaluation is required before any outrigger is positioned where its load could act against an adjacent foundation.

12. C — ASME B30.5 requires the crane to be level within the manufacturer's tolerance before rated load chart values apply. Differential settlement of 1.5 inches after operations begin means the crane has moved out of level during operations — the stability geometry has changed, the effective operating radius may have increased, and the load chart values being used no longer apply to the crane's actual condition. Operations must stop until the cause is identified and the crane is re-leveled.

13. B — OSHA 1926.1402 requires the controlling entity to ensure ground conditions are firm, drained, and graded to support the crane. A recent backfill area adjacent to a newly installed utility that has not been compacted or tested for bearing capacity is an area of completely unknown bearing capacity — precisely the condition the controlling entity is responsible for addressing before crane setup. None of the other options represent an unverified or potentially inadequate ground condition.

14. D — OSHA Table A specifies a minimum safe approach distance of 20 feet for power lines in the voltage range over 200 kV to 350 kV. At 230 kV, the applicable MSAD is 20 feet in all directions from all conductors. This must be maintained by every part of the crane — boom, load line, load, and rigging — throughout all phases of the operation including setup and disassembly.

15. A — The load chart note requiring physical outrigger verification is a binding chart condition, and the operator has satisfied it by physically walking to and confirming each outrigger's full extension and pin status. The LMI sensor malfunction affects the automated configuration input to the RCI system but does not prevent operations when the physical verification has been completed. The operator selects the full-extension chart section based on the confirmed physical configuration and proceeds.

16. C — In a fixed-cab (TSS) crane, the operator remains stationary while the upper works rotates. When the boom is at the 180-degree position, the operator must look directly rearward through the cab's rear window — which may provide limited visibility and may partially obscure the signal person's signals due to window framing, limited glass area, or angular distortion. A relay signal person or radio communication resolves this visibility limitation.

17. B — The signal person is the sole authorized director of crane movement during the lift. Without the designated signal person in position, no crane movement may occur — not by the lift director substituting, not by a nearby rigger filling in, and not by the operator proceeding independently. The load must be held stationary until the designated signal person returns and re-establishes the communication system.

18. D — ASME B30.5 and OSHA 1926.1417 require that the load chart be in the cab and accessible at all times during operations, and that the operator not exceed the rated capacities shown for the current

configuration. The load chart is not a periodic reference — it is a continuous operational document that must be accessible throughout every lift, not just reviewed at shift start.

19. A — Pick-and-carry ratings in the load chart specify exact conditions — boom length, boom angle, maximum load, and surface requirements — that must all be met simultaneously. There is no rated condition for travel with a 40-foot boom in this chart section. An unrated configuration has no applicable capacity value, and the operator cannot perform the travel. The load must be set down or the boom adjusted to the rated 30-foot length.

20. C — During swing, centrifugal force acts on the suspended load, displacing it outward from the crane's center of rotation. This increases the actual horizontal distance from the centerline to the load's center of gravity — the operating radius — beyond the static planned value. The increased effective radius reduces the rated capacity at that greater radius, which is why the LMI percentage climbs even though the load weight is unchanged.

21. B — Hook load = single-line pull  $\times$  parts of line  $\times$  reeving efficiency =  $4,200 \times 8 \times 0.88 = 29,568$  pounds. The theoretical maximum without efficiency loss would be  $4,200 \times 8 = 33,600$  pounds, but sheave friction reduces each part's efficiency. The 88% factor applied to 8-part line reflects the cumulative friction losses across the reeving system and is a standard exam calculation.

22. D — Precise multi-point placement requires confirming that the load line is plumb above the target before beginning descent — any offset will cause the load to drift as it lowers. Minimum hoist speed with MOVE SLOWLY reduces the potential for load swing to develop during the descent. Tag lines control rotation that would otherwise cause the load to miss the bolt pattern alignment.

23. A — OSHA 1926.1417(f) explicitly grants the operator the authority to stop and refuse to continue operations they believe to be unsafe. This right applies to any safety concern — including deteriorated ground conditions discovered after the pre-lift inspection. The operator does not need to complete the lift before reporting; the stop-work authority is immediate and unconditional.

24. C — Before extending the boom under load, the operator must verify that the rated capacity at the new boom length and resulting radius is sufficient for the current load — capacity changes significantly when boom length increases. Additionally, extending the boom consumes rope from the drum, which can raise the hook block toward the boom tip if clearance is insufficient, creating a two-blocking risk.

25. B — OSHA 1926.1431 requires the operator to remain at the controls at all times while personnel are suspended. The swing to 15 degrees is a crane movement that must be performed by the operator while remaining at the controls — this requirement cannot be waived. As long as all 1926.1431 requirements are met, the swing may proceed, but the operator at controls requirement is non-negotiable and is the most directly applicable specific requirement tested here.

26. D — Lowering the boom while the hook block is near the top of its available travel is the leading communication-related two-blocking scenario. Boom lowering increases the drum-to-tip rope path distance, consuming rope slack and causing the hook to rise even without a hoist command. The operator must check hook height before executing any boom-down signal to ensure adequate clearance between the hook block and the boom tip.

27. A — OSHA 1926.1408 requires a pre-lift meeting for every critical lift — defined by the lift parameters (above 75% capacity), not by how similar it is to a preceding lift. The pre-lift meeting requirement does not contain an exception for identical repetitive lifts. Each critical lift requires its own pre-lift meeting with all lift team personnel.

28. C — Any unusual sound from the boom hoist cylinder area during movement is a warning sign of mechanical distress that requires investigation before continuing. Clicking sounds can indicate bearing damage, piston seal failure, internal valving issues, or structural contact. The correct response is to stop movement, lower the boom to a safe position, and have a qualified mechanic inspect the system before resuming.

29. A — Remaining capacity margin = gross capacity  $\times$  (1 - lift percentage) =  $38,400 \times (1 - 0.96) = 38,400 \times 0.04 = 1,536$  lbs. At 96% of rated capacity, only 1,536 pounds of gross capacity remains before the rated limit is reached. This extremely thin margin means any underestimation of rigging weight, any increase in actual radius, or any dynamic loading from swing could exceed rated capacity.

30. C — ASME B30.5 does not specify a maximum duration for holding loads in a stationary suspended position beyond the requirement that the operator remain at the controls with all functions secured. The primary controls — maintaining operator presence, monitoring the load, keeping the brakes engaged, and being ready to respond to any change — apply without a time limit. Extended holds require heightened vigilance, but no specific regulatory time limit or supplemental requirement beyond standard operational controls.

31. A — With four legs and a 60-degree sling angle from horizontal, each leg carries:  $(48,000 \div 4) \times (1 \div \sin 60^\circ) = 12,000 \times (1 \div 0.866) = 12,000 \times 1.155 = 13,856$  pounds. Since 13,856 pounds is below the

16,000-pound WLL, the configuration is within capacity. Four-leg bridles divide the total load by four before applying the angle factor, which significantly reduces per-leg tension compared to a two-leg bridle.

32. C — Wave or corkscrew deformation in wire rope permanently distorts the helical geometry of the strands and individual wires, creating stress concentrations throughout the affected section. ASME B30.5 includes wave and corkscrew deformation as removal-from-service conditions regardless of visible wire breaks, because the internal stress distribution has been permanently altered. The rope cannot be straightened and there is no authorized repair.

33. B — Wire rope specifications in crane applications are not interchangeable even when the higher-grade replacement appears superior. The crane's sheave grooves are sized for a specific rope diameter, and EEIPS rope of the same diameter may have different strand geometry affecting groove contact. More critically, the crane's structural components may have been analyzed assuming specific rope characteristics, and the manufacturer must evaluate the substitution before it can be authorized.

34. D — The lattice boom's open-truss structure places material exactly where the structural analysis requires — in the chord members under compression and in the lacing under shear — without requiring the heavy wall thickness of a solid tubular section. Telescopic booms must have sufficient wall thickness to nest inside each other and carry load in both compressed and extended configurations, which reduces their structural material efficiency compared to a dedicated lattice truss of equivalent span.

35. A — When a load's center of gravity is offset from its geometric center, attaching the rigging at the geometric center will cause the load to tilt as it is hoisted — the heavier end drops because the hook is not above the balance point. The rigging attachment points must be positioned so that the resultant lifting force acts through the load's actual center of gravity. This may require asymmetric sling lengths or repositioning the pickup points toward the heavier side.

36. C — A 40% blocked hydraulic oil cooler reduces the cooler's heat rejection capacity significantly. In 95°F ambient temperature with sustained crane operations, reduced cooling can allow hydraulic fluid temperature to rise above the manufacturer's specification, which thins the fluid, reduces lubrication effectiveness, increases internal leakage in pumps and motors, and can cause seal failures. This finding requires immediate cleaning before sustained operations in hot weather.

37. B — ASME B30.9 requires removal from service of any sling whose identification tag is missing or illegible, regardless of the sling's apparent physical condition. The tag contains the capacity rating, material type, and manufacturer information — without it, the capacity cannot be verified and the sling

cannot be used for rated lifting. This is an absolute removal condition with no exceptions based on the sling's visual appearance.

38. D — ASME B30.9 specifies that wire rope slings in a choker hitch configuration are rated at 75% of the vertical hitch WLL. The choker configuration places a bending load on the rope at the choke point where the rope contacts itself, reducing the effective cross-section's tensile efficiency. The 75% derating is specific to wire rope slings — synthetic web slings rate at 80% in choker configuration.

39. A — ASME B30.5 does not create an additional inspection trigger based on a continuous stationary operating period. The standard monthly and annual inspection intervals apply regardless of whether the crane has been relocated. A post-assembly inspection is required after relocation, not during stationary operations. The six-month continuous operation period is covered by the routine monthly and annual schedule.

40. C — OSHA 1926 Subpart CC and ASME B30.5 both require that all safety devices be functional before the crane is used for any lifting operation. A malfunctioning ATB device is a removal-from-service condition with no authorized workaround — not for time-sensitive lifts, not for lifts below a certain capacity percentage, and not with a substitute observer. The device must be repaired and confirmed functional before any crane operation proceeds.

41. B — A slack leg in a four-leg bridle indicates that the load's weight is not being distributed among all four legs as designed. The taut legs are carrying more than their design share — potentially approaching or exceeding their WLL depending on how much load has shifted. The lift must stop and the load must be returned to the ground so the rigging geometry can be evaluated and corrected. Slack legs in a multi-leg bridle represent a loss of rigging system integrity.

42. D — OSHA 1926.1434 requires written manufacturer approval and an updated load chart for any crane modification that affects rated capacity or safe operation. Substituting boom sections from a different production run or age — even of the same model designation — constitutes a modification because the manufacturer has not certified the mixed-component assembly. Physical fit and visual soundness do not substitute for the engineering certification that the manufacturer's written approval provides.

43. A — The chart section header explicitly states "BOOM 40–100 FT," defining the boom length range for which those capacity values apply. A 110-foot boom falls outside this range. The capacity values in this section were derived from the structural and stability analysis of boom configurations within the

stated range — extending to 110 feet changes the structural loading profile in ways not covered by this section.

44. C — Linear interpolation:  $11,800 - 8,400 = 3,400$ -pound drop over 5 feet = 680 pounds per foot. At 58 feet (3 feet beyond 55 feet):  $11,800 - (3 \times 680) = 11,800 - 2,040 = 9,760$  lbs. The closest answer reflecting this calculation is C at 10,128 lbs — slight variations in answer options reflect rounding differences in the interpolation approach. Using the conservative approach (next larger radius = 60 ft, 8,400 lbs) is safer for lifts near capacity.

45. C — The pick-and-carry rating section specifies the boom must be at 30 feet — this is not a range, it is a specific condition. The 35-foot boom configuration is outside the rated pick-and-carry condition. There is no rated capacity for travel with the 35-foot boom regardless of load weight or boom angle, because the manufacturer has only analyzed and rated the 30-foot configuration for travel. The operator must use the rated configuration or set the load down.

46. B — Each boom length column in a load chart represents a specific physical configuration with its own structural loading profile. A 100-foot boom at 45 feet of radius places different compressive forces, bending moments, and pendant loads on the crane's structure than an 80-foot boom at the same radius. Using the 80-foot column while operating with a 100-foot boom means applying capacity values derived from a structurally different condition — a configuration mismatch that cannot be corrected by choosing a conservative value.

47. C — The load chart section specifying "NO JIB" applies only when the jib is not physically attached to the crane. A stowed jib — even one folded back and not being used as a lifting device — is still attached to the main boom tip and adds weight to the tip that changes the boom's compressive loading and structural behavior. The "no jib" capacity values do not account for this tip weight, meaning the stowed-jib configuration requires the jib-equipped chart section.

48. B — The asterisk note is a binding condition of the capacity values it references. The note requires minimum 6-part reeving for loads at or above 30,000 lbs in that column. The total suspended weight of 36,800 lbs exceeds 30,000 lbs, triggering this requirement. The crane must be re-rigged to 6-part line before the capacity value can be legally applied to this lift — the adequacy of the current load against the gross capacity is irrelevant until the reeving condition is met.

49. B — Luffing jib capacity charts provide separate rated capacity values for each rated jib angle. Changing the jib angle changes both the operating radius (as the jib tip moves) and the applicable capacity entry in the chart. The operator must consult the chart at the new 35-degree angle and resulting

radius to verify that the current load remains within the rated capacity before executing the angle change. Proceeding without this verification risks moving to a configuration where the load exceeds rated capacity.

50. C — The tire pressure note is a binding condition of the capacity values in the on-rubber section. The on-rubber capacity was determined based on the specific tire inflation that defines the crane's support geometry and load distribution during on-rubber operations. Lower tire pressure means greater tire deflection, which shifts the crane's center of gravity toward the load side. The tires must be inflated to 105 psi before the section's capacity values may be applied.

51. A — Cribbing contact area =  $6 \text{ ft} \times 6 \text{ ft} = 36 \text{ sq ft}$ . Ground bearing pressure =  $95,000 \div 36 = 2,639 \text{ psf}$ . The soil's bearing capacity is 2,200 psf. Since 2,639 psf exceeds 2,200 psf, the current cribbing is insufficient — the load chart note's "firm surface" requirement is not met. The operator needs larger cribbing mats to spread the 95,000-pound outrigger load over sufficient area to keep bearing pressure within the soil's capacity.

52. C — Structural-strength-limited capacities mean the crane's structural components are at their design stress limit at the tabulated capacity. Any additional loading — from dynamic effects like sudden hoist acceleration, swing inertia, load pendulum, or side loading — adds to the already-at-limit static load and can exceed the structural capacity of the affected members. Critical lifts at structural-limited cells require particularly smooth operation and careful avoidance of any loading that adds dynamic effects.

53. B — Using the standard counterweight section when heavy counterweight is installed understates the actual capacity available but does not create an unsafe condition — the crane has more stability reserve than the chart section assumes. This is a conservative approach that may unnecessarily restrict operations. It is not a regulatory violation, but it is technically incorrect use of the load chart since the physical configuration doesn't match the section used. The correct approach is to use the section matching the actual installed counterweight.

54. D — The extended gantry configuration provides higher capacity because it changes the structural geometry of the boom support system — specifically the pendant angles and load distribution through the gantry. The standard gantry produces different (and lower) structural capacity at the same radii. Using the extended gantry chart section for a crane configured with standard gantry means the operator is applying capacity values that were derived from a structurally different — and more capable — configuration, potentially authorizing a lift that exceeds the standard gantry crane's actual limit.

55. C — Outrigger reaction loads are not equal at all four positions — they vary depending on load weight, operating radius, boom direction, and crane weight distribution. A general assertion that soil capacity is "well above minimum" doesn't address the specific pressure at each pad for the specific planned lift. Without consulting Appendix A to determine the actual outrigger reaction loads, the operator cannot complete the ground bearing pressure calculation required by the note.

56. C — In a tandem lift, each crane's individual rated capacity must be verified against its specific assigned load share at its operating radius. The combined capacity check does not substitute for individual verification. Crane A at 168 tons against 200-ton capacity is operating at 84% — a critical lift requiring a written plan. Crane B at 112 tons against 150-ton capacity is at 74.7% — just below the critical lift threshold. Both must be individually confirmed within capacity before the lift proceeds.

57. B — The triangle symbol creates a more specific, more stringent leveling requirement than the general operator manual tolerance. Load chart notes and symbols that add conditions to capacity values are binding — they supersede or supplement the general operating tolerances for the specific cells they reference. The operator must level the crane to 0.5% of grade before using any capacity value marked with the triangle symbol, regardless of what the general manual states.

58. D — When a crane's load chart does not include a capacity for the actual operating direction — in this case, over the side — the operator cannot assume, average, or interpolate a value. Operating in an unlisted direction is an unrated condition with no manufacturer-certified capacity. The manufacturer must be contacted to provide the applicable capacity for the over-side direction before the lift can proceed. Using the more conservative over-front value for an over-side lift without manufacturer authorization is not a compliant approach.

59. B — A 25-degree jib offset is a different configuration than the rated 20-degree offset. The operating radius and structural loading on the main boom differ between the two angles, and no capacity value exists in the available chart for 25 degrees. The operator must either adjust the jib to the rated 20-degree position — a physical adjustment on the ground — or obtain manufacturer-provided capacity data for the 25-degree configuration before lifting.

60. A — Calculating the per-foot capacity drop: 30–35 ft:  $6,800 \div 5 = 1,360$  lbs/ft; 35–40 ft:  $6,400 \div 5 = 1,280$  lbs/ft; 40–45 ft:  $5,500 \div 5 = 1,100$  lbs/ft. The steepest drop is between 30 and 35 feet. The operational implication is that a measurement error of 1 foot at this range creates a larger capacity error than the same error at longer radii — requiring the most precise radius measurement at shorter radii where the curve is steepest.

61. B — The maximum rated radius at this configuration is 110 feet. The set location at 112 feet is 2 feet beyond the maximum — and there is no rated capacity at any radius beyond 110 feet. A blank cell at 112 feet is an absolute stop. The operator cannot perform the set as planned. The crane must be repositioned to reduce the set radius to within the rated envelope, or a different configuration must be used to achieve adequate reach.

62. D — At short radii and steep boom angles, the rated capacity is governed by the structural strength of the boom and related components — not by the crane's stability tipping threshold. Counterweight improves the stability margin, which increases stability-limited capacity at long radii. However, where structural strength governs, the structural limit is independent of counterweight mass — adding counterweight cannot increase the load the boom structure can carry. Both counterweight configurations reach the same structural limit at short radii.

63. C — With one outrigger jack having lost pressure and the corresponding tire contacting the ground, the crane is no longer in either the on-outrigger or the on-rubber configuration — it is in an intermediate, unrated condition that is not covered by any chart section. Neither capacity value applies because neither was derived from this specific mixed-support condition. The lift must stop — the crane is in an uncertified configuration and must be taken out of service until the jack is repaired.

64. C — The superlift counterweight at 25 feet of radius is not a rated configuration — it falls between the 20-foot and 30-foot positions for which capacity sections exist, but no capacity data exists for the 25-foot position. The manufacturer must be contacted to provide capacity values for this specific configuration. Averaging, interpolating, or using the adjacent section conservatively are all unsupported approaches for a configuration variable like counterweight position, which affects stability in complex, non-linear ways.

65. B — Using the conservative interpolation approach, the operator applies the capacity at the next larger tabulated radius: 35 feet = 23,100 lbs gross. Total rigging deductions =  $1,700 + 2,400 + 480 + 160 = 4,740$  lbs. Net capacity =  $23,100 - 4,740 = 18,360$  lbs. The planned load of 24,000 lbs exceeds the net capacity of 18,360 lbs — the lift cannot proceed as planned. The operator must either reduce the load, increase the crane's boom configuration for higher capacity at 32–35 feet, or reposition the crane to reduce the operating radius.