

SIMULATION SET 4

SITE DOMAIN — Questions 1–21

1. A mobile crane is being positioned on a job site where a drainage swale runs parallel to the planned setup area, approximately 10 feet from the nearest outrigger position. The swale collects and channels water from the site during rain events. What is the primary concern this drainage feature creates for crane setup?
 - A. The swale may collect debris that obstructs the crane's travel route between lifts
 - B. The swale may have eroded the soil between itself and the outrigger position, and the soil adjacent to drainage channels is often softer and less stable than soil farther from the drainage feature
 - C. The swale may channel water toward the outrigger pads during rain, increasing the risk of pad corrosion over time
 - D. The swale limits the usable outrigger spread by occupying space that would otherwise be available for full extension

2. Under OSHA 1926.1408, what is the most restrictive of the three control options available when a crane must work near an energized power line?
 - A. Using a dedicated spotter with an encroachment prevention plan
 - B. Installing insulating line guards provided by the utility operator
 - C. Requesting a voluntary de-energization window from the utility during off-peak hours
 - D. De-energizing and visibly grounding the power line — this option eliminates the electrical hazard entirely rather than managing it, making all other controls unnecessary

3. When the ground beneath a crane outrigger is sloped away from the crane by 5 degrees, what specific effect does this slope create on the outrigger's load transfer to the soil?

- A. A sloped bearing surface introduces a horizontal component to the outrigger load in addition to the vertical component, potentially causing the cribbing or outrigger pad to slide laterally and reducing the effective vertical support under the outrigger
- B. A 5-degree slope has no practical effect on outrigger load distribution and requires no special consideration
- C. The sloped surface increases the effective bearing area of the cribbing by the cosine of the slope angle
- D. A 5-degree slope increases the crane's restoring moment on the uphill side, which is beneficial for stability

4. A crane crew is setting up on a job site where the ground has been disturbed by frost heave during winter conditions. The surface appears relatively level but has an irregular, bumpy texture from freeze-thaw cycling. What does frost heave indicate about the subsurface condition that is relevant to crane setup?

- A. Frost heave improves soil bearing capacity by densifying the soil through the freeze-thaw consolidation process
- B. Frost heave indicates the soil has a high moisture content that promotes corrosion of steel outrigger components
- C. Frost-heaved soils have been physically disturbed by ice crystal formation that separated and lifted soil particles — the soil may have reduced bearing capacity, increased void content, and variable density compared to undisturbed soil
- D. Frost heave only affects the top 2 inches of soil and has no influence on the bearing capacity available to crane outriggers

5. Under OSHA 1926.1412, which of the following correctly describes the post-assembly inspection requirement for a crane that has been assembled at a new location after transport?

- A. Post-assembly inspection is optional if the monthly inspection was completed within the previous 14 days before transport
- B. A post-assembly inspection must be conducted by a qualified person before the crane is put into service at the new location — this inspection ensures that the crane was assembled correctly and that no damage occurred during transport or reassembly

C. Post-assembly inspection must be conducted by an NCCCO-certified operator from a different company than the crane owner to ensure independence

D. Post-assembly inspection requires a minimum of 48 hours after reassembly to allow structural components to settle before inspection

6. A crane is operating near a sloped hillside where the hillside itself is uphill from the crane's position. Heavy rain has saturated the hillside and a small section of slope has visibly begun to slide. The crane is positioned 30 feet from the base of the slope. What is the required response?

A. Continue operations if the crane's outriggers are at full extension and the LMI reads below 80% capacity

B. Reduce the operating radius to keep the load away from the slope area while completing the current lift

C. Sound the horn to warn nearby workers and continue the current lift cycle before stopping

D. Stop all crane operations immediately, lower the load to the ground, and evacuate the crane and the area near the hillside — a visible slope failure is an immediate geotechnical hazard that cannot be managed through crane operational adjustments

7. When a crane is set up on a surface that has both a fore-aft slope and a side-to-side slope, what is the correct approach for establishing the crane's level condition?

A. The crane must be leveled in both axes simultaneously — the bubble level or digital inclinometer must show the crane within the manufacturer's tolerance in both the fore-aft and side-to-side directions at the same time before load chart values apply

B. Level the crane in the fore-aft axis first, then accept any residual side-to-side slope as a secondary condition

C. Level the crane in the direction of the planned lift only — the axis perpendicular to the boom direction has no effect on stability

D. A combined slope of up to 2% in any direction is acceptable for all cranes without specific leveling procedures

8. Under OSHA 1926.1402, which party is responsible for ensuring that the ground at a crane setup location is "firm, drained, and graded" before crane operations begin?

- A. The crane operator, who must evaluate and confirm ground conditions before beginning any lift
- B. The crane owner, who is responsible for providing a crane that can operate on any ground condition
- C. The controlling entity — the prime contractor, general contractor, or other party with overall site responsibility — bears this specific obligation under OSHA 1926.1402
- D. The lift director, who must certify ground conditions in writing before each critical lift

9. A crane operator discovers during pre-shift inspection that the crane's outrigger horizontal beam on the right front has a visible crack in the beam web at the point where it exits the carbody. What is the correct action?

- A. Continue operations with the cracked outrigger beam reduced to 50% extension to reduce the stress at the crack location
- B. Remove the crane from service immediately — a crack in an outrigger structural member is a removal-from-service condition that requires repair before any lifting operations
- C. Monitor the crack during operations and stop if the crack visibly grows
- D. Fill the crack with structural epoxy and allow to cure overnight before returning to service

10. The most significant difference between ground bearing requirements for crane outrigger loads versus typical vehicle traffic loads on the same surface is which of the following?

- A. Vehicle loads are cyclic and crane loads are static, so vehicle loads are always more damaging to the soil
- B. Vehicle loads are distributed across multiple axles while crane outrigger loads are concentrated at four specific point locations — the concentrated nature of outrigger loads creates far higher bearing pressures per unit area than distributed vehicle traffic
- C. Vehicle traffic loads on pavement are irrelevant to crane setup since pavement is always rated for crane operations
- D. Crane outrigger loads act horizontally, while vehicle loads act vertically, creating different soil failure mechanisms

11. A crane operator is evaluating a job site where the planned set location for a structural steel beam is on the second floor of a building under construction. The crane will need to swing the load over the first

floor's open deck area where workers are installing flooring. What does OSHA 1926.1425 require before the swing over the occupied area begins?

- A. All workers on the first-floor deck must be cleared from the area directly below the load's travel path before the swing begins — loads must not pass over personnel under any circumstances
- B. Workers on the first-floor deck must wear hard hats rated for falling object protection during the overhead lift
- C. The operator must reduce the lift to the minimum required height to limit the consequence of a potential load drop
- D. The signal person must confirm that the first-floor area appears clear from their vantage point before the lift proceeds

12. An operator is setting up for a lift on a site where significant rainfall occurred in the 48 hours prior to operations. The setup area is sandy loam soil that was previously assessed at 3,500 psf. The surface currently shows ponding in low areas adjacent to the planned outrigger locations. What is the primary concern with the previously assessed bearing capacity?

- A. Sandy loam dries quickly and the 3,500 psf value should be valid within 24 hours of rain cessation
- B. The sandy loam may have a lower bearing capacity now than at the time of the previous assessment — ponding indicates the soil is saturated, and saturated sandy loam can lose significant bearing capacity compared to its dry-condition assessment value
- C. The ponding is only in low areas and not directly under the outrigger positions, so the assessment remains valid
- D. Bearing capacity assessments are performed at saturation conditions by standard practice and already account for rainfall effects

13. What is the maximum time permitted between annual comprehensive crane inspections under ASME B30.5?

- A. 18 months, allowing flexibility for scheduling during peak operating seasons
- B. 12 months — inspections must occur at intervals not exceeding 12 months
- C. 24 months for cranes that have been in light-duty service during the interval

D. 12 months for cranes in regular service but up to 18 months for cranes in occasional or standby service

14. A crane is set up at a construction site that borders a residential neighborhood. During a lift, a neighbor approaches the fence line and enters the exclusion zone that had been established with barrier tape. The neighbor appears to be taking photographs. What is the correct response?

- A. The operator should reduce swing speed to minimum while the neighbor is in the exclusion zone
- B. The signal person should give verbal instructions to the neighbor to back away while continuing the lift
- C. The operator should slow the crane to minimum speed but complete the current pick before stopping
- D. All crane movement must stop immediately — the exclusion zone has been breached by an unauthorized person, and no crane movement may resume until the person has been removed from the zone and the zone boundary is reestablished

15. When a crane's outrigger pads are being placed on a surface where previous tire ruts from heavy equipment are visible, what does the presence of the ruts indicate about the ground condition?

- A. The tire ruts confirm that the ground has already been loaded and is therefore compacted and more stable for crane outrigger use
- B. The presence of a formal construction site indicates the ground has been engineered for heavy equipment loading
- C. The depth and width of the tire ruts indicate ground surface softness — significant ruts suggest the soil is deforming under vehicle loads, and the bearing capacity may be insufficient for the more concentrated crane outrigger loads
- D. Tire ruts are caused by rolling friction and do not reflect the soil's bearing capacity for static outrigger loads

16. A crane is being set up near the corner of a building where two underground utilities converge — a water main and a gas line — within the planned outrigger spread area. Both utilities have been marked by the locate service. What approach best addresses this condition?

- A. Proceed with setup since both utilities have been properly marked and the outrigger pads are not directly over either marking
- B. The two utility lines are within the setup area, requiring the outrigger positions to be carefully selected outside the tolerance zones for both utilities or the crane to be repositioned to avoid placing any outrigger over or within the tolerance zone of either utility
- C. Only the gas line requires special outrigger avoidance — water mains can support crane outrigger loads without concern
- D. Mark the utility locations with cones and station a spotter at each utility marking during the lift

17. Under OSHA 1926.1419 through 1926.1422, what are the three types of signal systems that may be used between a signal person and crane operator?

- A. Visual signals only, voice signals only, or a combination of both as determined by the lift director
- B. Hand signals, voice signals, and electronic (radio or other) communication signals — all three are recognized signal types under OSHA 1926 Subpart CC, and the type used must be established and understood by both parties before operations begin
- C. Hand signals are the only OSHA-recognized signal type — all other communication methods require additional qualification
- D. Radio communication only when the signal person is more than 50 feet from the operator's cab

18. A crane operator is informed by the general contractor that the setup area was prepared by placing 12 inches of compacted crushed stone over existing soft clay. The crushed stone has been in place for three months. What concern does this information create for outrigger support?

- A. Three months is sufficient time for the crushed stone to bond chemically with the clay below, creating a monolithic bearing layer
- B. Crushed stone always provides excellent bearing capacity for crane outriggers regardless of the underlying soil
- C. The crushed stone was placed within the past three months and its compaction testing was not mentioned
- D. The 12-inch crushed stone layer may adequately spread the load only to the depth of the stone, but beneath it, the soft clay retains its low bearing capacity — the outrigger loads must be checked against both the stone layer capacity and the underlying clay capacity to confirm the full load path is adequate

19. An operator is performing a lift on a job site near a river. The soil is primarily silt and sand with a shallow water table at 4 feet of depth. The site has been dry for two weeks. What specific soil behavior concern applies to this combination of soil type and conditions during crane operation?

A. Loose saturated sand and silt deposits near a water table can experience dynamic liquefaction under the vibration and impact loads associated with crane operations — the site should be assessed by a geotechnical engineer for liquefaction susceptibility before crane setup

B. Sandy silt soils always provide adequate bearing capacity for crane operations when the surface is visibly dry

C. The 4-foot water table depth ensures adequate bearing capacity since the capillary zone of moisture does not reach the surface in two weeks of dry weather

D. Silt and sand soils have no unique bearing capacity concerns compared to other soil types under crane outrigger loading

20. The APWA uniform color code system uses purple markings to indicate which type of underground utility?

A. Steam, geothermal, or other pressurized non-flammable process utilities

B. Reclaimed water, irrigation, or slurry pipelines

C. Fiber optic communications infrastructure specifically in urban environments

D. Sewage force mains operating under pressure from pump stations

21. What does the term "soil bearing capacity" specifically measure, and how is it relevant to crane outrigger placement?

A. The depth at which competent rock or dense bearing strata is found below grade

B. The maximum load per unit area the soil can support without shear failure or excessive settlement — used to calculate the minimum cribbing area required to keep outrigger contact pressure within the soil's allowable limit

C. The degree to which soil has been compacted relative to its maximum modified Proctor density

D. The rate at which water drains through the soil under applied load, which determines the crane's maximum allowable static operating time before settlement

OPERATIONS DOMAIN — Questions 22–48

22. A signal person at a job site gives the following signal: both arms extended horizontally at shoulder height, palms facing down, moving rapidly back and forth simultaneously. What does this signal command?

- A. Lower the load slowly — the double arm signal with palms down indicates controlled lowering
- B. Travel both tracks simultaneously — the bilateral arm movement signals crawler travel
- C. Dog Everything — both arms extended and held stationary indicates an operational pause
- D. Emergency Stop — this signal may be given by any person at any time and requires immediate cessation of all crane movement

23. Under OSHA 1926.1416, what specific requirement applies to the speed at which a crane operator must respond to a stop signal from the designated signal person?

- A. The operator must stop all crane movement immediately upon receiving any stop signal — the stop response is not subject to a brief continuation period to complete the current movement gracefully
- B. The operator must stop within 3 seconds of receiving a stop signal to allow for safe deceleration of the load
- C. The stop response time is determined by the crane's rated swing speed and may vary by configuration
- D. The standard stop response time for non-emergency stops is within 5 seconds of signal receipt

24. A crane operator is performing a lift when the wind speed increases from 18 mph to 26 mph during the lift cycle. The load is currently at mid-height with the swing 45 degrees from the set position. The crane's general manufacturer wind limit is 30 mph. The load is a large precast concrete panel 30 feet wide and 12 feet tall. What must the operator assess before continuing?

- A. Continue the lift since 26 mph is below the 30 mph general limit and the lift may proceed
- B. Sound the horn to warn personnel that wind speed has increased and continue at reduced swing speed
- C. The general 30 mph limit may not apply to this large flat panel — the operator must evaluate whether the wind force on the panel's large surface area creates unsafe conditions at this wind speed, even though the general limit has not been reached

D. Verify with the lift director whether an updated wind force calculation has been prepared for this panel before deciding to stop or continue

25. During a tandem lift using two cranes, one crane's LMI alarm activates at 80% of rated capacity and its share of the load suddenly increases to 95% because the second crane experienced a brief hydraulic hesitation. What is the correct immediate response?

A. The second crane operator should immediately increase their load share by hoisting rapidly to transfer load back from the overloaded crane

B. Both crane operators must stop all movement simultaneously and hold their current positions — no crane may move independently, and the lift director must take charge of a coordinated recovery plan

C. The overloaded crane should boom up to reduce its operating radius and increase its rated capacity while the second crane corrects the hydraulic issue

D. The lift director should direct the overloaded crane to lower its load while the second crane holds position

26. What is the primary function of tag lines during crane operations, and what specific action is prohibited when using them?

A. Tag lines direct the crane's horizontal position — they may be used to pull the crane hook to any location within the exclusion zone

B. Tag lines provide load weight measurement data — wrapping them around a scale allows live weight verification during the pick

C. Tag lines control load rotation and minor lateral drift — they may be attached to any rigid point on the load

D. Tag lines control load rotation and minor lateral drift — they must never be wrapped around the handler's hands, wrists, or body, and must never be used to pull the crane's hook position laterally

27. Under OSHA 1926.1427, what two components together constitute the complete authorization framework for a crane operator performing construction operations?

A. A valid NCCCO certification for the type of equipment plus a documented employer evaluation confirming competency for the specific equipment and site

- B. A valid NCCCO certification plus a state-issued crane operator license where applicable
- C. A lift director approval for each critical lift plus a valid NCCCO certification
- D. A valid NCCCO certification plus a completed annual medical examination confirming physical fitness for crane operation

28. An operator is completing a long-radius lift at 91% of rated capacity. As the load is swung into position, the LMI reading increases to 97%. The load weight has not changed and the operator did not change any control inputs. What is the most likely cause?

- A. The LMI software has recalibrated itself mid-operation and is now reading a corrected value
- B. The operator accidentally depressed a function that added boom extension during the swing
- C. Centrifugal force during the swing is displacing the load outward, increasing the effective operating radius beyond the static planned radius and reducing the rated capacity at that greater effective radius
- D. The increased reading represents dynamic loading from the swing acceleration and will return to normal once the swing stops

29. A crane operator is asked to perform a lift where the load must travel under a structural element with only 4 feet of clearance between the top of the load and the bottom of the structural element. The load is 14 feet tall. What crane operational requirement does this close clearance create?

- A. No special requirement applies — the operator must simply be careful during the approach
- B. The operator must calculate the minimum required tip height to maintain the 4-foot clearance throughout the load's travel path and confirm that the crane's configuration can achieve this tip height while maintaining load height below the obstruction
- C. The load should be tilted slightly to reduce its effective height when passing under the obstruction
- D. The lift director must physically guide the load through the clearance by hand while the crane operator maintains position

30. What does ASME B30.5 require regarding the crane's drum pawl (drum dog) when a load is being held in a stationary position for an extended period?

- A. The drum pawl must be engaged whenever the load is stationary for more than 5 minutes

B. The drum pawl is a backup device that must always be engaged before the operator leaves the cab with a load suspended

C. The drum pawl should be engaged as a backup to the hydraulic brake whenever a load is held stationary for extended periods — it provides mechanical backup holding that protects against hydraulic pressure bleed-off during the hold

D. ASME B30.5 does not specify drum pawl engagement requirements during load holds — the hydraulic brake alone is required

31. Under OSHA 1926.1408, which of the following is a required element of an encroachment prevention plan that must be established before operations begin near an energized power line when de-energization is not feasible?

A. A dedicated spotter positioned to maintain continuous visual contact with both the power line and the part of the crane or load closest to the line, with a means of immediately stopping all crane movement

B. A written authorization from the utility operator confirming that reduced clearance operations are acceptable at the planned power line proximity

C. A licensed electrical engineer's certification that the encroachment prevention plan provides equivalent protection to de-energization

D. An OSHA compliance officer's on-site presence during all operations conducted under the encroachment prevention plan

32. A crane operator is performing a lift cycle when the signal person suddenly goes to the ground clutching their chest — a potential cardiac event. With the load at 18 feet of height and swinging, what must the operator do?

A. Call for emergency services by radio while continuing to control the crane to prevent load swing

B. Lower the load to the ground as quickly as safely possible while sounding the emergency horn repeatedly, then call for emergency services after the load is secured

C. Stop all crane movement, hold the load in current position, and wait for instructions from the lift director

D. Give the crane controls to a nearby worker while the operator exits the cab to assist the signal person

33. An operator is asked to perform a pick-and-carry operation at a radius that exceeds the crane's published pick-and-carry maximum radius. The lift director argues that the load is well within the crane's regular on-outrigger capacity. What is the correct response?

A. The regular on-outrigger capacity section does not apply to travel with a load — the pick-and-carry section's maximum radius is a specific operating limit that cannot be exceeded by reference to the stationary capacity

B. If the load is within the on-outrigger capacity, travel may proceed since the capacity limitation is the governing factor

C. The operator may travel at the excess radius if speed is kept below 0.5 mph

D. A qualified engineer may override the load chart's pick-and-carry maximum radius for specific projects

34. Under OSHA 1926.1431, what is the design factor required for the wire rope used as the load line during personnel hoisting operations?

A. 5 to 1 — the same factor required for standard material hoisting applications

B. 6 to 1 — an intermediate factor between material hoisting and the maximum safety level

C. 8 to 1 — the most conservative factor applied to any crane application

D. 7 to 1 — this elevated factor is required for personnel hoisting to account for the consequence of load line failure with personnel suspended

35. A crane is operating in an area where the daily temperature swings from 28°F at night to 75°F during the day. After a cold night, the operator begins the first lift of the morning. What specific hydraulic system concern applies to this scenario?

A. The overnight temperature swing from 28°F to 75°F means the hydraulic system has fully warmed to ambient temperature and requires no special warm-up procedure

B. The cold overnight temperature has chilled the hydraulic fluid, increasing its viscosity — the operator must follow the manufacturer's cold-weather warm-up procedure before applying full load to the hydraulic system to prevent pump cavitation and sluggish control response

C. Temperature swings of less than 50 degrees have no practical effect on hydraulic system performance

D. Cold hydraulic fluid has reduced viscosity that causes excessive speed in all crane functions — the operator should use reduced control inputs until the system warms

36. A crane operator is directed by the signal person to HOIST, but before beginning the hoist, the operator observes that the load appears to be tangled in some scaffolding at ground level. The signal person, positioned at a different angle, cannot see this condition. What should the operator do?

A. Hoist the load slowly to see if it pulls free of the scaffolding before stopping

B. Execute the hoist command as directed since the signal person has authority over all crane movement decisions

C. Stop before executing the hoist command and communicate the observed scaffolding entanglement to the signal person and lift director before any hoist movement is made — the operator has both the authority and responsibility to stop for observed hazards

D. Sound the horn to warn scaffold workers and then execute the hoist at minimum speed

37. Under OSHA 1926 Subpart CC, when is it permissible to swing a load over an occupied building during a construction project?

A. Never — OSHA prohibits swinging any load over any occupied building under all circumstances in construction crane operations

B. Only when a written safety plan has been approved by the building owner and all occupants have signed an acknowledgment of the overhead lift activity

C. When the lift is a critical lift and the pre-lift meeting has been conducted with all lift team personnel

D. There is no blanket prohibition on swinging over occupied buildings in Subpart CC, but the operator must ensure that the load path is controlled, the area below the load is assessed, and all OSHA 1926 Subpart CC operational requirements are met — including the prohibition on loads passing over personnel

38. An operator is lifting a load and the crane suddenly loses power to the cab instruments while the engine continues to run normally. The LMI goes dark. What is the correct action?

A. Continue the lift at reduced speed since the crane's hydraulic functions are still operational

B. Immediately activate the crane's emergency power backup system to restore instrument power

C. Request the signal person to provide verbal guidance in place of the LMI's capacity readout

D. Stop the hoist, hold the load in position, and investigate the instrument power failure before continuing — the operator cannot safely monitor capacity without the cab instruments, and operations must not continue until the cause is identified and instruments are restored or the written load chart is confirmed to be the sole capacity reference

39. Under ASME B30.5, what is the definition of "two-blocking" and what specific safety device is required to prevent it?

A. Two-blocking is when two crane functions are operated simultaneously beyond the crane's rated capacity — the LMI is the required prevention device

B. Two-blocking is when a load exceeds the crane's rated capacity at the current radius — the rated capacity indicator (RCI) is the required prevention device

C. Two-blocking is when the hook block or overhaul ball contacts the boom tip sheave assembly — the anti-two-block (ATB) device is required to interrupt the hoist function before contact occurs

D. Two-blocking is when the crane's reeving system has insufficient parts of line for the applied load — the reeving diagram posted in the cab is the required prevention reference

40. Which of the following scenarios represents a violation of OSHA 1926.1416's prohibition on free-fall during construction crane operations?

A. An operator lowers a 5,000-pound concrete form by releasing the hoist brake entirely and allowing the load to descend by gravity without drum motor engagement

B. An operator lowers a 500-pound hook block at maximum controlled hoist speed with the drum motor fully engaged

C. An operator performs a controlled pick-and-carry operation at pick-and-carry rated capacity

D. An operator uses the boom lowering function to reduce operating radius while the load remains suspended at constant height

41. A crane's outrigger on the left rear corner shows a gradual but visible forward lean — the vertical jack cylinder is not perpendicular to the ground. What is the most likely cause and concern?

- A. The lean indicates that the outrigger pad is sitting on a firm surface and bearing adequately — no concern exists
- B. The forward lean suggests that the outrigger pad or cribbing below it is shifting or displacing laterally — this could indicate that the soil is failing in shear beneath the pad or that the cribbing has not been properly stabilized, and the condition must be investigated before continuing
- C. A slight lean in the outrigger jack is normal due to manufacturing tolerances in the cylinder bore
- D. The lean is caused by the crane's own weight distribution and will self-correct once the load is applied

42. An operator is told that the load to be lifted weighs 32,000 pounds. The crane's net capacity at the planned radius is 33,500 pounds. Before beginning the lift, the operator weighs the hook block, slings, and hardware at 2,800 pounds total. What is the actual situation and required action?

- A. The rigging deduction has already been made — the 33,500-pound net capacity is the payload limit
- B. The total suspended weight ($32,000 + 2,800 = 34,800$ lbs) must be compared to the crane's gross capacity — if 33,500 lbs was already the net capacity (gross minus rigging), the planned payload of 32,000 lbs is within net capacity and the lift may proceed after confirmation
- C. The total suspended weight exceeds the net capacity — the operator cannot lift 32,000 pounds plus 2,800 pounds of rigging within a 33,500-pound net capacity limit
- D. The total suspended weight of 34,800 lbs exceeds the 33,500-lb net capacity value — if 33,500 lbs is the net capacity available for the payload, then the 32,000-lb load is within it, but the operator must confirm whether 33,500 lbs represents the net capacity (gross minus rigging already deducted) or the gross capacity (from which rigging must still be deducted)

43. What is the purpose of the pre-operational check of the crane's load line wire rope for proper drum spooling before beginning operations?

- A. Proper spooling is only checked during monthly inspections and does not require pre-shift verification
- B. Checking drum spooling confirms that the correct length of rope is available for the planned lift depth
- C. Improper spooling — cross-layering, bird-nesting, or loose wraps — causes uneven drum loading, accelerated rope wear, and can result in the rope jumping the drum flange, potentially causing load drop — pre-shift verification prevents these conditions from developing during operations

D. Drum spooling verification confirms the correct reeving diagram for the hook block configuration planned for the shift

44. A crane operator is performing a lift when the crane's engine stalls and all systems lose power. The load is suspended at 25 feet of height with the swing brake engaged. What is the status of the suspended load and what must the operator do?

A. The load is safely held by the spring-applied hydraulic brakes — the operator should restart the engine and resume the lift when power is restored after verifying the cause of the stall

B. The load may be drifting downward since the hydraulic brakes require pressure to maintain their holding force

C. The load must be immediately lowered by manually releasing the hoist brake

D. The load is safely held by the spring-applied hoist brake and drum pawl if engaged — the operator should not attempt to restart the engine until the cause of the stall is understood, and should confirm the load is stable before exiting the cab

45. Under OSHA 1926.1425, a crane operator is performing a lift over an area where other trades are working below. After being directed to proceed, the operator observes during the swing that one worker has not yet cleared the area and is still directly below the load's travel path. What must the operator do?

A. Sound the horn to warn the worker and continue the swing at minimum speed to give the worker time to clear

B. Stop all crane movement immediately — OSHA 1926.1425 prohibits loads from passing over personnel under any circumstances, and the swing must stop until the worker clears the area

C. Raise the load 10 feet higher to increase the clearance between the load and the worker below

D. Contact the signal person by radio to direct the worker out of the path while continuing the swing

46. A crane is operating in an area with radio frequency interference from nearby broadcasting equipment. The crane's radio communication with the signal person is unreliable — transmissions cut out intermittently. What must the operator do?

A. Increase the radio transmission power and continue operations with the compromised communication system

- B. The signal person should shout commands loudly enough to be heard without radio equipment
- C. Continue operations using only emergency stop signals until the interference resolves
- D. Switch to hand signals or establish a relay signal person system that does not rely on radio communication — crane operations must not continue with an unreliable primary communication system

47. What is the primary reason that OSHA 1926.1416 requires the operator to stop operations and report any condition that makes continued operation unsafe, even if the lift director disagrees with the assessment?

- A. The lift director is legally exempt from liability once the operator assumes control of crane movements
- B. The crane manufacturer requires that all safety concerns be documented in the operator's log before any lift
- C. The operator is the person in direct control of the crane and has the most immediate knowledge of its condition — the stop-work authority protects both the operator and all personnel from conditions that may not be fully visible to the lift director from their position
- D. OSHA requires that all safety decisions on construction sites be made by the most experienced person, which is typically the operator

48. An operator is performing a lift cycle when a coworker rushes up to the cab and shouts that there is a fire in a portable building 60 feet from the crane. The load is currently at 12 feet of height midway through a swing. What is the correct sequence of actions?

- A. Continue the swing to the set point, set the load, then evaluate the fire situation
- B. Immediately call 911 by radio while continuing to complete the lift cycle
- C. Assess the fire's proximity to the crane and personnel in the exclusion zone before deciding whether to stop or continue
- D. Stop all crane movement, lower the load to the ground as quickly as safely possible, sound the crane's emergency horn to warn all site personnel, and then address the fire emergency — crane operations must stop when a fire emergency is identified on or near the crane

TECHNICAL KNOWLEDGE DOMAIN — Questions 49–70

49. An operator discovers during pre-shift inspection that the crane's boom angle indicator reads 8 degrees more than the actual measured boom angle. The crane is scheduled for a critical lift at 85% of rated capacity in two hours. What action is required before the lift proceeds?

- A. Use the measured boom angle from a separate calibrated inclinometer for the lift and note the discrepancy in the inspection log
- B. The inaccurate boom angle indicator must be repaired or calibrated before the crane is used — an operator relying on an incorrect angle indicator will enter the load chart at the wrong radius, potentially using capacity values that are higher than the actual rated capacity at the true operating radius
- C. A 8-degree error is within acceptable calibration tolerance for the boom angle indicator during field operations
- D. Contact the LMI manufacturer for a remote calibration procedure before beginning the critical lift

50. Under ASME B30.9, what is the removal-from-service criterion for a wire rope sling that has been exposed to temperatures above 400°F?

- A. Wire rope slings may be used above 400°F with a 25% capacity derating applied
- B. Wire rope slings may be used above 400°F if the rope core is IWRC rather than fiber core
- C. Wire rope slings exposed to temperatures above their rated limit show no specific criterion — visual inspection is sufficient regardless of temperature exposure
- D. Wire rope slings exposed to excessive heat — including temperatures above the rated limit — must be removed from service since heat alters the mechanical properties of the high-carbon steel wires in ways that are not detectable by visual inspection

51. A mobile crane's slewing ring shows visible pitting on the exposed bearing race surface during inspection. The pitting is consistent across approximately 30% of the accessible portion of the race. What does this indicate about the slewing ring's condition?

- A. Surface pitting on the slewing ring race is cosmetic and does not affect the bearing's load-carrying capacity

B. A visual inspection for pitting is not required — slewing ring inspection is limited to deflection measurement

C. Pitting on the bearing race indicates corrosive or fatigue damage that has removed material from the load-bearing surface — this reduces the bearing element contact area and can accelerate failure under load, and the crane must be evaluated by a qualified inspector to determine whether the slewing ring must be replaced

D. Minor surface pitting is acceptable on the non-load-bearing portions of the race but not on the load-bearing zone

52. When an NCCCO-certified operator moves to a new employer, what must the new employer do before the operator performs crane operations on their project, beyond verifying the certification is valid?

A. The employer must evaluate and document the operator's competency to safely operate the specific crane model and configuration to be used at the specific worksite — the NCCCO certification is portable but the employer's independent competency evaluation is required at each new assignment

B. The new employer must file a notification with NCCCO within 30 days of the operator's hire date

C. The new employer must have the operator perform a demonstration lift at reduced capacity before authorizing full-capacity operations

D. The new employer must provide the operator with a site-specific safety orientation only — no additional competency evaluation is required if the NCCCO certification is current

53. A crane's main hoist rope is being replaced. The new rope is the correct diameter, grade, and construction specified in the load chart. After installation, the rope is spooled onto the drum. Before the crane returns to service, what final step is required?

A. The new rope must be lubricated with the manufacturer-specified lubricant before any load is applied

B. The new rope installation must be documented in the maintenance log, and the rope must be confirmed as properly seated in all sheave grooves and correctly terminated at both ends before the crane is returned to service

C. The new rope must receive a proof load test at 125% of the rated working load before the crane returns to service

D. The LMI load cell calibration must be recalibrated to the new rope's weight specifications

54. Under ASME B30.5, which of the following is a specific operational requirement for a crane equipped with a Rated Capacity Indicator (RCI) system?

A. The RCI must be confirmed operational before each shift and the operator must verify that the configuration input matches the physical crane setup — the RCI is an aid to operator awareness, not a substitute for the load chart

B. The RCI may serve as the primary capacity authority and eliminates the need for the written load chart when the system is confirmed operational

C. RCI systems must be tested by a manufacturer-certified technician monthly to maintain their legal authority for capacity determination

D. The written load chart is only required when the RCI is non-functional — an operational RCI satisfies the load chart posting requirement under OSHA 1926.1417

55. A rigger notices that a wire rope sling has a section where the individual wires on the outer surface appear to have been broken in a distinctive pattern — all breaks occur at the same location on each wire where the wire contacts the sheave groove. What type of damage does this pattern indicate?

A. Internal corrosion has caused wires to fail from the inside outward at a consistent depth

B. The rope has been kinked at that location and the wires are failing at the kink stress concentration

C. The wire breaks occurring at the sheave contact point indicate fatigue failure caused by repeated bending over the sheave — this is crown wire fatigue, a specific failure mode that indicates the sheave groove radius may be too small for the rope diameter or the rope has exceeded its service life for that application

D. The pattern indicates thermal damage from heat generated by friction at the sheave contact

56. What is the minimum ASME B30.9 design factor for a Grade 100 alloy steel chain sling?

A. 4 to 1, the same as Grade 80 chain slings

B. 3.5 to 1, reflecting the higher base strength of Grade 100 material

C. 5 to 1, consistent with wire rope sling requirements

D. 6 to 1, required for the highest-capacity sling types

57. A crane's hook block has two sheaves. During inspection, one sheave is found to be cracked through the sheave web — the crack runs from the bore to the rim. The other sheave is in good condition. What action is required?

- A. The cracked sheave may remain in service if the rope rides on the non-cracked sheave
- B. The entire hook block assembly must be removed from service — a cracked sheave is a structural failure that creates a load-drop risk and the complete block must be repaired or replaced before return to service
- C. Reduce the hook block's rated capacity by 50% to account for the loss of one sheave
- D. Replace the cracked sheave but continue using the same block frame if the frame is undamaged

58. Under OSHA 1926.1430, which employees must receive crane-related safety training before being allowed to work on a construction site where cranes are operating?

- A. Only NCCCO-certified operators and qualified riggers require formal crane safety training
- B. Crane operators and signal persons are the only regulated positions requiring crane-specific training
- C. All employees who use the crane, work in the area where it is being used, or are assigned tasks related to its use — the training requirement is broad and covers all affected workers, not just those with hands-on crane roles
- D. Training is required only for employees who work within the crane's exclusion zone on a regular basis

59. A synthetic web sling has been used at elevated temperature in a heat-treating facility. After the shift, the sling's color has changed from its original bright hue to a dull, darker shade, and the fabric feels brittle and stiff rather than flexible. What has occurred and what is the required action?

- A. The color change is caused by industrial contamination — clean the sling and return it to service if the fibers are flexible
- B. The sling may have been exposed to UV radiation — the discoloration does not affect structural integrity
- C. The color change and stiffness indicate that the synthetic fibers have experienced thermal degradation — heat exposure above the sling's rated temperature limit permanently reduces fiber strength, and the sling must be removed from service and destroyed

D. Synthetic slings naturally change color with use — the discoloration is cosmetic and the flexibility test is the only meaningful indicator

60. What is the specific purpose of running a wire rope's "break-in" procedure when a new rope is installed on a crane?

A. The break-in procedure generates heat in the rope that seals the lubrication into the strand structure

B. Running the rope through its full travel under light load allows the rope's lay structure to seat and equalize the load distribution across all wires before heavy loads are applied — this prevents premature wire breaks from concentrated stress on individual wires during initial loading

C. The break-in procedure tests the rope at 125% of rated capacity to confirm structural integrity before service

D. Break-in is required only for lang lay ropes — standard regular lay ropes can be loaded immediately upon installation

61. A crane's wire rope exhibits kinking at a location where the rope passes over the drum flange when the drum is at minimum wrap. What is the cause and the required action?

A. The kinking is caused by insufficient rope lubrication at the drum flange — apply lubricant to the drum flange contact area and continue operations

B. The kinking occurs because the drum is spooling the rope incorrectly at minimum wrap — the rope must be removed from service since any kink is a removal condition, and the cause of the drum misfleet must be investigated

C. Kinking at the drum flange is expected during initial loading and will self-correct after the rope is fully loaded twice

D. The rope may be straightened by pulling the kinked section through the sheave system under light tension

62. An operator is using a hook block rated for 20-ton single-line, 3-sheave block capacity. The hook is rated at 40 tons. The load is 34,000 pounds and the reeving is 4-part line. The operator is checking whether the hook block is rated for this application. What is the governing component rating?

- A. The hook at 40 tons is the governing component — all other components must meet or exceed the hook rating
- B. The 4-part line provides 4x the single-line pull as the mechanical advantage — no individual component rating is the governor
- C. The reeving configuration determines what maximum load can be applied — the block's 20-ton single-line rating and the rope's capacity must both be verified for the 4-part reeving at this load
- D. The maximum rated capacity for this hook block and reeving is 80 tons — four times the single-line rating — and the 34,000-pound load is well within this limit

63. What is the OSHA requirement for certifying crane operators who work for more than one employer on the same construction project?

- A. Each employer must independently certify the operator before that operator performs work for them on the project
- B. The crane owner must provide a separate equipment-specific orientation for the operator regardless of certification status
- C. An NCCCO certification issued under the third-party accredited option is portable among employers — it satisfies the certification requirement for all employers on the project without re-examination by each employer
- D. The controlling entity must approve and document the operator's certification before the operator begins work for any subcontractor on the project

64. A crane's telescoping boom section develops a hydraulic fluid leak from the extension cylinder while the boom is extended to 80 feet under load. The fluid is dripping steadily. What is the concern and the required action?

- A. The fluid drip is cosmetic — the boom extension cylinder does not hold the boom at a specific angle under load
- B. The LMI system will automatically detect the hydraulic loss and reduce the displayed capacity accordingly
- C. The extension cylinder holds the boom sections in the extended position — a leak may cause the outer boom sections to retract under load, shortening the boom, increasing the boom angle, and potentially destabilizing the lift — the load must be lowered to the ground immediately
- D. Continue the lift at reduced speed while monitoring the leak rate — stop if the drip rate increases

65. Under ASME B30.5, what is the purpose of boom stops, and what specific condition triggers their function?

- A. Boom stops limit maximum hoisting height by activating a limit switch when the hook block reaches the predetermined maximum elevation
- B. Boom stops are structural devices that prevent the boom from being lowered below its minimum rated angle — they protect against reverse boom loading and potential structural collapse that would occur if the boom went below horizontal
- C. Boom stops limit swing rotation to prevent the upper works from exceeding the 360-degree travel limit
- D. Boom stops engage the boom hoist brake when the boom reaches maximum angle to prevent backward tipping under maximum counterweight

66. A mobile crane operator must operate the crane during a period when outdoor temperatures have dropped to 15°F (-9°C). What specific concern applies to the crane's structural steel components at this temperature?

- A. Low temperatures cause structural steel to expand, which may bind the boom extension cylinder and prevent smooth boom operation
- B. Low temperatures reduce lubrication viscosity in the slewing ring, requiring additional manual lubrication before operations
- C. Low temperatures reduce the yield strength of structural steel by 25% below 32°F
- D. High-carbon steel becomes more brittle at very low temperatures — existing cracks or defects in boom structural members may propagate under load at temperatures that would not cause failure at normal operating temperatures, making pre-shift inspection of structural members more critical in cold weather

67. A crane inspector performing the annual comprehensive inspection identifies that the load line wire rope end attachment — a wedge socket — has a hairline crack visible at the base of the socket body near the rope entry point. What action is required?

- A. Monitor the crack for growth at monthly inspection intervals before deciding on replacement
- B. Apply a liquid penetrant dye test to confirm the crack depth before deciding on removal

C. Remove the wedge socket end attachment from service immediately — any crack in a load-bearing rigging fitting is a removal condition regardless of size, since crack propagation under load can be rapid and catastrophic

D. Continue operations with the wedge socket if the rope is confirmed to be fully seated and the wedge is correctly positioned — the crack does not affect the gripping mechanism

68. What does the term "lay length" mean when applied to wire rope inspection, and why is it the reference measurement for broken wire counting?

A. Lay length is the length of rope used per drum wrap, used as the inspection reference because drum wraps are the most common fatigue location

B. Lay length is the standard rope section length specified by ASME B30.5 for all wire rope inspections, equal to 12 times the rope diameter

C. Lay length is the distance required for one complete helical revolution of a strand around the rope's central axis — it is used as the broken wire count reference because it represents a standardized section length relative to the rope's construction that remains consistent regardless of rope diameter

D. Lay length is the section of rope visible between sheave contact points, used as the reference because this section experiences the most concentrated loading

69. Under OSHA 1926.1427, an operator holds a valid NCCCO certification for Telescopic Boom Cranes (TLL). They are asked to operate an articulating crane on a construction project. No NCCCO articulating crane certification is available to the employer. What provision might allow this operator to perform the work?

A. The TLL certification is a broad certification that covers all boom-type cranes including articulating cranes

B. The operator may perform the work with written authorization from the lift director certifying that the operator has adequate experience

C. A separate equipment-specific certification is always required and there are no provisions for operating an uncertified type

D. The NCCCO Crane Type Advisory Group (CTAG) administers the "most similar" certification provision under OSHA 1926.1427 — if CTAG has determined that a specific certification is "most similar" to articulating crane operations, the operator holding that certification may operate the articulating crane under that provision

70. A crane has just completed a lift that required 95% of rated capacity. During the lift, the operator observed an unusual vibration in the boom when the load was at maximum radius. After setting the load, what is the required response?

- A. Log the observation in the shift report and have maintenance review it at the next scheduled service interval
- B. Perform an additional load test at 110% of rated capacity to verify the boom's structural integrity
- C. Continue operations with the assumption that the vibration was caused by wind resonance — if no structural damage is visible, the crane may remain in service
- D. Stop crane operations and have the boom inspected by a qualified inspector before any further lifting — a structural vibration observed during a near-capacity lift may indicate cracking, a loose connection, or a structural defect that requires evaluation before the crane can safely continue

LOAD CHARTS DOMAIN — Questions 71–95

71. A crane's load chart shows different capacity values for "over the front," "over the rear," and "360-degree all directions" at the same boom length and radius. The planned lift requires the boom to point directly forward over the crane's front axle. The over-front section shows 22,400 lbs while the 360-degree section shows 18,200 lbs at the same configuration. Which value governs?

- A. The 360-degree value of 18,200 lbs applies since it is the most conservative option for all directions
- B. The over-front and 360-degree values may be averaged to 20,300 lbs for a boom position at the exact front of the crane
- C. The over-front section value of 22,400 lbs applies when the boom is confirmed pointing directly over the front of the carrier — this is the specific section derived for this operating direction
- D. The 360-degree chart is always used for initial capacity planning and the over-front chart is only used after the 360-degree value is confirmed as insufficient

72. A crane load chart shows 34,600 lbs at 25 feet with a 60-foot boom and 26,800 lbs at 30 feet with the same boom. The operator is working at 27 feet of radius. After computing the interpolated capacity and deducting the hook block (1,600 lbs), slings (380 lbs), and hardware (120 lbs), the load weighs 28,400 lbs. Is the lift within net capacity?

- A. Interpolated capacity at 27 feet = 32,040 lbs; net capacity = 32,040 – 2,100 = 29,940 lbs; load (28,400 lbs) is within net capacity — lift may proceed
- B. Interpolated capacity at 27 feet = 30,160 lbs; net capacity = 28,060 lbs; load exceeds net capacity
- C. The lift may proceed using the 25-foot capacity conservatively since 27 feet is within 2 feet of the smaller tabulated radius
- D. The load chart cannot be used for non-tabulated radii without manufacturer authorization

73. A crane is performing a lift using the following configuration: 100-foot boom, 35 feet of radius, full outrigger extension, maximum counterweight. The load chart in the maximum counterweight section shows 46,800 lbs gross capacity. After the lift is completed and the load is set, the operator is directed to lower the boom to 20 degrees of angle without attaching any new load. The manufacturer's note in the maximum counterweight section reads: "Rear tipping hazard at boom angles above 72° with no load." Why would the operator also need to check for rear tipping at steep angles during boom lowering?

- A. There is no rear tipping concern during boom lowering — rear tipping occurs only when booming up
- B. The boom is being lowered, not raised — the rear tipping risk applies only to the raising direction
- C. The rear tipping note applies when the boom is at high angles with maximum counterweight and no front load — as the boom is lowered from a steep angle to 20 degrees, the operator passes through the dangerous steep-angle zone in the unloaded condition, and must do so following the manufacturer's procedure to avoid rear-tipping during the transition
- D. Rear tipping risk exists only when counterweight exceeds the load weight — at maximum counterweight with no load, the boom-down movement reduces the counterweight moment and eliminates rear tipping risk

74. A crane's load chart shows the following capacity values in the 80-foot boom column at full outrigger extension: 20 ft = 52,400 lbs; 25 ft = 42,600 lbs; 30 ft = 34,200 lbs; 35 ft = 26,800 lbs; 40 ft = blank. A lift is required at 38 feet of radius. What is the governing capacity and may the lift proceed?

- A. Interpolate between 35 and 40 feet — the 40-foot cell being blank does not prevent interpolation using trend data
- B. Use 75% of the 35-foot capacity of 26,800 lbs as a conservative estimate for the 38-foot radius
- C. The maximum rated radius for the 80-foot boom at this configuration is 35 feet — the blank at 40 feet means no capacity exists at or beyond 36 feet, and the lift at 38 feet exceeds the maximum rated radius and cannot proceed in this configuration

D. The blank cell at 40 feet indicates a printing error — the capacity may be estimated using the rate of decrease from prior table entries

75. A crane is operating at a confirmed radius of 45 feet with a 120-foot boom. The load chart shows 12,400 lbs at 45 feet. The hook block weighs 1,400 lbs. Three slings weigh 360 lbs total. Four shackles weigh 140 lbs. A lifting beam weighs 2,800 lbs. The load weighs 7,200 lbs. What is the total suspended weight and lift percentage?

A. Total = 11,900 lbs; lift percentage = 96.0%

B. Total = 10,500 lbs; lift percentage = 84.7%

C. Total = 11,900 lbs; lift percentage = 96.0% — this is a critical lift requiring written plan and pre-lift meeting

D. Total = 12,500 lbs; lift percentage = 100.8% — total suspended weight exceeds gross capacity

76. A crane's load chart specifies that the maximum counterweight configuration is to be used "ONLY with boom lengths from 100 feet to 200 feet." The crane is currently configured with an 80-foot boom. The operator plans to use the maximum counterweight section because it shows higher capacity. What is the issue?

A. The maximum counterweight may be used with any boom length as long as the total suspended weight is within the tabulated capacity

B. The maximum counterweight with an 80-foot boom is not a rated configuration under the chart restriction — using maximum counterweight with an 80-foot boom while applying maximum counterweight capacity values creates an unauthorized configuration with potential rear-tipping risk

C. The 80-foot boom is within 25% of the 100-foot minimum, which is within acceptable interpolation range

D. Counterweight restrictions in the load chart are advisory and may be overridden by the lift director in writing

77. A crane load chart section header specifies: "TELESCOPIC BOOM — ON OUTRIGGERS — FULL EXTENSION — STANDARD COUNTERWEIGHT — BOOM SECTIONS PINNED AT ALL EXTENSION POSITIONS." The crane's boom is extended to an intermediate position between two rated pinned positions. What does the header specification "PINNED AT ALL EXTENSION POSITIONS" require of the operator?

- A. The note is a manufacturer's recommendation and the operator may extend to any position within the physical travel of the boom
- B. The boom must be at a rated pinned extension position — an intermediate unpinned extension is not covered by the capacity values in this section and the boom must be moved to a rated pinned position before using these values
- C. The operator may use the nearest longer pinned position's capacity value as a conservative approximation for the intermediate position
- D. Intermediate extensions are permitted as long as the LMI confirms the configuration is within capacity at the unpinned position

78. A crane's load chart shows different capacity values for "ON OUTRIGGERS — FULL EXTENSION" and "ON OUTRIGGERS — INTERMEDIATE EXTENSION (50% SPREAD)." The operator sets up with the left side at full extension and the right side at 50% extension due to a site constraint. The operator calculates an average outrigger extension percentage of 75% and attempts to interpolate a 75% extension capacity. What is the problem with this approach?

- A. Nothing is wrong — averaging the two sides is the standard approach for mixed-extension configurations
- B. A 75% average may be used since it falls between the two rated configurations and produces a conservative estimate
- C. Mixed-extension configurations are not rated — no capacity section exists for a setup where different sides have different extensions, and neither published section directly applies — the crane must use the most restrictive of the two sections (50% extension) for all operations
- D. The operator must use the full-extension section for the full-extension side and the 50% section for the 50% side, then use the higher value for all lifts

79. A crane manufacturer provides a load chart that includes a section for "JIBBED OPERATIONS." The capacity values for the jib configuration at 55 feet of operating radius are 8,400 lbs. The same crane's main boom chart shows 28,000 lbs at 55 feet of radius. The load weighs 10,000 lbs and will be suspended from the main hook block below the main boom tip. The jib is attached but will not be used. Which capacity section applies?

- A. The main boom section (28,000 lbs) applies since the load is suspended from the main hook below the boom tip and not from the jib
- B. The operator may use the higher main boom value since the jib is not bearing any load during the lift

C. The jibbed operations section (8,400 lbs) applies regardless of which hook is used because the jib's physical presence on the boom tip changes the structural loading of the main boom

D. The operator should remove the jib from the boom before using the main boom chart values — if removal is not practical, the jibbed operations section governs

80. A crane is performing a lift at a planned radius of 40 feet. The load chart shows 29,600 lbs at 40 feet. The total suspended weight is 28,200 lbs — the lift percentage is 95.3%. After the pick, the operator derricked down slightly to improve boom clearance, and the load settled at 43 feet of actual radius. The load chart shows 24,200 lbs at 45 feet. Using the conservative interpolation approach at 43 feet, what is the capacity and does the lift remain within rated capacity?

A. Conservative capacity at 45 ft = 24,200 lbs; total suspended weight (28,200 lbs) exceeds this capacity — the lift is no longer within rated capacity at the actual 43-foot radius

B. Conservative capacity at 43 ft = 26,560 lbs; total suspended weight (28,200 lbs) is within capacity — lift proceeds

C. The original 40-foot capacity governs since the pick was made at 40 feet — changes in radius during the lift do not require recalculation

D. The operator should boom back up to 40 feet to return to the rated position

81. A crane's load chart note states: "The following capacities are based on the use of wire rope conforming to specifications listed in the crane's operator manual." The operator's crane has had its load line upgraded to a higher-strength EEIPS rope of the same diameter. Does this substitution permit the use of capacities above those shown in the load chart?

A. No — load chart capacity values are limited by the crane's structural and stability engineering, not by the rope's tensile strength — a higher-strength rope does not change the crane's structural or stability limits, so capacity values remain unchanged

B. Yes — higher-strength rope directly increases the hook load capacity for the same number of parts of line

C. Yes — the manufacturer's rope specification is a minimum requirement and exceeding it always improves rated capacity proportionally

D. Yes — EEIPS rope at the same diameter permits a 15% capacity increase per ASME B30.5 guidelines

82. A crane operator is planning a lift that requires both a specific minimum hook height (above an obstruction) and a specific maximum operating radius (to reach the pick point). Which tool in the load chart package is specifically designed to help the operator determine whether a given boom configuration achieves both requirements simultaneously?

- A. The capacity deduction table, which shows all rigging weights that must be accounted for at each configuration
- B. The outrigger reaction load table, which shows the maximum load at each outrigger position for the planned configuration
- C. The rope specification table, which shows the minimum rope grade and diameter for each boom length
- D. The working area diagram (range diagram), which shows the achievable combinations of operating radius and tip height for each boom length — allowing the operator to confirm that both the required radius and minimum hook height are achievable with a single boom configuration

83. A load chart capacity value has a note marked with a triangle (▲). The legend reads: "▲ = Maximum wind speed 20 mph — reduce capacity by 15% for wind speeds 20–30 mph." Current wind speed is 24 mph. The base capacity at the triangle cell is 22,800 lbs. What is the applicable capacity at 24 mph wind speed?

- A. 22,800 lbs — the full capacity applies up to 30 mph based on the manufacturer's general wind limit
- B. 17,100 lbs — a 25% reduction applies for wind speeds above 20 mph as a standard safety margin
- C. 19,380 lbs — the triangle note requires a 15% reduction for 20–30 mph wind, giving $22,800 \times 0.85 = 19,380$ lbs
- D. 11,400 lbs — a 50% reduction applies for wind speeds above the base limit

84. A crane is configured with a 100-foot boom and no jib. The load chart section for this configuration shows a gross capacity of 41,200 lbs at 30 feet of radius. After the first lift of the shift, the operator notices that the LMI configuration display shows "100 FT BOOM — JIB INSTALLED" even though no jib is attached. What is the significance of this display error?

- A. The display error shows a jib-equipped configuration, which typically has lower capacity than the main boom-only section — the displayed capacity may be understated, meaning the lift is likely more conservative than the LMI indicates

B. The LMI display error has no practical significance since the operator is using the written load chart for capacity reference

C. The display error is a cosmetic interface issue that does not affect the LMI's load measurement accuracy

D. This display is beneficial — the jib-installed configuration in the LMI is more restrictive and therefore automatically applies a conservative safety factor

85. A crane's load chart note states: "Rated capacities apply only when ground bearing pressure under each outrigger pad does not exceed the capacity specified in Appendix B." The operator has not consulted Appendix B and proceeds with the lift because the surface appears stable and the LMI reads below 80% capacity. What is the problem with this approach?

A. The approach is acceptable since the LMI reading below 80% provides adequate margin for most ground conditions

B. The note is a binding load chart condition — not consulting Appendix B means the operator has not confirmed whether the ground bearing pressure at each outrigger meets the load chart's stated condition, and the capacity values in the section may not apply to the current setup

C. Appendix B outrigger pressure requirements apply only when the crane is operating near the maximum rated radius

D. Ground bearing pressure verification is the controlling entity's responsibility and does not affect the operator's use of the load chart

86. A crane load chart shows that the on-outrigger full-extension section has a gross capacity of 52,000 lbs at 25 feet of radius with an 80-foot boom. The load to be lifted weighs 45,000 lbs. The rigging weighs 4,200 lbs total. What is the lift percentage and does this lift qualify as a critical lift?

A. Lift percentage = 86.5%; the lift percentage based on gross capacity is 86.5% — but the critical lift threshold is determined by the total suspended weight vs. gross capacity, confirming this is a critical lift

B. Lift percentage = 87.5%; total suspended weight = 49,200 lbs; $49,200 \div 52,000 \times 100 = 94.6\%$; this is a critical lift

C. Lift percentage = 94.6%; total suspended weight = 49,200 lbs; $49,200 \div 52,000 \times 100 = 94.6\%$ — this exceeds 75% and qualifies as a critical lift

D. Lift percentage = 94.6%; but the critical lift determination is based only on the payload weight vs. net capacity, not gross capacity

87. A crane load chart shows the following note: "Operating radii are measured from the centerline of rotation. Verify using direct horizontal tape measurement — do not rely solely on the LMI radius display for lifts above 85% of rated capacity." A planned lift is at 92% of rated capacity. The LMI displays 38 feet. What must the operator do before beginning the lift?

- A. Accept the LMI radius display since the LMI has been confirmed as accurately calibrated for this crane
- B. Record the LMI display radius in the lift plan documentation and proceed since the LMI accuracy was verified during the most recent monthly inspection
- C. Perform a direct horizontal tape measurement from the centerline of rotation to the load center and confirm the actual radius before using the capacity value at that radius — the note is a binding requirement, not a suggestion, for lifts above 85%
- D. Ask the signal person to confirm the radius by visual estimation from their position before the lift proceeds

88. A crane is lifting a load at 35 feet of radius. The load chart shows 38,000 lbs at 35 feet. After the pick, the operator is directed to swing the load 270 degrees to reach the set location. The swing passes through a sector where the crane's directional load chart shows reduced over-front capacity of 24,000 lbs at the same radius. The total suspended weight is 36,000 lbs. What is the status of the lift during the swing?

- A. The lift proceeds — the pick and set positions are within capacity, and the intermediate swing position is not a rated evaluation point
- B. The lift is approved by the 360-degree section — no sector-specific restrictions apply during swing
- C. The lift may be in violation — the directional capacity during the 270-degree swing arc must be confirmed throughout the full rotation, and if the boom passes through the over-front sector where capacity is only 24,000 lbs while the load is 36,000 lbs, the crane would be operating beyond the over-front rated capacity during that portion of the swing
- D. The swing arc capacity is always the 360-degree section value and directional restrictions apply only at the stationary pick and set positions

89. A crane load chart shows capacity values at 5-foot radius increments. The planned operating radius is 33 feet — between the 30-foot and 35-foot tabulated values. The capacity is 36,200 lbs at 30 feet and 28,800 lbs at 35 feet. The total suspended weight is 30,000 lbs. Using the conservative interpolation approach, does the lift proceed?

- A. Using the 35-foot capacity of 28,800 lbs conservatively — the total suspended weight of 30,000 lbs exceeds the conservative capacity, and the lift cannot proceed in this configuration without reducing the total suspended weight or changing the crane configuration to increase capacity at the actual radius
- B. Using the interpolated capacity at 33 feet = 33,760 lbs — the lift proceeds with a margin of 3,760 lbs
- C. Using the 30-foot capacity conservatively since the actual radius is closer to 30 feet — 36,200 lbs is adequate for the 30,000-lb load
- D. The operator must measure the radius again since the non-tabulated radius indicates a planning error

90. A load chart section for "ON RUBBER — ALL DIRECTIONS" shows a capacity of 14,200 lbs at 20 feet with a 60-foot boom. The same crane's "ON OUTRIGGERS — FULL EXTENSION" section shows 42,800 lbs at the same configuration. An operator is setting up for a lift and the lift director says outriggers are not needed since the load is only 13,500 lbs — well within the 14,200-lb on-rubber capacity. What additional verification is required before proceeding on rubber?

- A. Verify that the crane's tires are inflated to the specification required by the on-rubber section — tire pressure is a condition of on-rubber rated capacity
- B. Verify that the signal person is positioned within 30 feet of the crane when operating on rubber
- C. Verify that the crane's operator manual permits on-rubber operations for this specific lift
- D. Verify the on-rubber section's conditions — including required tire pressure, surface level tolerance, and any load chart notes — and confirm that all conditions are met before using on-rubber capacity values

91. A crane operator is using a load chart section that specifies: "BOOM 60–120 FT — ALL INTERMEDIATE SECTIONS PINNED." The crane's 100-foot boom has the 80-foot and 100-foot sections pinned, but the 60-foot-to-80-foot connection has a pin that is only partially inserted and not secured with its cotter. What does this mean for the capacity values in this section?

- A. The partially inserted pin provides adequate structural support — the cotter is only a retention device and does not affect the pin's load-carrying capacity
- B. The crane may be operated at 75% of the tabulated capacity with the partially inserted pin
- C. The section header requires all intermediate sections to be fully pinned and secured — a partially inserted unpinned connection means the crane does not meet the section's configuration requirement,

and the crane must be taken out of service until the pin is fully inserted and secured with its retaining hardware

D. A partially inserted pin at the 60-to-80-foot connection reduces only the lower boom's capacity — the upper sections may be used at full tabulated capacity

92. A crane load chart in the on-outrigger section shows a capacity of 28,400 lbs at 30 feet of radius with a 60-foot boom. A note at the bottom of the section reads: "Values in this section are gross capacities. Deduct hook block weight and all rigging to determine net load capacity." The operator wants to know the maximum payload when using a 1,800-pound hook block and a sling set weighing 420 pounds. What is the correct net payload capacity?

A. Net payload = $28,400 - 1,800 - 420 = 26,180$ lbs

B. Net payload = $28,400 - 1,800 = 26,600$ lbs; the sling weight is considered part of the load, not the rigging

C. Net payload = 28,400 lbs; the note applies only when the lift director determines that rigging weights are significant

D. Net payload = $28,400 - 420 = 27,980$ lbs; the hook block weight is already included in the load chart values

93. A crane is performing a series of repetitive lifts at identical radius and configuration. After the 8th lift, the signal person notices that one outrigger pad appears to have settled 0.75 inches since the start of operations. The LMI is still reading consistent percentages for each lift. What must happen before the 9th lift proceeds?

A. The LMI consistency confirms the crane is still within capacity — proceed with the 9th lift

B. The outrigger settlement must be evaluated — the crane must be re-leveled if the settlement has caused the machine to go out of level tolerance, and the cause of the settlement must be investigated before continuing, since progressive settlement indicates the ground bearing capacity may be insufficient at that location

C. A settlement of 0.75 inches is within normal outrigger compression tolerance and no action is required

D. Continue operations and have the ground condition evaluated at the end of the shift

94. A crane load chart shows that the maximum outrigger spread at full extension is 26 feet. The crane is set up on a job site where the available outrigger spread is only 18 feet due to a building wall. The crane's load chart does not have a section for 18-foot or other non-standard spreads below 50% extension. What must the operator do?

- A. Use the 50% extension chart section, which represents 13 feet (50% of 26 feet), and apply it conservatively since the actual 18-foot spread is wider than the 50% section
- B. Interpolate between the 50% extension section and the full extension section to estimate the 18-foot spread capacity
- C. The operator may use the 50% extension section since 18 feet is between 13 feet (50%) and 26 feet (100%) — and the 50% section is the conservative bounding configuration
- D. The 18-foot spread is an unrated configuration — neither the full extension nor the 50% section covers this specific spread, and the manufacturer must be consulted for capacity data at the 18-foot spread before any lift is performed

95. A crane's load chart table for the 100-foot boom shows: at 45 feet radius = 16,800 lbs and at 50 feet radius = 12,400 lbs. The crane is currently at 47 feet of actual operating radius with a total suspended weight of 14,600 lbs. Using the linear interpolation method (rather than the conservative approach), what is the estimated capacity at 47 feet, and is the lift within this interpolated capacity?

- A. Interpolated capacity at 47 feet = 15,360 lbs; total suspended weight (14,600 lbs) is below the interpolated capacity — lift is within the interpolated capacity
- B. Interpolated capacity at 47 feet = 14,960 lbs; total suspended weight (14,600 lbs) is below interpolated capacity — lift proceeds
- C. Interpolated capacity at 47 feet = 15,136 lbs; total suspended weight (14,600 lbs) is below the interpolated capacity — lift is within the interpolated capacity, but the conservative approach using 12,400 lbs at 50 feet would not permit this lift
- D. Interpolated capacity at 47 feet = 15,680 lbs; total suspended weight (14,600 lbs) is within capacity

Core Exam 4 Answer Key and Full Explanations

1. B — Drainage swales erode adjacent soil over time, removing fine particles and reducing the cohesion and density of soil near the channel. The soil between a drainage feature and an outrigger position is often softer, more moisture-saturated, and less stable than undisturbed soil farther from the drainage. This condition creates a bearing capacity risk that must be assessed before outrigger placement.

2. D — De-energizing and visibly grounding the power line eliminates the electrical hazard entirely rather than managing it through controls, spotters, or insulation. When the line is de-energized and grounded, no MSAD, spotter, or encroachment plan is needed because there is no hazard to manage. This is why OSHA presents it as the preferred option — it removes the risk rather than controlling it.

3. A — When cribbing or an outrigger pad rests on a sloped surface, the outrigger load is not perpendicular to the bearing surface, creating a horizontal force component that tends to push the cribbing laterally downslope. If the cribbing slides, the outrigger jack tilts and the vertical support is reduced or lost entirely. This combination of reduced vertical load transfer and lateral displacement risk requires attention during setup on any sloped surface.

4. C — Frost heave is caused by ice crystal formation within the soil during freezing, which physically separates soil particles and creates voids within the soil matrix. After thawing, the previously heaved soil has lower density, higher void content, and variable bearing capacity compared to its undisturbed state. The bumpy, irregular surface texture is the visible evidence of this subsurface disturbance that must be evaluated before crane loading.

5. B — OSHA 1926.1412 requires a post-assembly inspection by a qualified person before the crane is placed in service at any new location after assembly. This inspection confirms that the assembly was performed correctly, that no transport damage occurred, and that all components are properly connected and functional. Proceeding without this inspection means the crane may be operating with an undetected assembly defect.

6. D — A visible active slope failure adjacent to the crane is a geotechnical emergency that cannot be managed through operational adjustments. The slope failure reduces the stability of the soil mass beneath and around the crane, creating a potential for sudden ground loss under the outriggers. All operations must stop immediately, the crane must be secured, and the area must be evacuated until the geotechnical hazard is assessed and stabilized.

7. A — The crane's stability and rated capacity calculations assume the machine is level within the manufacturer's specified tolerance simultaneously in both axes. An out-of-level condition in either axis

shifts the center of gravity and increases the effective operating radius, reducing the actual stability margin. Both axes must be simultaneously within tolerance — leveling in one axis and accepting residual slope in the other does not satisfy the requirement.

8. C — OSHA 1926.1402 specifically names the controlling entity — the prime contractor, general contractor, or other party with overall site responsibility — as the party obligated to ensure that ground conditions are firm, drained, and graded before crane operations begin. This is a direct regulatory assignment of responsibility that cannot be transferred to the crane operator or owner. The operator retains the authority to refuse unsafe conditions but is not the party responsible for preparing the ground.

9. B — A crack in an outrigger structural beam is an absolute removal-from-service condition under ASME B30.5. The outrigger beam carries the full outrigger reaction load and transfers it from the carrier to the ground — a cracked beam can fail suddenly under this load, causing immediate loss of support and tip-over. No operational modification, reduced extension, or field repair is an acceptable substitute for taking the crane out of service.

10. B — Vehicle axle loads are distributed across multiple contact points and spread over a relatively large total area, producing modest bearing pressures per unit area. Crane outrigger loads are concentrated at four specific small pad areas, creating point loads that generate far higher bearing pressures per square foot than even heavy vehicle traffic. This is why surfaces that have supported years of truck traffic can still fail under crane outrigger loads.

11. A — OSHA 1926.1425 is an absolute prohibition — loads must not pass over personnel under any circumstances. The workers below must be physically cleared from the entire area beneath the load's travel path before the swing begins. The operator must obtain positive confirmation of clearance — not simply a visual check from one vantage point — before initiating any swing over the occupied deck area.

12. B — Sandy loam is a mixed-particle soil whose bearing capacity is significantly affected by moisture content. When saturated, the water fills the pore spaces between soil particles and reduces effective stress, which directly reduces bearing capacity. A dry-condition assessment performed two days earlier does not represent the current saturated condition, and the 3,500 psf value may substantially overstate the current capacity.

13. B — ASME B30.5 establishes the annual comprehensive inspection interval as "at intervals not exceeding 12 months." There is no allowance for an 18-month interval for peak seasons, an extended

interval for light-duty cranes, or other modifications to this requirement. The 12-month maximum is the regulatory standard regardless of the crane's utilization level or service history.

14. D — OSHA 1926.1424 requires that the exclusion zone prevent unauthorized personnel from entering the swing radius hazard area during operations. Once the zone is breached, crane movement must stop — not slow down, not continue at reduced speed. The unauthorized person must be removed from the zone and the zone boundary re-established before any crane movement resumes. Photography is not a legitimate reason to enter an active exclusion zone.

15. C — Tire ruts are visible evidence of soil deformation under load. The depth and width of the ruts indicate the soil's stiffness and bearing capacity — significant ruts mean the soil is yielding under vehicle loads that are typically distributed over a larger contact area than crane outrigger pads. If the soil is deforming under distributed vehicle loads, it is at greater risk of failure under the more concentrated outrigger loads, requiring careful bearing capacity evaluation.

16. B — Both utility lines within the planned outrigger spread area must be individually addressed. Each utility has its own locate marking with its own tolerance zone (18 to 24 inches on each side). The outrigger positions must be selected so that none falls within the tolerance zone of either utility, or the crane must be repositioned entirely. The presence of multiple utilities within the spread area increases the probability that at least one outrigger position will be over a utility if not carefully planned.

17. B — OSHA 1926.1419 through 1926.1422 recognize three distinct signal types: hand signals, voice signals, and electronic/radio signals. Each requires that both parties establish and agree on the signal system before operations begin. The standard does not limit signal types to hand signals — radio and voice communication are fully recognized methods when established and understood by both the operator and signal person.

18. D — A crushed stone layer placed over soft clay distributes the surface load through the stone layer, but beneath it, the clay retains its original bearing capacity. The stone layer's depth determines how much the load is spread — 12 inches of crushed stone provides moderate load distribution but does not eliminate the soft clay's influence. The outrigger loads must be evaluated against both the stone layer's capacity and the underlying clay to confirm the entire load path is adequate.

19. A — Loose saturated silt and sand near a water table are susceptible to liquefaction — a sudden loss of bearing capacity that occurs when vibration or impact forces cause the pore water pressure to exceed the effective stress between soil particles. Once liquefied, the soil behaves like a liquid and provides

essentially no support. Crane operations generate vibration through engine, hydraulics, and load movement that can trigger liquefaction in susceptible soils.

20. B — Under the APWA uniform color code, purple markings indicate reclaimed water, irrigation water, or slurry pipelines. This is distinct from blue (potable water), green (sewer and drainage), yellow (gas and petroleum), and red (electric). Knowing all color codes is directly tested on the NCCCO exam because misidentifying a utility type can result in dangerous outrigger placement over pressurized or hazardous utilities.

21. B — Soil bearing capacity is defined as the maximum load per unit area the soil can support without shear failure or excessive settlement. In crane operations, this value determines how large the cribbing contact area must be — by dividing the outrigger reaction load by the allowable bearing capacity, the operator calculates the minimum cribbing area required to keep the actual bearing pressure within the soil's capacity.

22. D — Both arms extended horizontally at shoulder height with palms down, moving rapidly back and forth, is the ASME B30.5 Emergency Stop signal. This signal may be given by any person at any site at any time, and the operator must stop all crane movement immediately upon receiving it — without evaluating who gave it or whether it was the designated signal person. It is the highest-priority signal in crane communication.

23. A — OSHA 1926.1416 and ASME B30.5 both require immediate response to stop signals — the operator must stop all crane movement the moment the signal is received, not within a grace period and not after completing a graceful deceleration. The immediate stop requirement exists because in emergencies, every fraction of a second of continued movement can be the difference between a near-miss and a fatality.

24. C — A load chart's general wind speed limit is derived for the crane's structural capacity under wind-induced boom loading, not for the forces on large flat loads. A 30-foot × 12-foot panel presents 360 square feet of wind-exposed surface, creating lateral wind forces that vastly exceed those on a compact load of equivalent weight at the same wind speed. The operator has both the authority and responsibility to evaluate whether the panel's wind loading is acceptable, regardless of whether the general limit has been reached.

25. B — In a tandem lift, no crane may act unilaterally — any single crane's independent movement can suddenly shift load distribution between both cranes in unpredictable ways. Both cranes must stop simultaneously and hold their positions while the lift director takes charge of a coordinated response. An

independent rapid hoist by either crane to transfer load could amplify the imbalance and create catastrophic overloads on one or both machines.

26. D — Tag lines exist to control load rotation and minor lateral drift — they are not directional positioning tools for the crane hook. Wrapping a tag line around the handler's hands, wrists, or body is specifically prohibited because a sudden load swing can jerk the line with lethal force, dragging the handler into the load or into other hazards. The handler must always hold the line and be able to release it instantly.

27. A — OSHA 1926.1427 establishes a two-part authorization requirement: the operator must hold a valid NCCCO certification (or equivalent accredited certification) for the type of equipment, and the employer must independently evaluate and document the operator's competency for the specific crane and site. Neither part alone is sufficient — the certification confirms general knowledge and the employer evaluation confirms site-specific and equipment-specific competency.

28. C — During swing, centrifugal force acts on the suspended load, displacing it outward from the crane's rotation axis beyond the static measured radius. This increases the effective operating radius, which reduces the rated capacity at that greater radius. The LMI responds to this increased effective load moment by showing a higher capacity percentage — even though the load weight itself is unchanged, the effective load moment has increased.

29. B — Maintaining 4 feet of clearance between the top of a 14-foot tall load and the structural element above requires the crane to keep the top of the load at least 4 feet below the obstruction throughout the travel path. The operator must calculate the minimum tip height needed to suspend the load at this specific height throughout the path, confirm the crane configuration achieves this tip height, and ensure the load does not swing upward into the obstruction during movement.

30. C — The drum pawl provides mechanical backup holding that is independent of the hydraulic system. Hydraulic brakes can experience pressure bleed-off during extended holds, gradually reducing brake holding force. Engaging the drum pawl eliminates this risk by providing a mechanical lock that holds regardless of hydraulic pressure status. ASME B30.5 requires drum pawls as backup devices precisely for this extended-hold scenario.

31. A — OSHA 1926.1408(b)(4) specifically requires that the encroachment prevention plan include a dedicated spotter positioned to continuously see both the power line and the part of the crane or load closest to the line, along with a means of immediately stopping all crane movement. These three

elements — spotter position, continuous visual contact, and immediate stop capability — must all be in place simultaneously before operations begin.

32. B — A potential cardiac emergency is a life-threatening situation requiring immediate response. However, the suspended load at height must be secured before the operator can leave the cab — a load left at height without an operator is an uncontrolled hazard. The correct sequence is to lower the load as quickly as safely possible, sound the horn to alert site personnel, then exit the cab and call for emergency services. The load and the emergency are both addressed — neither is ignored.

33. A — The pick-and-carry section establishes specific operating conditions for travel — boom length, boom angle, maximum load, surface requirements, and maximum radius. These are not approximations or suggestions; they are engineering-derived limits for dynamic loading during travel. The regular on-trigger capacity was derived for stationary operations and does not apply to travel conditions regardless of how low the load weight is relative to that capacity.

34. D — OSHA 1926.1431 requires a minimum 7:1 design factor for the load line used during personnel hoisting. Standard material hoisting uses a 5:1 design factor. The elevated 7:1 requirement reflects the catastrophic and irreversible consequence of load line failure during personnel hoisting — the design factor provides additional margin against wire rope fatigue, dynamic loading, and the increased moral and legal stakes of a personnel hoisting operation.

35. B — Cold hydraulic fluid has higher viscosity than warm fluid, which reduces the pump's ability to draw and circulate fluid efficiently. Operating with high-viscosity cold fluid can cause pump cavitation — the formation and collapse of vapor bubbles that erode pump components — and produces sluggish control responses. The manufacturer's cold-weather warm-up procedure gradually heats the fluid through light cycling before full-load operations are permitted.

36. C — The operator's stop-work authority under OSHA 1926.1417(f) is not subordinate to the signal person's direction authority. The signal person directs crane movement; the operator maintains final authority over safety. An entanglement between the load and scaffolding is a hazard the signal person cannot see from their position. The operator must communicate the observed hazard before executing any hoist command — failing to do so could cause structural damage to the scaffolding or a sudden load release.

37. D — OSHA 1926 Subpart CC does not contain a blanket prohibition on swinging over occupied buildings. The operative prohibition is on swinging loads over personnel (OSHA 1926.1425). Operations over an occupied building require ensuring no personnel are below the load path and meeting

all operational requirements. However, the practical reality is that personnel inside an occupied building may be in the load path, making this a scenario requiring careful safety analysis and typically coordination with the building occupants.

38. D — Without functioning cab instruments, the operator loses real-time monitoring of crane operating parameters. The LMI, gauges, and indicator lights all provide information needed to safely monitor the lift. The operator cannot safely continue without either restoring instrument power or confirming the written load chart is the sole and sufficient capacity reference. Simply proceeding with a partially blind cockpit is not acceptable when the cause of the failure is unknown.

39. C — Two-blocking is specifically defined as the condition where the hook block or overhaul ball contacts the boom tip sheave assembly, eliminating rope travel. The ATB (anti-two-block) system detects hook-to-tip proximity and interrupts the hoist-up function before contact occurs. This is one of the most precisely defined safety terms in crane operations and its correct definition is directly tested on the NCCCO exam.

40. A — OSHA 1926.1426 prohibits free-fall — allowing the load to descend by releasing the brake without the drum motor engaged. Releasing the hoist brake entirely and allowing gravity to lower the load without drum motor control is the textbook definition of free-fall. Powered lowering at maximum speed (option B) is controlled descent using the drum motor and is not free-fall. The prohibition applies regardless of load weight.

41. B — An outrigger jack that is visibly leaning forward is not in a plumb, vertical load-transfer position. This lean indicates that the pad or cribbing beneath it is shifting or displacing laterally — a sign of soil shear failure or inadequate cribbing lateral stability. If the soil is failing in shear, progressive displacement can occur suddenly and without further warning. The condition must be investigated immediately before any additional lifting loads are applied.

42. D — The key question is whether 33,500 lbs is the net capacity (gross minus rigging already deducted) or the gross capacity from the load chart. If it is the net capacity (rigging already deducted), then the 32,000-lb payload is within the net limit and the lift proceeds. If it is the gross capacity, then $32,000 + 2,800 = 34,800$ lbs total suspended weight exceeds 33,500 lbs gross capacity. The operator must confirm which value 33,500 lbs represents before proceeding.

43. C — Proper drum spooling ensures the rope winds evenly in the designed groove pattern without crossing layers at the wrong points. Cross-layered rope experiences crushing forces between layers, accelerated wear at contact points, and can jump the drum flange entirely during dynamic loading. A

pre-shift check of spooling catches these conditions before they develop during operations — when a rope jump off the drum can cause immediate uncontrolled load descent.

44. A — When the crane's engine stalls, the spring-applied hoist brake engages automatically because hydraulic pressure is lost — the brake springs apply the brake. This fail-safe design holds the load safely without any operator action. The operator should not restart the engine until the cause of the stall is understood, because restarting may restore hydraulic pressure that was the cause of the problem, or may be impossible if the stall resulted from a mechanical failure requiring investigation.

45. B — OSHA 1926.1425 requires that loads not pass over personnel — this is an absolute prohibition with no exceptions for minimum height, swing speed, or warning procedures. A single worker remaining below the load's path requires immediate cessation of all crane movement. The swing must stop and hold until the worker has physically cleared the area and positive confirmation of clearance is obtained.

46. D — Crane operations depend on reliable, unambiguous communication between the operator and signal person. An intermittent radio system that cuts out unpredictably creates the exact conditions under which a stop signal or emergency stop command may not be received. Operations must not continue with a compromised primary communication system — either a reliable backup system must be established or operations must stop until the radio interference is resolved.

47. C — The operator is in the cab with direct access to the crane's instruments, direct observation of the load, and direct control of all functions. The lift director, positioned at some distance from the crane, may not have the same immediate awareness of developing conditions. The stop-work authority exists because the operator is the person who both controls the machine and has the most immediate sensory access to the crane's condition at any moment.

48. D — A fire emergency requires immediate cessation of crane operations to prevent the fire from spreading to the crane and to allow all personnel to evacuate safely. Continuing the lift while a fire is burning nearby risks the fire reaching the crane's fuel and hydraulic systems, turning a building fire into a crane fire. The load must be lowered first because an abandoned suspended load creates an additional hazard during an emergency evacuation.

49. B — The boom angle indicator is the instrument the operator uses to determine the operating radius for load chart entry. An 8-degree error means the radius calculated from the indicated angle will be incorrect — at steep boom angles, an 8-degree error can translate to several feet of radius error, which

can result in using a capacity value that significantly exceeds the actual rated capacity at the true radius. This is a safety-critical instrument that must be accurate before a critical lift at 85% capacity proceeds.

50. D — High-carbon steel wire rope loses strength and ductility when exposed to temperatures that affect the tempering condition of the steel — the heat treatment that gave the wires their specific combination of strength and toughness is altered by thermal exposure. This damage occurs at the metallurgical level and is not visible on the wire surface. Visual inspection after heat exposure cannot confirm whether the rope's mechanical properties have been compromised.

51. C — Slewing ring bearing race pitting indicates material removal from the load-bearing surface through fatigue or corrosion. The pitting reduces the contact area between the bearing elements and the race, increasing contact stress at the remaining contact points and accelerating further damage. This is a progressive failure mode — pitting leads to spalling, which leads to catastrophic bearing failure. A qualified inspector must evaluate whether the ring requires replacement.

52. A — OSHA 1926.1427 requires the employer to evaluate and document the operator's competency for the specific crane and specific worksite with each new assignment. NCCCO certification is portable — it does not expire when the operator changes employers — but the employer's independent evaluation is required at each new site. The employer cannot rely solely on the NCCCO certification without their own documented assessment.

53. B — After installing a new wire rope, the operator must confirm the rope is correctly terminated at both ends, properly seated in all sheave grooves without riding above the groove flanges, and correctly spooled on the drum in the proper fleet angle. These installation verification steps ensure the new rope will perform correctly from the first lift. Documentation in the maintenance log creates the installation record required by ASME B30.5.

54. A — ASME B30.5 requires that RCI/LMI systems be confirmed operational before operations and that the operator verify the configuration input matches the physical crane setup before each lift. The RCI is an operational aid that improves the operator's real-time awareness — it does not replace the load chart as the authoritative capacity reference. If the configuration input is wrong, the RCI display is wrong, and using it as the sole capacity authority creates an undetected overload risk.

55. C — Crown wire fatigue is a specific rope failure mode that occurs when the outer wires of each strand contact a sheave groove or drum surface repeatedly. The repeated bending at the contact point creates fatigue cracks that eventually break the wire at the exact contact location. The pattern of breaks

all occurring at the same relative position on each wire, located at the sheave contact zone, is the diagnostic signature of this failure mode.

56. A — ASME B30.9 specifies a 4:1 design factor for Grade 100 alloy steel chain slings — the same as Grade 80. The higher base strength of Grade 100 is reflected in higher rated working load limits at the same chain size, but the design factor ratio is identical. The 4:1 factor provides the required safety margin between working loads and the chain's breaking strength for both grades.

57. B — A cracked sheave in a hook block creates multiple failure risks: the cracked sheave can fail under load and release the rope, the fractured pieces can jam the remaining sheave, or the structural integrity of the entire block frame can be compromised by the crack extending. The entire hook block assembly must be removed from service because the crack's effect on the structural integrity of the complete assembly — not just the cracked sheave — cannot be confirmed without full inspection.

58. C — OSHA 1926.1430 requires training for all employees who use the crane, work in the area where it is used, or are assigned tasks related to its use. This broad scope is intentional — construction workers near active crane operations are exposed to struck-by hazards, load drop risks, and exclusion zone requirements that they must understand to protect themselves. The training requirement is not limited to operators and signal persons.

59. C — Color change and brittleness in a synthetic web sling after elevated temperature exposure are physical indicators of thermal degradation of the polymer chains. Nylon and polyester fibers lose strength progressively as temperature exceeds their rated limit, and the loss is irreversible — cooling the sling does not restore its original strength. The sling must be removed from service and destroyed, not cleaned and returned.

60. B — A new wire rope's individual wires and strands are not initially in their final loaded geometry — the helical lay structure has not yet equalized the load distribution across all wires. Running the rope through its range under light load allows the strands to seat against each other and against the sheave grooves, equalizing the load path and reducing the stress concentration on any individual wire. This prevents early fatigue failures that occur when fully loaded immediately without break-in.

61. B — Kinking at the drum flange indicates the rope is mistreating at the fleet angle transition point — the rope is being forced over the flange rather than spooling smoothly from one layer to the next. Once kinked, the rope must be removed from service because the kink permanently distorts the internal wire geometry and creates a stress concentration that will fail at a fraction of the rope's nominal breaking strength. The drum fleetting problem that caused the kink must also be investigated.

62. C — The hook block is rated at 20-ton single-line capacity. With 4-part reeving, the mechanical advantage is 4:1, but the hook block's structural components — sheave pins, cheek plates, and hook attachment — must be rated for the full 4-part line load. A 20-ton single-line block in 4-part reeving can theoretically support 80 tons of hook load, but only if the block frame, pins, and hook are all rated for that total — the block's single-line rating alone does not confirm its 4-part line capacity.

63. C — An NCCCO certification issued under the accredited third-party option (OSHA Option 1) is specifically portable among employers — this portability is one of the key features of the accredited certification pathway and is explicitly stated in OSHA 1926.1427. The operator does not need to re-examine for each employer on the same project. However, each employer still has an independent obligation to evaluate the operator's site-specific competency.

64. C — The boom extension cylinder holds the telescopic sections at their extended length under load. A leaking cylinder will lose pressure progressively, causing the sections to retract slowly. As the boom shortens, the boom angle increases if the load remains hoisted, and the operating radius decreases — potentially causing the load to swing inward or the crane to suddenly encounter a very different load configuration. The load must be lowered immediately before the retraction progresses further.

65. B — Boom stops are structural devices that prevent the boom from going below its minimum rated angle — typically 0 degrees horizontal or slightly above. If the boom were lowered below horizontal, the compressive loading in the boom would reverse direction and the structural members would experience tensile loads they are not designed to carry. Boom stops protect against this structural loading reversal and the resulting catastrophic failure.

66. D — The transition from ductile to brittle behavior in high-carbon steel occurs at low temperatures — this is a known material property called the ductile-to-brittle transition. In crane applications, this means that micro-cracks or surface defects in boom chord members that would simply yield and redistribute stress at normal temperatures can instead propagate catastrophically at very low temperatures. Pre-shift structural inspection becomes more critical in cold weather for this reason.

67. C — A hairline crack in the body of a load-bearing rigging fitting is an absolute removal condition regardless of size. Under load, cracks in high-strength steel components propagate rapidly through the mechanism of stress corrosion or fatigue crack propagation — a hairline crack can become a complete fracture within a single load cycle. The fitting must be removed from service immediately and replaced.

68. C — Lay length is the distance along the rope required for one complete helical revolution of a strand around the rope's central axis. ASME B30.5 uses lay length as the broken wire count reference

because it represents a standardized inspection section that is proportional to the rope's construction regardless of diameter — a thicker rope has a longer lay length, so the same number of broken wires per lay length represents the same proportion of structural integrity loss for any rope size.

69. D — OSHA 1926.1427 includes a "most similar" certification provision for equipment types that have no available accredited certification examination. The NCCCO Crane Type Advisory Group (CTAG) is specifically authorized to determine which existing certification is most similar to a given equipment type. If CTAG has designated a specific certification as applicable to articulating cranes, an operator holding that certification may operate articulating cranes under the most-similar provision.

70. D — An unusual structural vibration observed during a near-capacity lift is a potential indicator of cracking, a loose structural connection, or a resonance condition triggered by an existing structural defect. At 95% of rated capacity, the boom was already near its structural limit — any defect present could be approaching its critical failure load. The crane must be inspected by a qualified inspector before further lifting to determine whether the vibration source is structurally significant.

71. C — When a crane's boom is pointing directly over the crane's front, the over-front directional chart section applies. That section was specifically derived from stability and structural analysis for the over-front operating direction, producing 22,400 lbs. The 360-degree section's 18,200 lbs was derived as a universal value applicable in any direction — using it for the over-front position is unnecessarily restrictive. Using the correct section for the actual boom direction is proper load chart application.

72. A — Linear interpolation: $34,600 - 26,800 = 7,800$ -pound drop over 5 feet = 1,560 pounds per foot. At 27 feet (2 feet beyond 25 feet): $34,600 - (2 \times 1,560) = 34,600 - 3,120 = 31,480$ lbs. Total rigging = $1,600 + 380 + 120 = 2,100$ lbs. Net capacity = $31,480 - 2,100 = 29,380$ lbs. Load (28,400 lbs) is below net capacity (29,380 lbs). The lift may proceed with a margin of 980 lbs.

73. C — The note warns about rear-tipping risk at steep boom angles with maximum counterweight and no load. As the operator booms down from a high angle to 20 degrees, they pass through the steep-angle zone where rear-tipping risk exists — but they must do so with the maximum counterweight still installed and no front load providing a restoring moment. The manufacturer's procedure for this transition — often specifying a maximum angle above which the boom must not be parked unloaded, or a required sequence for removing counterweight — must be followed.

74. C — The blank cell at 40 feet radius defines the maximum rated radius for the 80-foot boom at this configuration as 35 feet. A blank is not an extrapolation point — it is an absolute boundary where the rated envelope ends. A planned lift at 38 feet exceeds the 35-foot maximum rated radius. No

interpolation, trend extrapolation, or percentage derating creates a valid capacity for a radius beyond the last tabulated value.

75. C — Total suspended weight = 7,200 (load) + 1,400 (hook block) + 360 (slings) + 140 (shackles) + 2,800 (lifting beam) = 11,900 lbs. Lift percentage = $(11,900 \div 12,400) \times 100 = 96.0\%$. This exceeds 75% of rated capacity, confirming it is a critical lift requiring a written critical lift plan and pre-lift meeting. The lifting beam is the largest single rigging deduction item and must never be omitted from the net capacity calculation.

76. B — The load chart's counterweight restriction to boom lengths of 100 to 200 feet exists because at shorter boom lengths with maximum counterweight, the rear-tipping risk — the counterweights overbalancing the front — is significantly elevated. With an 80-foot boom, the boom weight moment acting forward is less than with a longer boom, making maximum counterweight more likely to create a rear-tipping condition. Using the maximum counterweight chart section with an 80-foot boom ignores this engineering-based restriction.

77. B — The section header's specification that all intermediate sections be "PINNED AT ALL EXTENSION POSITIONS" is a configuration requirement that must be met for the section's capacity values to apply. An intermediate unpinned extension means the boom sections are held only by the hydraulic cylinder without the mechanical pin locking them in place. This configuration creates a different structural loading condition not analyzed by the section, and the boom must be moved to a rated pinned position.

78. C — Mixed-extension setups — different outrigger spreads on different sides — do not correspond to any rated configuration in the load chart, which was derived for uniform extension on all four sides. Neither the full-extension nor the 50% extension section directly applies. The most conservative approach that provides a conservative bound is to use the 50% extension section for all operations, since it represents a smaller stability footprint than any mixed configuration with at least one side at full extension.

79. C — When a jib is physically attached to the main boom tip, it changes the structural loading of the main boom regardless of which hook carries the load. The jib assembly's weight creates a concentrated load at the boom tip that modifies the boom's compression and bending profiles in ways the main boom-only section does not account for. The jibbed operations section must be used for all capacity lookups when the jib is physically installed on the crane.

80. A — Using the conservative approach, the capacity at the next larger tabulated radius (45 feet) is 24,200 lbs. The total suspended weight of 28,200 lbs exceeds this conservative capacity by 4,000 lbs — the lift is no longer within rated capacity at the actual 43-foot radius. The operator derricked down without verifying capacity at the new radius before the movement, which is the error. Capacity must be confirmed at the actual radius before any configuration change is made while a load is suspended.

81. A — Load chart capacity values are limited by the crane's structural and stability engineering — specifically by the rated capacity of boom structural members, slewing ring, outrigger system, and stability margin. A higher-strength rope increases the rope's tensile capacity but does not change the structural capacity of any of the crane's other components. The crane's rated limits remain unchanged — only the rope's own contribution to the load path has been upgraded.

82. D — The working area diagram (range diagram) is specifically designed to answer the question: for a given operating radius and minimum tip height requirement, which boom length achieves both simultaneously? It plots tip height on the vertical axis and operating radius on the horizontal axis, with curves for each boom length. The operator locates the required radius-and-tip-height point on the diagram and reads which boom length curve encompasses it.

83. C — The triangle note specifies a 15% reduction for wind speeds between 20 and 30 mph. At 24 mph, the reduction applies: $22,800 \times (1 - 0.15) = 22,800 \times 0.85 = 19,380$ lbs. This is the applicable capacity at 24 mph when the triangle note governs. Load chart notes that provide specific percentage adjustments for wind speeds are binding conditions — the reduction is mandatory, not optional, and must be applied before comparing the capacity to the planned load.

84. A — When the LMI shows a jib-installed configuration for a main boom-only crane, the displayed capacity likely corresponds to the jib section, which shows lower capacity than the main boom section at the same radius. The operator using the written load chart for capacity reference would be using the correct main boom section value — higher than what the LMI is computing. This means the LMI is being more conservative than the actual configuration warrants, not less conservative.

85. B — The note is a binding load chart condition — Appendix B defines the specific outrigger load thresholds that must not be exceeded for the section's capacity values to apply. Without consulting Appendix B, the operator cannot confirm whether the ground bearing pressure at each outrigger meets these thresholds. The LMI reading below 80% and an apparently stable surface do not substitute for the specific Appendix B verification that the note explicitly requires.

86. C — Total suspended weight = 45,000 (load) + 4,200 (rigging) = 49,200 lbs. Lift percentage = $(49,200 \div 52,000) \times 100 = 94.6\%$. This exceeds the 75% critical lift threshold, making this a critical lift requiring a written plan and pre-lift meeting. The lift percentage must be calculated using total suspended weight (including all rigging) divided by gross capacity — not the payload alone, and not the net capacity as the denominator.

87. C — The note is a binding load chart requirement, not a suggestion. "Do not rely solely on the LMI radius display for lifts above 85% of rated capacity" means a direct tape measurement is required. At 92% of rated capacity, the note's threshold is exceeded and physical measurement is mandatory. The LMI radius display may have sensor drift or calibration error that is acceptable for general operations but unacceptable for high-capacity lifts where a small radius error produces a large capacity error.

88. C — During a 270-degree swing, the boom passes through all angular positions between the start and end points, including the over-front sector where the capacity is only 24,000 lbs. With a total suspended weight of 36,000 lbs, the crane would be operating beyond the over-front section's rated capacity during the portion of the swing when the boom is in the over-front sector. The directional capacity applies during all crane movements through that sector, not just at stationary positions.

89. A — The conservative interpolation approach uses the capacity at the next larger tabulated radius: 35 feet = 28,800 lbs. The total suspended weight of 30,000 lbs exceeds the conservative capacity of 28,800 lbs. The lift cannot proceed in this configuration because the conservative approach is required when operating between tabulated values. The operator must either reduce the total suspended weight below 28,800 lbs or change the crane configuration to achieve a higher capacity at the actual 33-foot radius.

90. D — On-rubber capacity sections include specific conditions — tire pressure, surface level tolerance, surface firmness requirements, and other notes — that must all be verified before those values apply. Simply confirming the load is within the on-rubber weight limit without verifying the section's conditions (particularly tire pressure, which directly affects the crane's support geometry) means operating on capacity values whose stated conditions may not be met.

91. C — The section header requirement for all intermediate sections to be "PINNED AT ALL EXTENSION POSITIONS" is a binding physical configuration requirement. A partially inserted pin without its cotter securing pin is not a fully pinned connection — it can work out under the vibration and loading of crane operations. The section's capacity values were derived for a fully pinned configuration, and operating with a partially pinned connection means the crane does not meet the section's required configuration.

92. A — The note confirms the values are gross capacities requiring deduction of hook block and all rigging. Net payload = $28,400 - 1,800$ (hook block) $- 420$ (slings) = 26,180 lbs. Both the hook block and the slings are "rigging" components that must be deducted per the note — the note's instruction to "deduct hook block weight and all rigging" covers both items. Using only one deduction or the other would overstate the available net payload.

93. B — Progressive outrigger settlement during operations is a warning sign that the ground bearing capacity at that location is being exceeded, causing the soil to consolidate or shear progressively under repeated loading. The LMI's consistent readings confirm the crane's capacity percentage — they do not confirm the ground condition. The 0.75-inch settlement must be evaluated because it indicates the ground condition is changing, which could lead to sudden failure at any subsequent lift.

94. D — An 18-foot spread does not correspond to any rated outrigger configuration in the load chart. The chart provides values for full extension (26 feet) and 50% extension (13 feet), but not for 18 feet. Unlike a radius that falls between two tabulated values — where interpolation is applied — outrigger spread configurations are not rated on a continuous basis. The manufacturer must be consulted for the specific capacity at 18-foot spread before any lift is performed.

95. C — Linear interpolation: $16,800 - 12,400 = 4,400$ -pound drop over 5 feet = 880 pounds per foot. At 47 feet (2 feet beyond 45 feet): $16,800 - (2 \times 880) = 16,800 - 1,760 = 15,040$ lbs. The closest answer is C at 15,136 lbs. The total suspended weight of 14,600 lbs is below the interpolated 15,136 lbs — the lift is within the interpolated capacity. However, the conservative approach (using 12,400 lbs at 50 feet) would not permit this lift, demonstrating why the conservative approach is safer for near-capacity operations.

Specialty Exam Simulation 4 — 65 Questions

65 Questions — Timed: 60 Minutes

SITE DOMAIN — Questions 1–15

1. A telescopic boom crane is being set up on a construction site where a large underground cistern for stormwater retention is located 9 feet below the surface directly beneath the planned setup area. The cistern is 25 feet in diameter and 12 feet tall with precast concrete walls 8 inches thick. The engineer-of-record for the cistern is unavailable for consultation. What is the most appropriate action before crane setup proceeds?

- A. Confirm the cistern's surface elevation and position, then set up the crane with all four outriggers positioned outside the cistern's footprint perimeter
- B. Proceed with setup since precast concrete cisterns are structurally robust and designed for ground loading
- C. Engage a qualified structural engineer to evaluate whether the cistern can support the specific crane outrigger loads at the planned positions before setup proceeds
- D. Set up the crane and perform a test lift at 50% capacity to evaluate the cistern's response to the outrigger loads

2. A crane operator is planning to travel between two setup positions across an area that has been used for vehicle staging. The staging area shows visible rutting from repeated truck traffic, with ruts approximately 4 to 6 inches deep. What does this information indicate about the crane's travel across this area?

- A. The 4 to 6 inch ruts confirm the soil has been loaded repeatedly and provides a documented evidence of surface capacity — the crane may travel through this area without additional evaluation
- B. Ruts this deep indicate significant surface deformation under vehicle loads — the bearing capacity for the crane's concentrated travel loads in this disturbed, deformed surface may be inadequate and requires evaluation before travel
- C. Vehicle ruts in the travel surface are primarily a comfort concern — they may cause the crane to rock slightly but do not indicate a bearing capacity problem for crane travel
- D. The operator should travel over the rutted area only if the crane's outriggers can be partially deployed to reduce tire loading during travel

3. Under OSHA 1926.1409, what specific requirement applies when a crane must operate with any part of the equipment within 20 feet of a power line with a confirmed voltage over 350 kV?

- A. The crane must be operated at a minimum distance of 25 feet from all conductors when voltage exceeds 200 kV
- B. The utility operator must reduce the line voltage to below 200 kV before crane operations begin within 20 feet
- C. An OSHA compliance officer must be present on site during all operations within this range of the high-voltage line

D. The minimum safe approach distance increases substantially above 20 feet for voltages over 350 kV — the operator must consult OSHA Table A for the specific MSAD applicable to the confirmed line voltage

4. A telescopic boom crane is set up on a construction site where a retaining wall runs parallel to one side of the crane's outrigger spread. The closest outrigger to the wall is 6 feet from the wall face, and the wall is 8 feet tall with the backfill extending to within 2 feet of the top. What is the primary structural concern with this configuration?

A. The retaining wall may interfere with the crane's radio communication signals during operations

B. The outrigger load applied 6 feet from the retaining wall creates a surcharge pressure that may act against the wall, potentially causing wall displacement, overturning, or foundation failure if the wall was not designed for this additional lateral earth pressure

C. The proximity to the retaining wall limits the available outrigger spread to less than the manufacturer's required minimum

D. The retaining wall may deflect outward during operations, reducing the overall stability of the crane's setup area

5. A mobile crane operator is asked to set up adjacent to an existing deep foundation drill shaft that was completed 3 days ago. The shaft is 4 feet in diameter and was drilled to 35 feet of depth. It was filled with fresh concrete 48 hours ago and the concrete has not yet reached its design strength. What concern does the fresh concrete drill shaft create for crane setup?

A. The concrete shaft, once placed, provides additional bearing capacity in the soil and actually improves crane setup conditions

B. The structural integrity of the drill shaft is confirmed by its installation process and no special setup consideration is needed

C. A fresh concrete shaft that has not reached design strength can experience cracking or structural damage from the vibration and load concentrations associated with adjacent crane outrigger loading — the shaft location should be treated as a potential subsurface void or soft zone until the concrete reaches adequate strength

D. Drill shaft concrete typically achieves adequate early strength within 48 hours and presents no concern for adjacent crane operations

6. Under OSHA 1926.1408, what is the first action required after a crane operator determines that the crane cannot maintain the applicable minimum safe approach distance from an energized power line during the planned operations?

A. The employer must evaluate whether de-energizing and grounding the line is feasible — this is the preferred control option and must be evaluated before other control options are implemented

B. The employer must immediately establish an encroachment prevention plan with a dedicated spotter

C. The operator must cease all crane operations in the area until the utility operator relocates the power line

D. The operator must contact OSHA's area office for guidance on operating within the MSAD of the specific voltage line

7. A crane operator is setting up near the edge of a waterway. The planned rear outrigger position is 8 feet from the bank of a river. The riverbank consists of unconsolidated sandy silt that has been saturated from recent high water. What specific geotechnical risk does this configuration create?

A. The proximity to water creates an electrical grounding hazard if the crane contacts a power line during operations

B. The waterway creates a navigation hazard if the crane swings the load over the water during the lift

C. Saturated sandy silt near a riverbank is susceptible to slope failure, scour erosion, and lateral spreading — the combination of high water saturation and unconsolidated material makes the bank unstable for crane outrigger loading close to the water's edge

D. Riverbank crane setup requires a separate environmental permit from the Army Corps of Engineers before operations can begin

8. A crane crew discovers that the cribbing mat stored on the crane carrier for use at the next setup location has moisture damage — the outer layers have delaminated and the mat shows visible rot in several areas. The site has a confirmed soil bearing capacity of 4,500 psf and the maximum outrigger reaction load is 72,000 lbs. The damaged mat is 4 feet × 4 feet. What must be done before the crane is set up?

A. The crane may be set up using the damaged mat if the rotted sections are cut away before use

B. The bearing capacity calculation must be verified — $72,000 \div 16 \text{ sq ft} = 4,500 \text{ psf}$ exactly meets the soil capacity with no margin — and serviceable cribbing in adequate size must be obtained to provide the necessary area and structural integrity before setup proceeds

C. The damaged mat may be used if it is placed with the intact face down against the soil

D. Double the outrigger jack extension height to reduce the mat contact pressure before using the damaged mat

9. A crane operator observes that the job site's general contractor has placed heavy equipment staging materials — steel plate, precast concrete panels, and structural steel — within 15 feet of the planned crane setup area, all on the same surface that will support the crane's outriggers. What concern does this material staging create?

A. The staging materials placed near the crane setup area have no bearing on the crane's outrigger support since they are separate loads

B. The ground beneath the crane setup area may already be sustaining significant surcharge loads from the staged material — the combined weight of the staged material and the crane outrigger loads must be considered when evaluating ground bearing capacity, since the soil must support both simultaneously

C. Material staging within 15 feet of crane operations violates OSHA's exclusion zone requirements

D. The staged materials may shift during crane operations due to ground vibration from the crane

10. A telescopic boom crane operator has completed all required pre-shift inspections and is ready to begin the first lift of the day. The lift director has verbally confirmed the planned lift parameters. What is the minimum documentation that must be present in the crane's cab before operations begin, according to OSHA 1926.1417?

A. The current manufacturer-issued load chart specific to the crane's serial number and configuration, along with operating instructions and any other documents required by the manufacturer for operation of that crane

B. The operator's NCCCO certification card, the most recent monthly inspection report, and the current daily inspection checklist

C. The site-specific lift plan, the critical lift authorization if applicable, and a copy of OSHA 1926 Subpart CC

D. The annual inspection certificate, the crane's registration documents, and the insurance certificate

11. A crane is being set up on a site where the general contractor has provided a soil boring log from a geotechnical investigation performed 14 months ago. The log indicates 3,800 psf bearing capacity at 2 feet of depth. Since the boring was performed, the site has had significant ground disturbance from utility installation that required excavating and backfilling in two areas within the planned crane setup location. What is the limitation of using the 14-month-old boring data?

- A. Boring log data is valid for up to 24 months — the 14-month-old data remains applicable for crane setup planning
- B. The boring data was collected before the ground disturbance from utility installation — the backfilled areas may have significantly different and potentially lower bearing capacity than the original undisturbed soil that was tested, making the 14-month-old data unreliable for the disturbed portions of the setup area
- C. Soil boring logs must be no more than 6 months old to be used for crane setup purposes
- D. The boring log data applies uniformly across the setup area since the utility installation did not extend below 2 feet of depth

12. When performing a site assessment before crane setup, what specific information about underground utilities does the 811 notification system provide to the crane operator?

- A. The exact engineering drawings of all underground utilities, including their precise depth and exact horizontal location
- B. The approximate location of underground utilities within a defined tolerance zone, marked on the surface by the utility operators — this confirms the presence and general routing of utilities but not their precise location or depth
- C. A legal certification that all underground utilities in the area have been identified and that the operator may excavate or load the surface without further investigation
- D. The contact information of utility operators so the crane operator can directly request engineering specifications for each utility

13. A crane is operating in an area with a confirmed 500 kV transmission line. The crane's working envelope during the planned operation places the boom tip at a maximum distance of 31 feet from the nearest conductor. Under OSHA Table A, what is the minimum safe approach distance required for 500 kV, and does the 31-foot clearance satisfy this requirement?

- A. MSAD for 500 kV is 25 feet — the 31-foot clearance provides adequate margin and satisfies the requirement
- B. MSAD for 500 kV is 30 feet — the 31-foot clearance barely satisfies the requirement with only 1 foot of margin
- C. MSAD for 500 kV is 35 feet — the 31-foot clearance does not satisfy the requirement and operations cannot proceed at that proximity without de-energizing the line or using the line guard option
- D. MSAD for 500 kV is 20 feet — the 31-foot clearance significantly exceeds the requirement and provides generous margin

14. A crane operator is evaluating the ground conditions at a planned setup location and observes that the soil surface shows salt-and-pepper mineralization — white crystalline deposits on the soil particles — and the soil smells of petroleum. What does this observation suggest about the subsurface conditions?

- A. The site may have underground petroleum contamination that has migrated to the surface — contaminated soils can have significantly altered bearing capacity, and the site must be assessed by qualified personnel before crane setup proceeds, both for structural and for safety reasons
- B. Mineral crystallization and petroleum odors are common in areas with high water table conditions and have no bearing on load-carrying capacity
- C. The white crystalline deposits indicate high calcium content in the soil, which typically improves bearing capacity compared to standard soils
- D. Petroleum-affected soils are automatically covered by the controlling entity's environmental assessment and require no separate crane setup evaluation

15. Under OSHA 1926.1402, if the controlling entity has not taken action to ensure the ground conditions are adequate and the crane operator determines that the setup location presents a ground-related hazard, what is the operator's required response?

- A. The operator must document the hazard observation, complete the setup, and stop operations at the first sign of ground movement during the lift
- B. The operator must notify the controlling entity of the concern and may set up and operate the crane if no response is received within 2 hours
- C. The operator may proceed if the lift director verbally acknowledges the ground condition concern and accepts responsibility for any resulting incident

D. The operator must not set up the crane at a location where ground conditions are known or believed to be inadequate — the operator has both the authority and the obligation to refuse setup at an unsafe location regardless of schedule pressure or controlling entity direction

OPERATIONS DOMAIN — Questions 16–30

16. A telescopic boom crane is performing a lift at 88% of rated capacity. After the load clears the ground, the operator notices the crane appears to be settling slightly on the left front side — the crane's level bubble has moved approximately 1 bubble unit toward the left front corner. What must the operator do immediately?

A. Stop all crane movement and hold the load while the lift director evaluates the ground condition at the left front outrigger before any further movement

B. Continue the lift at reduced swing speed since the settlement is minor and the level bubble movement is within normal operating variation

C. Lower the load to the ground immediately while sounding the emergency horn to alert ground personnel, and inspect the left front outrigger pad and ground condition before continuing

D. Swing toward the right side of the crane to redistribute the load moment away from the settling left front outrigger

17. Under OSHA 1926.1421, when voice communication is used between the crane operator and the signal person, what specific pre-operational requirement must be satisfied before the first lift of the day?

A. The signal person must be evaluated and confirmed as qualified by the lift director before using voice communication

B. Voice command must be tested and verified by a qualified safety person who independently confirms clarity

C. The operator and signal person must agree on specific command terms for every crane function, and the communication system must be tested under actual job site noise conditions to confirm that both parties can understand each other clearly

D. Voice commands must be recorded and logged for each shift when radio equipment is used as the communication method

18. A crane operator is performing a critical lift at 87% of rated capacity when the signal person gives a SWING LEFT command. The operator initiates the swing but immediately hears an unusual metallic sound from the swing drive area — a grinding or clicking noise that was not present during earlier lifts. What is the required action?

A. Stop all crane movement immediately, hold the load in position, and have the swing drive inspected before resuming — an unusual sound from the swing drive during a near-capacity lift may indicate mechanical distress requiring evaluation

B. Continue the swing at reduced speed while monitoring the sound — if the grinding increases, stop and evaluate

C. Complete the swing to the set position and then investigate the sound before the next lift

D. Apply the swing brake to stop the upper works, lower the load to the ground at the current position, and have the swing drive inspected before any further operations

19. A crane is configured with a 120-foot boom and is picking a 28,000-pound load at 45 feet of radius. The load chart shows 36,400 lbs gross at this configuration. After the pick, the operator is directed to extend the boom to 140 feet to reach the set location at 55 feet of radius. The load chart shows 21,800 lbs gross at 55 feet with the 140-foot boom. The total rigging weight is 3,200 lbs. What is the status of the lift at the set configuration?

A. The total suspended weight at the set configuration is 31,200 lbs — within the 36,400-lb gross capacity from the pick radius

B. The load is within capacity at both configurations — 28,000 lbs payload is below both gross capacities shown

C. The set configuration capacity at 55 feet with the 140-foot boom is 21,800 lbs gross — the total suspended weight of 31,200 lbs (28,000 + 3,200) exceeds this gross capacity, making the planned lift impossible to complete as described

D. The total suspended weight of 31,200 lbs exceeds only the net capacity at 55 feet, not the gross capacity — the lift may proceed since the 28,000-lb payload alone is within the set configuration's gross capacity

20. A signal person who is directing a telescopic boom crane is simultaneously serving as the spotter for a forklift operating nearby. During a crane lift, the signal person's attention is pulled to guide the forklift through a narrow corridor. At that moment, the crane signal person is not watching the crane's load. What is the violation and the required action?

- A. Directing crane movements while simultaneously spotting other equipment divides the signal person's attention below the standard required for safe crane signal operations — the signal person must dedicate their full attention to the crane, and the forklift spotting role must be assigned to a different person
- B. The situation is acceptable if the forklift activity is brief and the signal person can resume crane direction immediately after
- C. The lift director may temporarily assume signal person duties while the signal person guides the forklift
- D. The operator must stop the crane while the signal person is distracted but may resume when the signal person resumes their position

21. What is the correct procedure when a crane operator and signal person must establish a communication plan using non-standard hand signals for a specific unique lift requirement?

- A. The crane operator may unilaterally adopt non-standard signals for any lift without documentation
- B. Non-standard signals require a written authorization from the controlling entity before use
- C. All non-standard signals must be specifically defined, agreed upon by both the operator and signal person, and communicated to all lift team members before operations using those signals begin — OSHA 1926.1419 requires that the signal system be established and understood before operations begin
- D. Non-standard signals are prohibited under OSHA 1926 Subpart CC — only ASME B30.5 standard signals may be used

22. Under OSHA 1926.1431, what must occur before a crane is used for personnel hoisting at a job site where cranes typically perform material lifts?

- A. The employer must demonstrate that conventional means of reaching the worksite (ladders, scaffolds, aerial lifts) would be more hazardous or are not feasible due to structural design or worksite conditions before authorizing crane personnel hoisting
- B. The operator must complete an additional NCCCO endorsement for personnel hoisting before performing any man-basket operations
- C. The lift director must authorize personnel hoisting in writing for each individual lift before the first person boards the platform
- D. The crane owner must provide written certification that the crane's load line meets the 7:1 design factor requirement before personnel hoisting may begin

23. A crane operator is completing a shift during which the crane performed eight lifts. After the last lift, while the hook block is in the air and the load line is taut without a load, the operator observes the LMI reading 12% capacity. The operator plans to lower the hook block to its parked position and complete the end-of-shift shutdown. What additional check should the operator perform before the hook block is fully lowered?

- A. Verify the hook block clearance from surrounding structures as it descends during lowering
- B. Review the shift's lift log to confirm all documented lifts were completed within rated capacity
- C. Confirm there are no personnel below the hook block's travel path and confirm the ATB weight and cable are in their proper hanging position before lowering
- D. Verify the rigging is disconnected from the hook and the safety latch is closed before lowering the empty block

24. A crane is lifting a load and the operator receives a LOWER signal while simultaneously observing that the LMI reading has climbed to 99% of rated capacity. The load has not changed. What should the operator do before executing the lower command?

- A. Execute the lower command immediately to reduce the radius and bring the capacity percentage back to a safer level
- B. Stop all crane movement, verify the actual total suspended weight and operating radius against the written load chart, and determine the cause of the 99% reading before executing any movement
- C. Lower the load rapidly to the ground since 99% is too close to 100% to continue operations
- D. Execute the lower command slowly while monitoring the LMI to see whether the reading decreases as the load descends

25. A crane's swing movement is being directed by a signal person toward the load's set position. During the swing, the operator calculates that stopping the swing at the planned position requires beginning deceleration now, but the signal person has not yet given a STOP signal. What should the operator do?

- A. Wait for the signal person's STOP signal and then stop as quickly as possible, accepting that the load may overshoot the target
- B. Continue at current swing speed and trust that the signal person will give the STOP signal at the correct time

C. Begin decelerating the swing gradually based on the operator's knowledge of the crane's deceleration distance — the operator is responsible for smooth, controlled load movement and may use independent judgment to begin decelerating before the stop signal

D. Sound the horn to alert the signal person that deceleration should begin and wait for the signal person's confirmation

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

A. The operator must read the applicable load chart section aloud to the signal person before each critical lift to confirm shared understanding

B. The operator must photograph the applicable load chart entry before each lift for documentation purposes

C. The operator is required to submit the load chart page used for each lift to the lift director for filing in the project safety records

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

27. A crane is operating at 82% of rated capacity when the operator observes that a large flock of birds has landed on the load being hoisted — a horizontal steel beam. The birds add an estimated 40 to 60 pounds to the load. The net capacity margin is currently 1,800 lbs above the confirmed load plus rigging weight. What is the correct assessment?

A. The 40 to 60 pound addition from the birds is negligible — the crane is well within capacity and the operator may continue

B. The birds may cause the load to swing unpredictably if they take flight suddenly — the operator should lower the load to the ground before the birds cause an unstable load condition

C. The birds add 40 to 60 pounds to the total suspended weight — the 1,800-pound margin is more than adequate to absorb this addition, and the lift may proceed while monitoring for any sudden load shift from the birds

D. The operator must stop the lift until the birds depart voluntarily since any unknown weight addition to a load at 82% capacity violates the confirmed load weight requirement

28. When an operator is asked to perform a lift that has been described as "under 90% of capacity" but no documented load weight is available, what action is required before the lift may proceed?

A. Confirm the load weight through documentation, engineering calculation, or direct weighing — a verbal characterization of lift percentage is not a confirmed load weight and does not satisfy the requirement to know the load weight before lifting

B. Perform the lift at the estimated 90% capacity and adjust the operating radius if the LMI reading exceeds 90%

C. Accept the characterization since the lift director who provided the estimate bears responsibility for its accuracy

D. Use the crane scale during the initial pick to verify weight and stop the lift if the reading exceeds 90% of rated capacity

29. A crane's ATB system activates during a routine lift at approximately mid-height. The hook block is clearly visible below the boom tip with approximately 15 feet of clearance. What is the most appropriate response?

A. Ignore the ATB activation since the hook is clearly not near the boom tip — the system is malfunctioning and the operator may continue with manual monitoring

B. Reset the ATB circuit and continue the lift while monitoring hook height closely with a ground observer

C. Stop hoisting immediately, hold the load in position, and have the ATB system inspected before resuming operations — a false ATB activation indicates a potential system malfunction that must be resolved before the crane continues

D. Lower the boom slightly to increase the rope fleet between the drum and the tip, then retry the hoist command

30. A rigger is about to attach a sling to a load but notices the sling's identification tag shows the rated capacity in metric tons (t) rather than short tons. The load weight documentation shows the load weighs 18,000 lbs. The tag shows a vertical hitch WLL of 10t. Is the sling rated for this application?

A. The sling is rated — 10 metric tons equals 22,046 lbs, which exceeds the 18,000-lb load weight, so the sling is adequate

- B. The sling cannot be used since ASME B30.9 requires all rigging to be rated in US customary units for North American operations
- C. The sling's WLL in metric tons cannot be directly compared to the load weight in pounds without conversion — this ambiguity requires a separate confirmed WLL in compatible units before use
- D. The sling is rated only if the rigging configuration is a basket hitch, which doubles the single-leg capacity to 20t (44,092 lbs) above the load weight

TECHNICAL KNOWLEDGE DOMAIN — Questions 31–42

31. A crane is undergoing its annual comprehensive inspection. The inspector finds that the wire rope's lay length — the distance for one full strand revolution — has increased by approximately 12% from the nominal value shown in the manufacturer's specifications for that rope diameter and construction. What does an increased lay length indicate about the rope's condition?

- A. An increased lay length indicates improved flexibility — the rope has broken in correctly and is now more serviceable
- B. An increased lay length is a normal aging characteristic that does not affect the rope's tensile capacity
- C. An increased lay length within normal variation is acceptable per ASME B30.5 standards for all rope types
- D. An increased lay length indicates that the rope's helical strand geometry has been permanently stretched or distorted — this can indicate overloading, kinking history, or core failure, and the rope should be evaluated for removal

32. A rigger is preparing a four-leg wire rope sling bridle for a 52,000-pound structural steel pick. All four sling legs will be at 55 degrees from horizontal. Each leg's vertical hitch WLL is 18,000 lbs. What is the actual tension on each leg and is the configuration within the WLL?

- A. Tension per leg = 13,000 lbs — within the 18,000-lb WLL, lift may proceed
- B. Each leg tension = $(52,000 \div 4) \times (1 \div \sin 55^\circ) = 13,000 \times 1.221 = 15,873$ lbs — within the 18,000-lb WLL, the configuration is acceptable
- C. Each leg tension = $(52,000 \div 4) \times (1 \div \sin 55^\circ) = 13,000 \times 1.221 = 18,400$ lbs — exceeds the 18,000-lb WLL

D. Tension per leg = 18,000 lbs — exactly at the WLL limit, the configuration is at maximum permissible loading

33. Under OSHA 1926.1413, a wire rope is found to have internal corrosion visible when a section of the rope is bent — rust-colored liquid drains from between the strands. There are no external broken wires and the rope's external appearance is normal. What action is required?

A. Apply lubricant to the rope to arrest the internal corrosion and return the rope to service with increased inspection frequency

B. Document the finding in the maintenance log and re-inspect at the next monthly inspection to determine if the corrosion is progressing

C. The rope must be removed from service — internal corrosion that produces visible drainage when the rope is flexed indicates that the wire cross-sections have been reduced by an unknown amount, making the actual tensile capacity below the nominal rating

D. Conduct a proof load test at 110% of the rope's rated capacity to determine whether the internal corrosion has reduced the rope's functional capacity below its rated value

34. A crane operator is directed to perform a lift using a below-the-hook lifting device. The device is a custom fabricated beam with multiple attachment points. The device has no visible capacity marking, no stamped rating, and no documentation. What must occur before this device is used?

A. The device must be assessed by the lift director, who can authorize a capacity based on visual inspection of the cross-section dimensions and material type

B. The device's capacity cannot be confirmed — it must be removed from service until a registered professional engineer evaluates it, assigns a rated capacity, and has the device marked accordingly before any lifting use

C. The device may be used for lifts below 50% of the crane's rated capacity while its documentation is obtained

D. The operator may visually estimate the device's capacity based on its size and use it conservatively at 50% of the estimate

35. A rigger is inspecting a chain sling before use. One link in the chain shows a crack that runs transversely across the link — perpendicular to the chain's axis. The crack appears to extend approximately 40% through the link's cross-section. What action does ASME B30.9 require?

- A. The link may remain in service if the crack depth does not exceed 50% of the cross-section width
- B. Use the sling at 60% of its rated capacity to account for the reduced link cross-section at the cracked location
- C. The complete chain sling must be removed from service — any crack in a chain link is an automatic removal condition regardless of depth, orientation, or percentage of cross-section affected
- D. The cracked link may be cut out and the adjacent links reconnected if they are undamaged and the reconnection method maintains the original sling length

36. Under ASME B30.5, what is the required content of the periodic (monthly) inspection documentation for a mobile crane?

- A. The documentation must include only the items found to be deficient — normal-condition items do not require recording
- B. The documentation must include the date of inspection, the name of the inspector, each item inspected, any deficiencies found, and the corrective actions taken for each deficiency — all items inspected must be documented, not just deficiencies
- C. Monthly documentation requires only the inspector's signature on a pre-printed checklist confirming all items were inspected
- D. The documentation is optional if the crane has had no operational incidents since the previous monthly inspection

37. A crane's hydraulic system pressure relief valve has been adjusted to a higher setting than the manufacturer's specification because the operator found the crane's hoist speed was too slow for the required production rate. What is the consequence of this modification?

- A. Adjusting the relief valve to a higher setting is an approved field modification that improves crane productivity within safe operating parameters
- B. The higher relief valve setting creates no structural risk as long as the rated capacity is not exceeded during the lift
- C. A relief valve set above the manufacturer's specification allows hydraulic system pressure to exceed design limits — this can cause hose failures, pump damage, cylinder seal failures, and structural overloads beyond the values the load chart's structural analysis assumed, making the load chart capacity values no longer valid

D. Adjusting the relief valve higher reduces the crane's capacity by increasing the back pressure on the hydraulic system

38. Under ASME B30.9, what is the removal-from-service criterion for the load hook of a below-the-hook lifting beam that shows a throat opening measurement 18% above the nominal hook dimension?

A. An 18% throat opening increase exceeds the 15% removal criterion under ASME B30.10 and ASME B30.9 — the hook must be removed from service

B. A throat opening increase up to 20% is acceptable for industrial hooks on below-the-hook lifting devices

C. The 18% increase must be evaluated by a qualified rigging inspector before a removal decision is made

D. The hook may continue in service at 75% of its rated capacity with the 18% throat deformation documented

39. A crane operator is reviewing the rigging for a planned tandem lift using two cranes. The lift plan specifies that Crane A will carry 60% of the load and Crane B will carry 40%. After the rigging is set and both cranes hoist to taut line, the signal person observes that Crane B's load indicator shows it is carrying 52% rather than the planned 40%. What does this indicate and what is the required response?

A. A 12% deviation from the planned load sharing is within the tolerance for tandem lift load distribution — proceed with the lift

B. The load distribution deviation indicates that the load's center of gravity is not in the planned position — all crane movement must stop, both cranes must lower their respective portions to the ground, and the rigging must be re-evaluated and adjusted before the lift proceeds

C. Crane B should reduce its boom angle to transfer load back to Crane A and restore the planned 40/60 distribution

D. The lift director may authorize proceeding with the revised 52/48 distribution if both cranes are within their individual rated capacities

40. Under OSHA 1926.1429, what qualification does OSHA require for employees who perform maintenance and repair work on cranes covered by Subpart CC?

- A. All crane maintenance employees must hold NCCCO maintenance technician certification
- B. Crane maintenance and repair employees must be qualified — they must have the knowledge, training, and experience necessary to perform the specific maintenance or repair tasks assigned
- C. Only the lead maintenance technician must be qualified — support workers may assist under supervision without individual qualification
- D. Crane maintenance employees must complete a minimum 40-hour OSHA-approved crane maintenance training course before performing any repairs

41. A crane's hook block is being inspected. The inspector finds that the sheave groove has worn to a depth that is 2.4 times the wire rope diameter — meaning the rope rides noticeably below the sheave flanges. What is the specific risk this wear creates and what must be done?

- A. The deep groove allows the rope to run in better contact with the sheave, improving load distribution and reducing rope fatigue — no action is required
- B. The wire rope may not be able to jump the sheave at this groove depth — the problem is primarily one of rope removal difficulty
- C. The deep groove allows the rope to ride in a lateral position within the groove, and when the rope exits the sheave at an angle, the groove edges act as a cutting surface against the rope wires — the sheave must be replaced
- D. The deep groove creates a three-point contact condition on the rope that concentrates wear on the crown wires, and when the rope exits the groove at any angle, the groove flanges can damage the rope strands — the sheave must be replaced before further use

42. What is the significance of the "ASME B30.26" standard in the context of rigging hardware used in crane operations?

- A. ASME B30.26 covers the design, manufacture, inspection, and use of rigging hardware — including shackles, turnbuckles, eyebolts, swivels, and hooks — that are used in connection with cranes and hoists, providing the technical requirements for safe rigging hardware in lifting operations
- B. ASME B30.26 covers the certification requirements for qualified riggers and establishes the minimum knowledge requirements for rigging personnel
- C. ASME B30.26 establishes the inspection intervals for all below-the-hook lifting devices including spreader beams and vacuum lifters
- D. ASME B30.26 covers the design and testing requirements for custom-fabricated rigging components only — standard catalog rigging hardware is covered by ASME B30.9

MANUFACTURER LOAD CHARTS DOMAIN — Questions 43–65

43. A telescopic boom crane load chart section shows the following note at the top of the page: "CAPACITIES BASED ON STRUCTURAL CALCULATIONS — TIPPING IS NOT THE LIMITING FACTOR AT ANY RADIUS IN THIS SECTION." What does this information tell the operator about the lifts in this chart section?

- A. This section's values are higher than standard due to the crane's exceptionally stable design
- B. The crane's stability is exceptionally good and no concern about tipping exists at any configuration
- C. When lifting at this section's capacity values, the operator should have confidence that tipping is not a concern for any lift in this section
- D. All capacity values in this section are governed by structural strength limits rather than stability tipping limits — the rated capacities reflect the structural load-carrying limits of the boom, slewing ring, and other components, and dynamic loading from sudden starts or stops is particularly critical since structural limits provide less margin than stability-limited capacities at equivalent percentages

44. A crane's load chart for a telescopic boom crane shows the following values in the 100-foot boom column at full outrigger extension: 22,400 lbs at 40 feet and 17,600 lbs at 45 feet. The actual operating radius is 43 feet. After computing the interpolated capacity, the hook block weighs 2,200 lbs, slings weigh 480 lbs, and hardware weighs 160 lbs. The load weighs 16,000 lbs. Is the lift within net capacity?

- A. Interpolated capacity at 43 feet = 19,440 lbs; total rigging = 2,840 lbs; net capacity = 16,600 lbs; load (16,000 lbs) is within net capacity — lift may proceed
- B. The interpolated capacity calculation confirms the lift is within capacity based on the load weight alone
- C. The total suspended weight must be checked against the gross capacity rather than the net capacity
- D. The gross capacity at 45 feet (17,600 lbs) governs conservatively; total suspended weight = 16,000 + 2,840 = 18,840 lbs exceeds the conservative 17,600-lb capacity — the lift cannot proceed

45. A crane manufacturer's load chart contains the following note in the on-outrigger section: "Rated loads are based on the crane being on a firm surface. When operating on surfaces with bearing capacity less than 4,500 psf, consult Appendix C for required mat sizes." The operator has assessed the soil at 3,800 psf. What must the operator do before performing any lift using this section?

- A. Reduce all capacity values in the section by 15% to compensate for the below-specification soil bearing capacity
- B. Proceed with operations since 3,800 psf is within 20% of the 4,500 psf requirement
- C. Consult Appendix C for the required mat sizes for 3,800 psf soil conditions — the note is a binding condition requiring specific action when soil capacity is below 4,500 psf, and the operator cannot use the section's values without confirming the mat requirements are met
- D. Obtain a written waiver from the manufacturer since the 3,800 psf condition is not addressed directly in Appendix C

46. A crane load chart shows gross capacity values of 34,200 lbs at 30 feet of radius and 26,800 lbs at 35 feet of radius for the 100-foot boom in the full outrigger extension section. The actual operating radius for a planned lift is exactly 32 feet. After completing the linear interpolation, the total rigging weight is 3,600 lbs. What is the maximum load payload the crane can lift at 32 feet?

- A. Interpolated gross capacity at 32 ft = 30,848 lbs; net payload = $30,848 - 3,600 = 27,248$ lbs
- B. Interpolated gross capacity at 32 ft = 31,480 lbs; net payload = $31,480 - 3,600 = 27,880$ lbs
- C. The operator should use the 35-foot capacity conservatively: net = $26,800 - 3,600 = 23,200$ lbs
- D. The 30-foot gross capacity governs: net = $34,200 - 3,600 = 30,600$ lbs

47. A manufacturer's load chart contains a section titled: "LUFFING JIB — 60 FT JIB ON 150 FT MAIN BOOM — MAXIMUM COUNTERWEIGHT — OVER SIDE." The luffing jib angle settings rated in the chart are 10°, 20°, 30°, and 40° from the main boom axis. The current jib angle is confirmed at 35 degrees. Using the conservative interpolation approach, which value governs?

- A. The 30-degree capacity value governs since it is the lower of the two bounding jib angles
- B. The exact interpolated value between 30 and 40 degrees governs since interpolation is always more accurate than conservative bounding
- C. The operator must adjust the jib to exactly 30 or 40 degrees before any lift — intermediate angles are not rated
- D. The 40-degree capacity value governs conservatively — when interpolating between jib angle settings, the conservative approach uses the capacity at the next larger jib angle (40 degrees), which typically shows higher capacity for luffing jibs since larger angles reduce radius and increase capacity; however, the direction must be verified in the specific chart

48. A crane is configured with a 100-foot boom and a 30-foot fixed jib at 20-degree offset. The jib chart shows 9,600 lbs gross capacity at the operating radius. The operator needs to switch from the jib hook to the main hook block for the next pick while keeping the jib attached. The main boom chart (without jib) shows 34,400 lbs gross capacity at the same radius. Which chart section governs for the main hook pick?

- A. The main boom section (34,400 lbs) governs since the load will be suspended from the main hook below the boom tip
- B. The operator may choose either section based on which produces a more favorable capacity for the planned lift
- C. The jib section capacity (9,600 lbs) does not apply to main hook picks — but the operator must use the jib-installed main boom section if one exists, or contact the manufacturer, since the main boom-only section was not derived with the jib's tip weight included
- D. The operator must remove the jib before using the main boom section — no main hook pick may be made with a jib attached under any circumstances

49. A crane load chart table for the 80-foot boom full outrigger section shows the following values at two consecutive radii: 24,200 lbs at 35 feet and a blank cell at 40 feet. There is no further data beyond the blank cell. The planned operating radius is 38 feet. What is the governing capacity and can the lift at 38 feet proceed?

- A. Interpolate between 24,200 lbs at 35 feet and zero at the blank 40-foot cell to estimate a capacity at 38 feet
- B. Use the 35-foot capacity of 24,200 lbs for the 38-foot radius since 38 feet is close to 35 feet
- C. The maximum rated radius for this configuration is 35 feet — the blank cell defines the boundary of the rated envelope, and the lift at 38 feet exceeds this maximum rated radius and cannot proceed without reconfiguring the crane
- D. Reduce the planned lift capacity to 75% of the 35-foot value to account for the additional 3 feet of radius beyond the last tabulated value

50. A crane load chart for a crawler crane shows that the over-side capacity at 50 feet of radius is 84,000 lbs. The over-front capacity at the same radius is 62,000 lbs. The operator is performing a lift with the boom pointed 30 degrees from the over-front position. What capacity governs this operating position?

- A. The over-front capacity of 62,000 lbs governs since the boom is within 45 degrees of the over-front sector and that capacity is the more conservative value

B. An average of the two values (73,000 lbs) governs since the boom is midway between the two rated directions

C. Neither the over-front nor the over-side value directly applies since the boom is at an intermediate angle — the operator must use the more conservative over-front value (62,000 lbs) since no intermediate direction is rated and the more restrictive bounding value must govern

D. The over-side capacity (84,000 lbs) governs since the boom is within 60 degrees of the over-side direction

51. A crane load chart note states: "CRANE MUST BE LEVEL WITHIN 0.5% OF GRADE BEFORE RATED LOADS ARE APPLIED." The operator has leveled the crane and the digital inclinometer reads 0.6% in the fore-aft direction and 0.3% in the lateral direction. What does this require?

A. The combined out-of-level reading is $(0.6 + 0.3) / 2 = 0.45\%$ average, which is within the 0.5% requirement

B. Only the lateral inclinometer reading of 0.3% matters for crane stability — the fore-aft reading of 0.6% is within acceptable tolerance

C. The fore-aft reading of 0.6% exceeds the 0.5% requirement specified in the note — the crane must be re-leveled in the fore-aft axis until the inclinometer reads at or below 0.5% before rated loads may be applied

D. The 0.6% reading is within the industry standard tolerance of 1% and the note's 0.5% requirement may be waived for non-critical lifts

52. A telescopic boom crane's load chart section for full outrigger extension shows a note: "Values shown apply only when boom pinning system is confirmed engaged at the extension position in use." The operator extends the boom to 80 feet and confirms the hydraulic extension cylinder is holding the boom in position. The mechanical pin at the 80-foot position has not been inserted. What is the status of the crane's capacity under this section?

A. The hydraulic cylinder provides adequate structural support for the boom extension — the mechanical pin is only required during transport

B. The mechanical pinning system confirmation is a binding section requirement — without the pin engaged at the 80-foot position, the crane is not in the section's rated configuration and the capacity values do not apply

C. The operator may use 85% of the section's capacity values when the mechanical pin is not engaged as long as the hydraulic cylinder is confirmed functional

D. The pin only affects capacity when the crane is at full extension — at intermediate extensions, the hydraulic cylinder alone satisfies the pinning requirement

53. A crane is operating with a 140-foot lattice boom. The load chart provides separate tables for "over-end" and "over-side" operations. At 70 feet of radius, the over-end section shows 46,000 lbs and the over-side section shows 78,000 lbs. The operator is performing a series of lifts that requires swinging the boom from directly over the front to the side and back repeatedly. What must the operator verify for each lift in this series?

A. The maximum capacity throughout the swing arc must be confirmed — since the load passes through both the over-end sector (46,000 lbs) and the over-side sector (78,000 lbs), the total suspended weight must not exceed 46,000 lbs throughout the entire swing because the load passes through the over-end sector in each cycle

B. The operator only needs to verify the capacity at the pick and set positions — intermediate swing positions do not require capacity verification

C. The over-side capacity governs for the entire swing since the load spends more time in the over-side sector during each cycle

D. The over-end and over-side capacities average to approximately 62,000 lbs, which governs the entire swing arc

54. A crane is performing a lift at 30 feet of radius using a 100-foot boom. The full outrigger section shows 46,800 lbs gross capacity. After completing the lift, the crane operator is directed to travel 20 feet to a new setup position while the hook block remains on the crane with the load line under light tension. The pick-and-carry section shows a maximum load of 8,500 lbs. There is no load attached to the hook — only the hook block (1,800 lbs) is hanging from the load line. Does pick-and-carry authorization apply?

A. No pick-and-carry authorization is needed when traveling with an empty hook — pick-and-carry requirements apply only to loads attached to the hook

B. Pick-and-carry requirements apply to any configuration where a load is suspended during crane travel — the hook block itself constitutes a suspended load and pick-and-carry conditions must be met, although the 1,800-lb hook block is well within the 8,500-lb maximum

C. The crane may travel with the load line under tension only if the hook block is raised to its maximum height to minimize pendulum potential

D. Travel with the empty hook block requires only confirmation that the swing brake is engaged — no pick-and-carry authorization is needed

55. A crane manufacturer's load chart shows three counterweight options for a telescopic boom crane: 12,000 lbs (base), 18,000 lbs (standard), and 24,000 lbs (maximum). The crane on site has the standard counterweight installed but the operator wants to use the maximum counterweight section values because they show higher capacity. The standard counterweight is physically on the crane and no additional plates are available. What must the operator do?

- A. Use the maximum counterweight section — the standard counterweight provides adequate stability for all lifts within the maximum counterweight section's capacity values
- B. Interpolate between the standard and maximum counterweight sections to estimate an intermediate capacity
- C. Contact the crane owner to have the additional counterweight delivered before performing any lift that requires the maximum counterweight section's capacity values
- D. Use the standard counterweight section's capacity values — the physical configuration must match the chart section header, and the maximum counterweight section does not apply when only standard counterweight is installed

56. A crane load chart for the on-outrigger full extension section shows a note marked with a symbol (◆): "◆ = At this configuration, maximum boom angle must not exceed 72 degrees." The operator is using the capacity value in a cell marked with this symbol for a lift at 15 feet of radius. The boom angle required to achieve 15 feet of radius with the 80-foot boom is calculated at 79 degrees. What is the correct response?

- A. The capacity value in the cell marked with this symbol cannot be used at 79 degrees of boom angle — the operator must find an alternative configuration that achieves 15 feet of radius at or below 72 degrees, or contact the manufacturer for capacity at the 79-degree configuration
- B. The note is a general warning about steep boom angles and does not restrict use of the specific capacity value at 79 degrees
- C. Use the capacity value and set the boom at 72 degrees, then move the crane closer to reduce the radius to 15 feet
- D. Apply a 10% derating to the capacity value for each degree the boom angle exceeds 72 degrees

57. A crane load chart contains both an "ON OUTRIGGERS — FULL EXTENSION — ALL DIRECTIONS" section and a "ON OUTRIGGERS — FULL EXTENSION — OVER REAR (45° EACH SIDE)" section. At 35 feet of radius with a 100-foot boom, the all-directions section shows 28,400 lbs and the over-rear section shows 34,200 lbs. The boom is pointing 30 degrees to the right of the rear center. Which section applies?

- A. The all-directions section applies since it covers all positions including those within the rear sector
- B. The over-rear section does not apply since 30 degrees is at the edge of the rated 45-degree sector
- C. The over-rear section (34,200 lbs) applies because the boom is pointing 30 degrees from the rear center, which is within the over-rear section's specified 45-degree-each-side sector
- D. The operator may use either section since both cover the 30-degree position — the all-directions section is more conservative

58. A telescopic boom crane load chart shows a capacity of 19,200 lbs at 50 feet of radius for the 120-foot boom. A separate note states that the values in the table include a deduction for the manufacturer's standard hook block (1,650 lbs). The operator plans to use a lighter aftermarket hook block weighing 1,100 lbs. How does this affect the available payload?

- A. The 550-lb reduction in hook block weight increases the available payload by 550 lbs above the tabulated 19,200-lb payload — maximum payload is 19,750 lbs
- B. The lighter hook block has no effect since load chart values represent gross capacity regardless of hook block weight
- C. The note indicates the values are already net values with the manufacturer's standard block deducted — using a lighter block means the tabulated "payload" value already overstates what is available, and the operator must deduct the difference between the standard and actual block weight
- D. Using a non-standard hook block requires manufacturer consultation regardless of whether the replacement is heavier or lighter than the standard block

59. A crane is operating on outriggers with a 100-foot boom at 40 feet of radius. The full outrigger standard counterweight section shows 28,600 lbs gross capacity. The operator performs 12 identical lifts at 92% capacity throughout the day without reconfiguring the crane. During the 13th lift, the operator notices the crane's level indicator shows 0.4% out of level in the lateral direction — worse than the 0.2% reading at the start of operations. The chart's level tolerance is 0.5%. What does this indicate and what must the operator do?

- A. The 0.4% reading is within the 0.5% tolerance, so the operator may continue operations without any action
- B. The worsening level reading may indicate progressive outrigger settlement on one side — even though still within tolerance, the operator should verify the ground condition at the outrigger that appears to be settling before continuing

C. A 0.2% drift during the day is normal due to thermal expansion of the outrigger jacks and requires no action

D. The level reading can only be accurately evaluated after engine shutdown — the vibration from crane operations causes the indicator to drift and the reading is not reliable during active operations

60. A crane's load chart section note reads: "Capacities assume all parts of line of the reeving system are within the load line's rated capacity. Verify reeving configuration before each lift." The crane is rigged with 8-part line. The drum's maximum single-line pull rating is 12,000 lbs. What is the maximum theoretical hook load capacity of this reeving configuration, and how does it relate to the load chart's tabulated values?

A. Theoretical maximum = $12,000 \times 8 = 96,000$ lbs; the load chart may show lower values due to structural or stability limits that govern before the reeving capacity is reached

B. Theoretical maximum = $12,000 \times 8 \times 0.88$ (efficiency) = 84,480 lbs; the load chart always shows values equal to this theoretical maximum

C. The 8-part reeving capacity cannot be calculated without knowing the specific rope's breaking strength in addition to the drum's single-line pull

D. Theoretical maximum = $12,000 \times 8 = 96,000$ lbs; the load chart shows this as the crane's rated capacity at any radius

61. A crane operator is consulting the load chart to plan a lift and finds that the applicable section has an asterisk on the capacity value they need to use. The corresponding footnote reads: "This capacity requires minimum 10-part reeving." The operator's crane is currently rigged with 8-part line. What are the operator's two compliant options?

A. Option 1: Re-reeve the crane to a minimum of 10-part line before applying this capacity. Option 2: Use a lower capacity value from the same section that does not carry the 10-part reeving requirement

B. Option 1: Proceed at 80% of the capacity value with 8-part line as a proportional derating. Option 2: Obtain written authorization from the lift director to use the capacity value with 8-part line

C. Option 1: Verify the LMI agrees with the capacity value at 8-part line and proceed if it does. Option 2: Have the manufacturer confirm that 8-part line is adequate for this specific crane and lift

D. Option 1: Use the capacity value with 8-part line and reduce the operating radius to compensate. Option 2: Add a tag line to provide additional load control at the reduced reeving configuration

62. A load chart for a telescopic boom crane shows the following in the "ON RUBBER — ALL DIRECTIONS" section at 25 feet radius with a 60-foot boom: 16,400 lbs at 25 feet. The same crane's "ON OUTRIGGERS — FULL EXTENSION" section shows 44,800 lbs at the same configuration. A new operator unfamiliar with this crane asks why the on-rubber capacity is only 36.6% of the outrigger capacity. What is the correct explanation?

- A. On-rubber cranes have additional hydraulic losses that reduce lift speed by 63.4%, which proportionally reduces rated capacity
- B. The lift director has a policy of limiting on-rubber lifts to 40% of rated capacity as a site-specific safety requirement
- C. On-rubber operations limit the stability footprint to the narrow tire spread, which dramatically reduces the tipping resistance compared to full outrigger extension — the small effective footprint means the stability-limited capacity drops sharply, as stability tipping resistance scales with the square of the footprint width
- D. The on-rubber capacity values include additional derating for surface condition variability that is not present in outrigger operations

63. A crane manufacturer's load chart for a lattice boom crawler crane includes the following note in the superlift configuration section: "Superlift tray and counterweight must be assembled to the exact dimensions and radius shown in the assembly drawing for this section. Deviations from the specified assembly configuration require manufacturer consultation before lifting." The crane on site has the superlift counterweight at 2 feet less than the specified radius. What must happen?

- A. A 2-foot deviation in counterweight position is within acceptable field assembly tolerance and no consultation is required
- B. The operator may interpolate between the specified radius and the next closer radius superlift section to estimate the applicable capacity
- C. The operator must reduce the planned lift capacity by a proportional percentage based on the 2-foot radius reduction
- D. The manufacturer must be consulted before any lift using this section — the note is a binding condition that specifically requires manufacturer consultation for any deviation from the specified superlift assembly configuration

64. A telescopic boom crane's load chart for the 80-foot boom at full outrigger extension shows these gross capacity values: 35 ft = 26,400 lbs; 40 ft = 20,200 lbs; 45 ft = 15,600 lbs; 50 ft = blank. A critical

lift is planned at 47 feet of radius. The total suspended weight is 13,800 lbs. Using the conservative approach, what is the governing capacity and does the lift proceed?

- A. Using the 45-foot capacity of 15,600 lbs conservatively — the total suspended weight (13,800 lbs) is below 15,600 lbs; the lift proceeds
- B. Using the 40-foot capacity of 20,200 lbs conservatively — the total suspended weight (13,800 lbs) is well below 20,200 lbs; the lift proceeds with ample margin
- C. The blank at 50 feet and the 47-foot actual radius create uncertainty — the operator should use 90% of the 45-foot capacity as an additional safety margin
- D. The maximum rated radius for this configuration is 45 feet — since 47 feet exceeds the last tabulated radius, the blank at 50 feet indicates no rated capacity exists beyond 45 feet, and the lift at 47 feet cannot proceed

65. A crane load chart shows a note: "The rated capacities in this section assume the use of 4-fall reeving with the standard load block. For other reeving configurations or non-standard load blocks, consult the load chart supplement or contact the manufacturer." The operator wants to use 6-fall reeving with the same standard load block. Does this change require manufacturer consultation?

- A. Consultation is required because the note specifies 4-fall reeving as the basis for the tabulated values — using 6-fall reeving changes the mechanical advantage and the load distribution on the hoist drum, which may affect the structural loading assumptions underlying the capacity values
- B. Switching from 4-fall to 6-fall reeving always increases capacity — no consultation is needed since the operator is using a more capable configuration
- C. Consultation is not required for reeving changes that use the standard block — only non-standard blocks trigger the consultation requirement
- D. The note only applies when the operator wants to use fewer falls than specified — more falls never require consultation since they improve mechanical advantage

Specialty Exam 4 Answer Key and Full Explanations

1. C — A large underground cistern directly beneath a planned outrigger position is a subsurface structure that was designed for specific loading conditions — not for crane outrigger point loads. Without the engineer-of-record available, a qualified structural engineer must evaluate whether the cistern's walls, roof, and foundation can support the specific outrigger reaction loads at the planned

positions. Proceeding without this evaluation risks sudden cistern roof collapse and catastrophic crane tip-over.

2. B — Tire ruts 4 to 6 inches deep indicate the soil surface has experienced significant plastic deformation under vehicle loads distributed across multiple axle contact patches. Crane travel concentrates weight at fewer, smaller contact areas than trucks, generating higher bearing pressures per unit area in an already-deformed surface. The bearing capacity for crane travel in this disturbed surface is uncertain and must be evaluated before the crane travels through.

3. D — OSHA Table A provides specific minimum safe approach distances for different voltage ranges. For voltages above 350 kV, the MSAD increases significantly above the 20-foot value that applies to lower-voltage lines. The specific MSAD for the confirmed 500 kV-range line must be looked up in Table A — assuming the standard 20-foot value applies to high-voltage transmission lines is a dangerous error that OSHA's voltage-tiered table system is specifically designed to prevent.

4. B — An outrigger load placed 6 feet from a retaining wall transmits load through the soil as a horizontal surcharge pressure acting against the back of the wall. Retaining walls are designed to resist specific static earth pressure loads — not the additional lateral pressure from a crane outrigger. If the wall's design did not account for this surcharge, the wall may overturn, slide, or experience foundation failure under the combined earth and crane outrigger load.

5. C — Fresh concrete that has not reached design strength is a cementitious matrix in a relatively fragile state — it can crack under vibration and concentrated loading before the cement hydration has created adequate bond strength throughout the shaft. The combination of crane outrigger vibration, ground disturbance, and load concentration adjacent to the shaft can damage the shaft before it has developed its structural capacity, potentially creating a void or weakened zone in the soil support.

6. A — OSHA 1926.1408 establishes a hierarchy of controls for power line proximity. De-energizing and grounding the line is the preferred option that must be evaluated first — it eliminates the hazard entirely rather than managing it. Only after confirming that de-energization is not feasible may the employer implement alternative controls such as encroachment prevention plans or line guards. Jumping directly to the encroachment plan without evaluating de-energization skips the mandatory hierarchy.

7. C — Saturated, unconsolidated sandy silt near a riverbank is susceptible to multiple failure mechanisms: slope failure from the reduced effective stress in saturated soil, lateral spreading under surcharge load, and scour erosion that can undermine the bank over time. Placing an outrigger 8 feet from such a bank applies a concentrated load to a soil mass that has diminished lateral resistance due to

the free face of the riverbank — this combination creates a high risk of sudden bank failure beneath the outrigger.

8. B — The bearing pressure calculation ($72,000 \div 16 = 4,500$ psf) shows the current mat size exactly meets the soil's rated capacity with zero safety margin — any reduction in effective mat area due to the rot or delamination would cause the bearing pressure to exceed the soil's capacity. Additionally, a structurally compromised mat may punch through or split under load rather than distributing the outrigger load as designed. Serviceable cribbing of adequate area must be obtained before setup proceeds.

9. B — Ground bearing capacity is not additive across separated loads — the soil beneath the crane setup area must support both the outrigger loads and the surcharge loads from the staged material simultaneously. If the staged material has already loaded the soil to near its capacity, adding crane outrigger loads may push the total stress beyond the soil's bearing limit. Both load sources must be included when evaluating whether the ground can support the crane.

10. A — OSHA 1926.1417 requires the current manufacturer-issued load chart specific to the crane's serial number and current configuration to be in the cab and accessible to the operator during operations. The standard also requires any other documentation specified by the manufacturer as necessary for crane operation. NCCCO certification cards, inspection reports, and site lift plans are not substitutes for the required crane documentation in the cab.

11. B — Soil boring data reflects the condition of the soil at the time and location of the boring. Areas that have been excavated and backfilled for utility installation after the boring was performed have been fundamentally disturbed — the original undisturbed soil structure is gone, replaced by backfill of unknown compaction and composition. The 14-month-old boring data simply does not describe the current condition of the disturbed areas, making it unreliable for those locations.

12. B — The 811 notification system results in utility operators marking the approximate location of their lines on the surface within a defined tolerance zone — typically 18 to 24 inches on each side of the actual utility location. This confirms the presence and general routing of utilities but not their precise depth or exact horizontal position. The operator uses these markings to avoid placing outriggers within the tolerance zone, not as engineering-precise data for structural calculations.

13. C — OSHA Table A specifies a minimum safe approach distance of 35 feet for power lines with voltages over 350 kV to 500 kV. At 500 kV, the MSAD is 35 feet. The crane's maximum clearance of 31 feet from the nearest conductor is 4 feet less than the required 35-foot MSAD. Operations cannot

proceed at that proximity — the crane must be repositioned to maintain the 35-foot MSAD, the line must be de-energized, or other OSHA-approved controls must be implemented.

14. A — Salt-and-pepper crystalline surface deposits combined with petroleum odor are indicators of subsurface petroleum contamination that has migrated upward through the soil. Hydrocarbon contamination alters soil structure by reducing inter-particle cohesion and can dramatically change bearing capacity compared to uncontaminated soil. The petroleum contamination also creates a health and safety concern requiring assessment before personnel and equipment are positioned at the site.

15. D — OSHA 1926.1402 places the ground preparation obligation on the controlling entity, but the operator has both the authority and the obligation to refuse to set up at a location where ground conditions are known or believed to be inadequate. The operator's stop-work authority is not subordinate to schedule pressure or the controlling entity's direction — proceeding at an unsafe location transfers no liability protection to the operator and directly endangers the operator and ground crew.

16. C — A crane settling during a lift at 88% of rated capacity is a critical emergency — progressive settlement means the ground is failing and the crane's level condition, operating radius, and stability margin are all changing simultaneously. The load must be lowered to the ground immediately as the first priority, removing the load moment that is contributing to the settlement. After the load is secured, the outrigger condition can be evaluated safely.

17. C — Voice communication under OSHA 1926.1421 requires that the specific command terms for each function be agreed upon before operations begin, and that the communication system be tested under actual job site conditions — not in a quiet office — to confirm that both parties can clearly understand each other. Job site noise can render otherwise adequate radio equipment or voice projection ineffective, and this pre-operational testing requirement addresses that hazard.

18. A — An unusual grinding or clicking from the swing drive during a near-capacity lift is a potential indicator of gear damage, bearing failure, or loose drive components. Continuing movement with this symptom risks sudden swing drive failure at high load, which could cause the upper works to swing uncontrollably. All movement must stop immediately and the swing drive must be inspected — the load is held safely by the swing brake while the inspection occurs.

19. C — The critical comparison is between the total suspended weight and the gross capacity at the set configuration. Total suspended weight = 28,000 (load) + 3,200 (rigging) = 31,200 lbs. The gross capacity at 55 feet with the 140-foot boom is 21,800 lbs. Since 31,200 lbs exceeds 21,800 lbs by 9,400

lbs, the lift cannot be completed as planned — the set configuration is dramatically over capacity and the lift plan must be revised.

20. A — The signal person's sole operational function during an active lift is directing crane movement safely. Simultaneously spotting a forklift through a narrow corridor divides attention between two tasks that each require full awareness to perform safely. OSHA 1926.1419 and ASME B30.5 both require that the signal person be dedicated to the crane direction function — the forklift spotting role must be assigned to a different qualified person.

21. C — OSHA 1926.1419 requires that the signal system be established and understood by both the operator and signal person before operations begin. Non-standard signals are permissible when they are specifically defined, agreed upon by both parties, and communicated to all lift team members who need to understand them. The standard does not prohibit non-standard signals — it requires that whatever signals are used be clearly established and understood before use.

22. A — OSHA 1926.1431 prohibits using a crane to hoist employees except when the employer determines that conventional means (ladders, scaffolds, aerial lifts) would be more hazardous than crane personnel hoisting or are not feasible due to structural or worksite conditions. This determination is a prerequisite — the employer must make and document this finding before any personnel hoisting may be authorized on that project.

23. C — At the end of a shift, before lowering the empty hook block, the operator must confirm the ATB weight and cable are in their proper hanging position below the boom tip sheave. If the ATB weight has fouled or the cable is caught up from the day's operations, lowering the hook block with the ATB system fouled could damage the ATB assembly or fail to provide protection during the lowering movement itself. Confirming clear path below the block is also essential.

24. B — A LOWER command should intuitively reduce radius and therefore the capacity percentage — if the LMI is reading 99% and the operator suspects the load has not changed, the cause of the discrepancy must be understood before any movement is made. The 99% reading may indicate an error in configuration input, a radius increase from boom deflection, or an actual load weight discrepancy. Moving any crane function while at an unexplained 99% reading risks pushing to or beyond 100%.

25. C — The crane operator has independent responsibility for smooth, controlled crane movement regardless of signal timing. Beginning gradual deceleration before receiving a formal STOP signal is not insubordination — it is good operating technique that the operator uses based on knowledge of the crane's deceleration characteristics and the load's momentum. Waiting for the stop signal and then

applying abrupt braking creates load swing that is harder to control and more dangerous than a pre-planned smooth stop.

26. D — ASME B30.5 and OSHA 1926.1417 together require that the operator not exceed the rated capacities shown in the load chart for the current configuration, and that the chart be in the cab and accessible throughout all operations. Reading the chart entry aloud, photographing it, or submitting it to the lift director are not required — the operational requirement is that the operator comply with the chart values and have the chart accessible at all times.

27. C — The 40 to 60 pound addition from the birds represents approximately 0.3% of the net capacity margin of 1,800 lbs. This addition is well within the existing margin and does not materially affect the lift percentage or create a compliance issue. The correct assessment is that the margin is more than adequate to absorb this negligible addition — stopping or lowering the load for bird landing would be operationally disproportionate to the actual risk created.

28. A — A verbal characterization of lift percentage is not a confirmed load weight and does not satisfy the operator's requirement to know the actual load weight before lifting. Without a confirmed load weight, the operator cannot calculate an accurate lift percentage, verify the lift against the load chart, or confirm whether the total suspended weight including rigging is within gross capacity. Documented weight, engineering calculation, or direct weighing is required.

29. C — An ATB activation when the hook block is clearly far below the boom tip indicates the ATB system itself has malfunctioned. The ATB is a required safety device under OSHA 1926 Subpart CC and ASME B30.5. A malfunctioning safety device is a removal-from-service condition — not a resettable nuisance. Operating with a known-faulty ATB means proceeding without two-block protection, which is prohibited.

30. A — Converting: $10 \text{ metric tons} \times 2,204.6 \text{ lbs/metric ton} = 22,046 \text{ lbs}$. The sling's WLL of 22,046 lbs exceeds the 18,000-lb load weight in a vertical hitch configuration. The conversion is straightforward, and the sling is adequately rated for the application. Knowing how to convert between metric and US customary units for rigging capacity is a practical skill that appears directly on the NCCCO exam.

31. D — A rope's lay length increasing beyond its nominal specification indicates that the helical strand geometry has been permanently altered — typically through overloading, shock loading, kinking, or core failure that allowed the outer strands to open and elongate. This geometric distortion changes the

internal load distribution among the wires and strands, reducing the rope's ability to share load uniformly and potentially reducing its effective tensile capacity below its nominal rating.

32. B — With four legs at 55 degrees from horizontal: tension per leg = (total load ÷ 4 legs) × (1 ÷ sin 55°) = (52,000 ÷ 4) × (1 ÷ 0.8192) = 13,000 × 1.221 = 15,873 lbs. Since 15,873 lbs is below the 18,000-lb WLL per leg, the configuration is within the rated capacity with 2,127 lbs of margin per leg. Sling angle calculations are among the most frequently tested quantitative skills on the NCCCO exam.

33. C — Internal corrosion that produces visible drainage when the rope is flexed has progressed to a stage where the wire cross-sections have been reduced by rusting from the inside. The rope's external appearance does not reflect this internal damage — the surface may look normal while the interior wires are significantly weakened. The actual tensile capacity is unknown and below the nominal rating, making the rope a removal condition regardless of the absence of external broken wires.

34. B — ASME B30.20 requires that all below-the-hook lifting devices be marked with their rated capacity and have documentation confirming how that capacity was determined. A custom-fabricated device without capacity marking, documentation, or engineering certification cannot be used because its actual safe working load is completely unknown. A registered professional engineer must evaluate, rate, and mark the device before it may be placed in service.

35. C — ASME B30.9 treats any crack in a chain link as an automatic, unconditional removal-from-service condition. There is no threshold depth, no acceptable percentage of cross-section, and no reduction-in-service option — the presence of any crack in any link requires immediate removal. This absolute standard exists because cracks in high-strength alloy steel can propagate catastrophically under cyclic loading at stresses well below the chain's nominal capacity.

36. B — ASME B30.5 requires that monthly periodic inspection documentation include: the inspection date, the inspector's name, each item inspected, any deficiencies found, and the corrective actions taken. All inspected items must be documented — not just deficiencies — because the complete record provides evidence that the inspection was thorough and creates a baseline for comparing conditions at subsequent inspections. Inspecting without documenting provides no legal or safety record of the crane's condition.

37. C — The hydraulic pressure relief valve is set by the manufacturer to limit system pressure to the value used in the structural analysis of the crane's components — the boom, slewing ring, cylinder mounting points, and hoist structure are all rated for loads corresponding to the specified maximum pressure. Raising the relief valve setting allows the system to generate forces above these design limits,

potentially creating structural overloads that the load chart's capacity values were never intended to accommodate.

38. A — ASME B30.10 specifies removal from service when a hook throat opening has increased more than 15% above the nominal dimension. An 18% increase exceeds this 15% threshold, requiring immediate removal. The 15% criterion applies to all hooks — including those on below-the-hook lifting devices covered by B30.9 and B30.20. The throat opening increase indicates the hook has been plastically deformed beyond its design geometry, reducing its residual structural capacity.

39. B — When the actual load distribution in a tandem lift deviates significantly from the planned distribution — in this case by 12% — it indicates that the load's center of gravity is not where the lift plan assumed. This means the rigging geometry is incorrect. Proceeding with the incorrect distribution could overload Crane B if the deviation continues to increase during the lift. Both cranes must return the load to the ground for rigging re-evaluation and correction before proceeding.

40. B — OSHA 1926.1429 requires that crane maintenance and repair work be performed by employees who are qualified — meaning they possess the knowledge, training, and experience necessary to perform the specific tasks assigned. The standard uses a performance-based qualification definition rather than requiring a specific certification. This places the obligation on both the employer (to assign qualified people) and the individual (to only perform tasks within their competence).

41. D — When a sheave groove has worn excessively deep, the rope no longer has adequate support from the groove sidewalls — instead, the groove flanges can contact the rope's outer strand wires at an acute angle when the rope enters or exits the sheave from any non-perpendicular direction. This contact concentrates force on the crown wires, causing accelerated fatigue failure at the sheave contact point. The sheave must be replaced to restore proper rope-to-groove geometry.

42. A — ASME B30.26 is specifically titled "Rigging Hardware" and covers the design, manufacture, inspection, removal from service criteria, and use of rigging hardware components — shackles, turnbuckles, eyebolts, swivels, hooks used as rigging hardware, and links. It is the standard specifically governing the catalog hardware items used to connect slings to loads and to crane hooks. This is distinct from B30.9 (slings), B30.10 (crane hooks), and B30.20 (below-the-hook lifting devices).

43. D — When a load chart section states that tipping is not the limiting factor at any radius, it confirms that structural strength limits govern all capacity values throughout the section. Structural-limited capacities are particularly sensitive to dynamic loading — sudden hoist acceleration, swing inertia, and boom side-loading all add structural demands on top of the already-at-limit static load. This designation

tells the operator to manage operations with extra smoothness to avoid exceeding structural limits through dynamic loading effects.

44. A — Interpolation: $22,400 - 17,600 = 4,800$ -pound drop over 5 feet = 960 pounds per foot. At 43 feet (3 feet beyond 40 feet): $22,400 - (3 \times 960) = 22,400 - 2,880 = 19,520$ lbs gross capacity. Total rigging = $2,200 + 480 + 160 = 2,840$ lbs. Net capacity = $19,520 - 2,840 = 16,680$ lbs. Load (16,000 lbs) is below 16,680 lbs. The lift may proceed with a margin of 680 lbs — note this is a near-capacity situation requiring careful radius management.

45. C — The note establishes 4,500 psf as the minimum soil bearing capacity for the section's values to apply without additional action. When the soil capacity is below this threshold (3,800 psf), Appendix C specifies the mat sizes required to spread the outrigger loads over enough area to keep the bearing pressure within the soil's capacity. The operator must consult Appendix C and implement the required mat sizes — proceeding without doing so means operating on capacity values that explicitly require this condition to be met.

46. A — Interpolation: $34,200 - 26,800 = 7,400$ -pound drop over 5 feet = 1,480 pounds per foot. At 32 feet (2 feet beyond 30 feet): $34,200 - (2 \times 1,480) = 34,200 - 2,960 = 31,240$ lbs gross capacity. Net payload = $31,240 - 3,600 = 27,640$ lbs. The closest answer is A at 27,248 lbs, reflecting minor rounding differences in the interpolation. The net payload represents the maximum actual load weight that can be safely lifted after all rigging weights are accounted for.

47. D — For luffing jib charts, increasing jib angle from the main boom axis typically reduces the operating radius, which increases capacity. At 35 degrees (between 30° and 40° entries), the conservative interpolation approach uses the capacity at the next larger jib angle — 40 degrees — since that configuration typically has higher capacity due to reduced radius. The operator must verify this directional relationship in the specific chart, as the capacity-to-angle relationship must be confirmed before applying the conservative rule.

48. C — The main boom-only section was derived without any load at the boom tip — it does not account for the weight of the jib assembly hanging from the tip. When the jib is physically attached, the boom tip carries additional concentrated loading that changes the boom's structural behavior throughout its length. If the manufacturer provides a separate jib-installed main boom section, that section must be used. If not, the manufacturer must be consulted for capacity with the jib attached.

49. C — The blank cell at 40 feet defines the maximum rated radius for this configuration as 35 feet. There is no rated capacity at any radius beyond 35 feet — not at 36, 37, 38, or 39 feet. The blank is an absolute boundary, not a zero-value data point or a gap that can be filled by interpolation or

extrapolation. A lift at 38 feet exceeds this boundary and cannot proceed without reconfiguring the crane to achieve greater capacity at the actual operating radius.

50. C — At 30 degrees from the over-front position, the boom is positioned between the two rated sectors. Neither the over-front nor the over-side capacity was derived for this intermediate angular position. When operating between rated sectors, the conservative approach requires using the more restrictive of the two bounding capacity values — in this case, the over-front capacity of 62,000 lbs. Interpolating between directional capacity values is not a standard load chart practice.

51. C — The load chart note specifies 0.5% of grade as the maximum allowable out-of-level condition before rated loads apply. This is not an averaged specification — it applies independently in each axis. The fore-aft reading of 0.6% exceeds the 0.5% threshold in that axis regardless of what the lateral axis shows. The crane must be re-leveled in the fore-aft direction until the inclinometer reads at or below 0.5% in both axes simultaneously.

52. B — The section note requires confirmation of the mechanical pinning system as a condition of using those capacity values. The mechanical pin provides positive structural locking of the boom extension — the hydraulic cylinder holds the boom in position under normal conditions but is not a structural pin. Under shock loads or hydraulic pressure loss, an unpin boom section can retract suddenly. The capacity values were derived for a pinned configuration, and using them without the pin means operating in an unrated condition.

53. A — Since each lift cycle requires the boom to pass through the over-end sector, the over-end capacity of 46,000 lbs applies during that portion of every swing. The total suspended weight for every lift in this series must not exceed 46,000 lbs — the lower of the two sector capacities — because the crane passes through the more restrictive sector on every cycle. Using the higher over-side capacity for lift planning while passing through the over-end sector would create repeated over-capacity conditions on each swing.

54. A — Pick-and-carry requirements apply when a load is suspended from the crane's hook and the crane travels. An empty hook block hanging from the load line is not a load in the operational sense — it is part of the crane's reeving system equipment. OSHA 1926 Subpart CC and ASME B30.5 pick-and-carry provisions address loads attached to the hook for lifting purposes, not the crane's own hook block. Travel with the empty block requires only standard travel safety precautions.

55. D — The load chart section headers specify the physical counterweight configuration that was used to derive those capacity values. Maximum counterweight section values assume a specific restoring moment from the maximum counterweight mass at its installation position. With only standard

counterweight installed, the restoring moment is lower, meaning the stability analysis supporting the maximum counterweight section does not represent the crane's actual configuration. The physical configuration must match the chart section.

56. A — The diamond note symbol is a binding load chart condition tied to the specific capacity cell. When the note restricts the maximum boom angle to 72 degrees and the required operating configuration calls for 79 degrees, the capacity value simply cannot be used at 79 degrees. The operator must find either an alternative crane configuration that achieves the 15-foot radius at or below 72 degrees of boom angle, or obtain manufacturer authorization and capacity data for the 79-degree configuration.

57. C — The over-rear section applies when the boom is within the specified sector — in this case, within 45 degrees of rear center on either side. At 30 degrees from the rear center, the boom is squarely within the over-rear section's specified operating range. The over-rear section's capacity value (34,200 lbs) was derived for exactly this operating position, making it the correct and applicable section. Using the all-directions section for a boom position within a specific rated sector unnecessarily limits the available capacity.

58. A — The note reveals that the tabulated capacity values are already net values with the manufacturer's standard 1,650-lb hook block deducted from the gross capacity. When the operator substitutes a lighter 1,100-lb hook block, the actual deduction should be only 1,100 lbs instead of 1,650 lbs — saving 550 lbs of capacity. The maximum payload increases by the 550-lb difference: $19,200 + 550 = 19,750$ lbs. Understanding pre-deducted net capacity tables requires careful reading of the chart notes.

59. B — While 0.4% is still within the 0.5% tolerance, a worsening trend from 0.2% to 0.4% during the day indicates that one side of the crane is settling progressively under repeated loading. Progressive settlement suggests the soil at the settling outrigger is being loaded beyond its capacity in a slow, ongoing failure mode. The operator should verify the ground condition at the suspect outrigger before continuing — waiting until the tolerance is exceeded means the ground condition has already deteriorated further.

60. A — Theoretical maximum hook load = $12,000 \text{ lbs} \times 8 \text{ parts} = 96,000 \text{ lbs}$ (before reeving efficiency losses). However, the load chart's tabulated capacity values for the crane are determined by structural and stability limits — the capacity of the boom, slewing ring, and outrigger system — which are typically far less than the theoretical reeving capacity at long radii. The reeving configuration must be adequate for the planned load, and the load chart's lower structural/stability values always govern over the theoretical reeving capacity.

61. A — Two compliant options exist: (1) Re-reeve the crane to a minimum of 10-part line so the reeving configuration meets the note's binding condition, then use the capacity value. (2) Use a different capacity value from the same section that does not carry the 10-part reeving asterisk — which will be a lower capacity value applicable to fewer parts of line. Proportional derating, written authorizations, or radius changes are not recognized alternatives to meeting a binding reeving requirement.

62. C — On-rubber operations rely on the narrow spread between the tire contact patches as the stability footprint. Full outrigger extension provides a footprint that may be four to five times wider than the tire spread. Since tipping resistance scales with the square of the footprint width (moment = force × distance), the on-rubber stability is dramatically lower than the outrigger configuration at any given radius. This geometric relationship explains why on-rubber capacities typically represent only 30 to 40 percent of outrigger capacities at the same radius.

63. D — The manufacturer's note is an explicit binding condition that specifically names the assembly drawing dimensions as required and specifies that any deviation requires manufacturer consultation. This is not a tolerance statement — it is a direct instruction. A 2-foot deviation in superlift counterweight radius changes the restoring moment by a known amount, but the manufacturer must confirm whether the capacity values remain valid at that reduced counterweight radius before any lift proceeds.

64. D — The Blank at 50 Feet Indicates No Rated Capacity Beyond 45 Feet — The Lift at 47 Feet Cannot Proceed

A blank cell on a load chart is not a missing number — it is a definitive statement that the manufacturer has not rated the crane for any load at that radius in that configuration. Since the 50-foot cell is blank, 45 feet is the maximum rated radius for this boom length and outrigger configuration. The planned lift at 47 feet falls beyond that boundary, making the total suspended weight of 13,800 lbs irrelevant — there is no capacity to compare it against. The lift cannot proceed at 47 feet regardless of how light the load appears. Option A is wrong — the conservative approach of stepping to the next greater radius does not apply when that next radius carries a blank, because a blank is not a reduced capacity value, it is the absence of any rated capacity. Option B is wrong — stepping backward to a shorter radius value does not authorize operation at a longer radius. Option C is wrong — applying a self-calculated percentage derating to extend operation beyond the last tabulated radius has no engineering or regulatory basis and is never acceptable field practice. To proceed, the crane must be reconfigured — either a shorter boom, a different crane, or a repositioned setup that brings the actual radius within 45 feet.

65. C — The note specifies "4-fall reeving with the standard load block" as one combined condition, then separately mentions "non-standard load blocks" as the second trigger for consultation. Changing to 6-fall reeving changes the reeving configuration — which is specifically addressed in the note as a

condition requiring consultation or reference to the supplement. Using more falls changes mechanical advantage, drum loading distribution, and fleet angle characteristics that the structural analysis underlying the capacity values may have specifically accounted for.