SIMULATION SET 5

SITE DOMAIN — Questions 1–21

1. A mobile crane is being positioned on a job site where the surface has been treated with road base stabilization — a mixture of Portland cement and native soil — that was placed and cured 45 days ago. The stabilized layer is 8 inches thick over native soft clay. The contractor reports the stabilized layer has achieved a compressive strength of 150 psi. What must the operator evaluate before using this surface for crane outrigger support?

A. The stabilized layer's bearing capacity must be confirmed adequate for the specific outrigger reaction loads — stabilized layers can punch through to the soft clay beneath them if the layer thickness and compressive strength are insufficient to distribute the concentrated point load, and the punching failure mode must be specifically evaluated rather than relying solely on the compressive strength value

B. A 150 psi compressive strength at 45 days confirms the layer has reached its design strength and is adequate for all crane operations

C. Road base stabilization always provides adequate support for crane outriggers when the cured strength exceeds 100 psi

D. The 8-inch thickness is the primary factor — stabilized layers over 6 inches are considered structurally equivalent to reinforced concrete for crane operations

2. Under OSHA 1926.1408(a), what is the specific sequence of steps the employer must complete when a crane must operate in proximity to power lines?

A. The employer may proceed directly to implementing operational controls if the power line is more than 20 feet from the planned work area

B. Identify the line voltage — then determine the applicable minimum safe approach distance — then determine whether de-energization is feasible — then implement either de-energization or an encroachment prevention plan depending on feasibility

C. The employer need only determine whether de-energization is feasible before beginning operations — the MSAD calculation is performed by the signal person using visual estimation

D. Establish the exclusion zone first, then determine the line voltage, then implement the appropriate controls based on the voltage

3. A crane operator discovers during setup that one of the outrigger pads has become partially embedded in the surface — one corner has sunk approximately 2 inches while the opposite corner is still at surface level. The crane is not yet level. What action is required before leveling and lifting begin?

A. Proceed with leveling by extending the jack on the embedded side to compensate for the pad's partial embedment

B. Remove the pad, assess the ground condition beneath the embedded corner, add cribbing if needed to address the bearing deficiency causing the embedment, and confirm the ground is adequate at that position before replacing the pad and proceeding with leveling

C. Continue the setup since minor pad embedment is expected on soft surfaces and will stabilize once the crane is leveled

D. Add a second pad on top of the partially embedded pad to increase the bearing area and restore the pad to level

4. A crane operator is evaluating the ground condition at a planned setup location on a municipal construction project. The setup area is adjacent to a recently excavated and backfilled water main replacement. The backfill was placed using the excavated material and was compacted by a vibratory plate compactor. The work was completed 6 days ago. What is the concern with using this area for crane outrigger support?

A. Vibratory compaction is the highest-quality compaction method and the 6-day-old backfill meets all requirements for crane operations

B. Vibratory plate compactors are not OSHA-approved compaction equipment for crane support surfaces

C. The recently backfilled trench represents a zone of disturbed, relatively recently placed soil — even with compaction, newly backfilled trenches often have lower bearing capacity than the surrounding undisturbed soil, and the compaction quality and depth should be verified by a qualified person before outrigger loading

D. Water main replacement backfill is always performed to AASHTO standards and is automatically qualified for crane outrigger support

5. Under ASME B30.5, what is the definition of a "frequent" inspection, and how often must it be performed for a crane in regular service?

A. A frequent inspection under ASME B30.5 is a daily or pre-shift visual inspection performed by the operator or a qualified person before each work shift — it covers specific items including controls, wire rope condition, hooks, reeving, brakes, and safety devices

B. A frequent inspection is performed weekly for cranes in regular daily service

C. A frequent inspection is any unscheduled inspection triggered by an operational incident

D. The term "frequent inspection" in B30.5 refers to any inspection performed more often than the monthly interval

6. A crane is set up for a lift at a job site where the surface consists of a reinforced concrete slab over a large underground parking structure. The slab is 8 inches thick, reinforced with #6 rebar at 12-inch centers, and was designed for 250 psf live loading. The operator's crane requires an outrigger load of 95,000 lbs at the heaviest pad, spread over a 4-foot × 4-foot mat. What is the bearing pressure and does this slab satisfy the structural requirement without additional analysis?

A. Bearing pressure = 95,000 ÷ 16 = 5,938 psf — well below typical concrete strength and acceptable

B. The mat distributes the load across the reinforced concrete and the combined system is adequate for this application

C. Bearing pressure = 5,938 psf — this dramatically exceeds the 250 psf live load design of the slab, meaning the slab is being subjected to approximately 24 times its design live load and structural failure is possible — a structural engineer must evaluate the slab before this outrigger position is used

D. Concrete slabs rated for 250 psf live loading include a 10:1 safety factor that implies 2,500 psf bearing capacity is available for concentrated loads

7. A mobile crane is performing repetitive lifts over the course of a full work shift. At the start of the shift, the crane was confirmed level within 0.3% of grade. Six hours into the shift, the operator notices the crane has listed slightly — the level indicator reads 0.7% in the fore-aft direction. The manufacturer's leveling tolerance is 1.0%. What is the significance of this change?

A. The crane is still within the 1.0% tolerance and no action is required

B. The progressive out-of-leveling despite being within the absolute tolerance indicates that one or more outrigger positions is experiencing ongoing settlement that is worsening over time — even while within tolerance, the trend toward increasing out-of-level warrants investigation of the settling outrigger before further lifting

C. Level changes during the shift are normal due to thermal effects on the outrigger jacks and require no investigation

D. The operator should adjust the outrigger jack on the settling side to re-level the crane and continue operations without interruption

8. What specific OSHA regulation governs the training requirements for crane operators in construction, and what is the minimum knowledge domain that operators must be trained in?

A. OSHA 1926.1412 covers operator training requirements including pre-shift inspection procedures and operational limitations

B. OSHA 1926.1419 covers operator qualification including communication systems and signal interpretation requirements

C. OSHA 1926.1416 covers operator training requirements including load chart reading and safe operational distances

D. OSHA 1926.1430 covers operator training requirements, which must include recognition of hazards associated with crane operations, the requirements of Subpart CC, and proper operation of the equipment

9. A crane is set up on a job site where the contractor has placed 4 inches of crushed limestone over a parking lot that previously had asphalt pavement. The asphalt is still beneath the limestone. The operator knows that asphalt can soften significantly in hot weather. Ambient temperature is currently 98°F. What specific concern does the asphalt base create?

A. Hot weather can cause asphalt to soften and creep under concentrated point loads — the outrigger pad may sink progressively into the softened asphalt during extended operations, and the bearing capacity of a hot asphalt surface is significantly lower than its cold or moderate-temperature capacity

B. The 4 inches of crushed limestone over the asphalt provides complete thermal isolation between the outrigger pad and the asphalt

C. Asphalt retains its structural capacity up to 140°F and the 98°F ambient temperature is within normal operational range

D. The asphalt beneath the limestone has no effect on outrigger support since the limestone is the bearing layer

10. Under OSHA 1926.1402(b), which of the following correctly describes the responsibility for ensuring ground conditions are adequate before a crane is erected or assembled on a construction site?

A. The crane operator bears sole responsibility for ground condition assessment since the operator controls crane movement

B. The OSHA area director must approve all crane setup locations for projects within the director's jurisdiction

C. The controlling entity is specifically responsible for ensuring the ground conditions — including firmness, drainage, and grading — are adequate for crane setup, operation, and disassembly

D. Shared responsibility between the crane owner and the controlling entity requires a jointly signed certification of ground adequacy before each new setup

11. An operator performing a pre-shift inspection notices that the load line is showing visible corrosion on the outside wires in a section approximately 8 feet long near where the rope rests in the boom tip sheave when the crane is parked. What is the significance of corrosion concentrated at the resting position?

A. Surface discoloration at the parking position is cosmetic — the rope is protected by the sheave groove from the worst environmental exposure

B. Concentrated corrosion at the rope's typical resting position in the sheave indicates the rope has been exposed to moisture in a location where it remains wet for extended periods — the corrosion may be more advanced internally than externally, and the section may have developed corrosion fatigue that requires careful evaluation against removal criteria

C. Corrosion that develops only at the sheave contact point indicates the sheave groove has a chemical coating that is causing the corrosion

D. Localized corrosion is acceptable as long as the rope passes a 5% diameter reduction check at the affected section

12. A telescopic boom crane is being positioned at a job site where the operator notices that the ground surface has been recently treated with a weed-killer chemical that has left a white powdery residue on the soil. The operator smells a faint chemical odor. What is the primary concern for crane setup?

A. The chemical may damage the crane's rubber outrigger pads and should be washed off before setup

B. Chemical surface treatments are regulated by the EPA and the operator must file a Form 10-14 before operating over chemically treated soil

C. Weed-killer chemicals used in commercial concentrations can leach into soil and affect its pH and structure — certain herbicides applied at high concentrations can also affect worker safety through dermal or inhalation exposure

D. The chemical treatment may have altered the soil's physical structure or bearing capacity, and the white residue and chemical odor indicate an unknown soil treatment that should be identified and evaluated for both worker safety and ground stability effects before crane setup proceeds

13. What is the minimum required content of a pre-shift inspection documentation under ASME B30.5?

A. ASME B30.5 requires that pre-shift inspection findings be recorded in a format that documents items inspected, any deficiencies found, and whether each deficiency was corrected before operations began or reported to the designated person for follow-up

B. Pre-shift inspections do not require documentation — only monthly and annual inspections must be formally documented under B30.5

C. Pre-shift documentation requires only a dated signature from the operator confirming the inspection was completed

D. ASME B30.5 specifies a standard form that must be used for pre-shift documentation — no alternative forms are acceptable

14. A crane operator is setting up near a high-voltage transmission line that is confirmed at 765 kV. The nearest conductor is approximately 45 feet from the planned boom tip position during the lift. Under OSHA Table A, what is the minimum safe approach distance for this voltage, and does 45 feet provide adequate clearance?

A. MSAD for 765 kV is 35 feet — 45 feet provides adequate clearance with a 10-foot margin

B. MSAD for 765 kV is 50 feet — the 45-foot clearance does not satisfy the requirement and operations must not proceed in this configuration

C. MSAD for 765 kV is 40 feet — 45 feet provides adequate clearance with a 5-foot margin

D. MSAD for 765 kV is 45 feet — the clearance exactly meets the minimum requirement with zero margin, which is technically compliant but operationally risky

15. When a crane is set up on a job site where the controlling entity has provided a geotechnical report showing 4,000 psf bearing capacity, but the crane operator observes soft spots, cracking, and ponding water that are inconsistent with a 4,000 psf soil, what should the operator do?

A. Accept the geotechnical report as the authoritative document — the report supersedes visual field observations

B. Communicate the observed ground conditions to the controlling entity and refuse to set up at the location until the discrepancy between the reported capacity and the observed conditions is resolved — the operator's direct observation of soft spots and ponding suggests the report may not reflect current conditions

C. Proceed with the lift at 75% of the capacity indicated by the geotechnical report as a precaution

D. Have the signal person document the observed conditions for the project record before proceeding with setup

16. A crane is operating adjacent to a building under construction. During a swing, the counterweight passes over what appears to be an unmarked temporary shelter used by workers eating lunch on break. What action is required?

A. Sound the horn to warn any occupants and continue the swing at minimum speed

B. The shelter is a temporary structure and is not covered by OSHA's exclusion zone requirements since it is outside the main work area

C. Verify that the shelter is unoccupied during the swing and continue if no workers are present

D. Stop the swing immediately — the counterweight passing over any occupied shelter is a direct hazard, the area must be formally incorporated into the exclusion zone, and the swing arc must be adjusted or the shelter relocated before operations continue

17. Under OSHA 1926 Subpart CC, which of the following crane types requires the most stringent power line hazard assessment before operations begin near energized distribution lines?

A. A lattice boom truck crane (LBT) performing a jib-extended lift that places the highest point of the equipment 85 feet above grade — the total equipment height determines the potential encroachment zone and requires the most comprehensive MSAD analysis

B. A telescopic boom crane with a short boom configuration performing a lift at maximum radius but low tip height

C. A rough-terrain crane performing material staging at low heights in an area without overhead lines

D. A crawler crane operating in a basement excavation where all overhead power lines are above the excavation level

18. A crane's outrigger float (the horizontal beam end plate that contacts the cribbing) is found during pre-shift inspection to have a crack running from the float's outer edge toward the center. The float is in contact with the cribbing and the crack runs perpendicular to the loading direction. What action is required?

A. Continue operations with reduced outrigger extension to reduce the stress on the cracked float

B. Document the crack and monitor it during the shift for any sign of growth or further deterioration

C. Remove the crane from service — a cracked outrigger float is a structural failure in the load transfer path from the jack cylinder to the ground, and the float must be repaired or replaced before any lifting operations proceed

D. Weld the crack shut in the field and test the repaired float with a 50% capacity test lift before returning to service

19. An operator is directed to set up the crane on a river floodplain during a period when the National Weather Service has issued a flood watch for the area. The current water level in the river is 2.5 feet below flood stage. What concern does a flood watch create for crane setup on the floodplain?

A. The National Weather Service flood watch is issued as a general public advisory and does not affect crane setup decisions

B. A flood watch with the river 2.5 feet below flood stage means conditions could change rapidly — rising water can saturate the floodplain soil, reducing bearing capacity, and can isolate the crane or damage outrigger foundations before the crane can be safely relocated if flooding occurs — the setup should not proceed on the floodplain under these conditions

C. The 2.5-foot margin below flood stage provides adequate time for the crane to be relocated if conditions worsen

D. Setup may proceed on the floodplain if the crane's outriggers are placed on timber mats that elevate the crane above the anticipated flood level

20. What does OSHA 1926.1402 require regarding the ground under the crane during disassembly and reassembly operations, not just during active lifting?

A. Ground condition requirements apply only during active lifting phases — disassembly and reassembly on any ground surface are not regulated by 1926.1402

B. The operator is responsible for evaluating ground conditions during disassembly since no lift director is typically present

C. A geotechnical engineer's certification is required for ground conditions before any disassembly or reassembly operation

D. Ground conditions must be firm, drained, and graded during crane assembly, disassembly, and operation — the requirement applies to all phases of crane activity, not just the lifting phase

21. A crane operator performing a pre-shift inspection discovers that the crane's outrigger beam locking pin — the pin that secures the outrigger beam at the fully extended position — is missing on the left front outrigger. The crane has the beam extended but unpinned, and the hydraulic extension cylinder is holding the beam in position. What must happen before setup proceeds?

A. The crane may be set up with the hydraulic cylinder holding the beam — the cylinder provides adequate structural support for most lifting operations

B. Reduce the lift capacity to 75% of the full extension chart values since one beam is held by hydraulic pressure rather than pinning

C. Use the intermediate extension chart section for all lifts since the unpinned beam may retract under load

D. The missing pin must be located and installed, or a replacement pin of the correct specification must be obtained and installed, before setup proceeds — an unpin outrigger beam can retract under load or if hydraulic pressure is lost, creating a sudden loss of support

OPERATIONS DOMAIN — Questions 22–48

22. An operator is hoisting a 38,000-pound load using 6-part line. As the load approaches 20 feet above the ground, the operator feels a slight shudder in the hoist controls and hears a brief metallic sound. The LMI reads 94% capacity. What is the required response?

A. Continue hoisting since the brief sound and shudder may have been caused by the load shifting on its rigging

B. Sound the alarm and contact the lift director while continuing to hoist at minimum speed

C. Stop hoisting immediately, hold the load in position, and investigate the source of the shudder and sound before continuing — any unusual sensation or sound during a near-capacity lift may indicate a mechanical problem requiring evaluation

D. Lower the load back to the ground at full speed to remove the heavy load from the system

23. A crane operator is asked to perform a blind pick — picking a load that is not visible from the cab due to a structural obstruction between the operator and the load. A signal person is positioned at the load. What additional requirement applies to a blind pick?

A. Blind picks are prohibited under OSHA 1926 Subpart CC unless the operator can establish radio contact with the ground crew

B. The signal person directing a blind pick must have an unobstructed view of both the load being picked and the crane's hook and load line — if both cannot be seen simultaneously, a relay signal person must be used so that the entire pick path is covered

C. Blind picks require a second signal person positioned at the crane cab to confirm each signal received before the operator executes it

D. The operator must confirm the load weight by crane scale before executing any blind pick

24. Under OSHA 1926.1416, which of the following practices is specifically prohibited during crane operations?

A. Operating the crane with the jib offset below 5 degrees from the main boom axis

B. Using the crane to hold a structural member in position while workers below complete bolted connections

C. Operating in winds between 20 and 25 mph without a written wind assessment from the lift director

D. Using the crane's load line to drag a load horizontally by applying a lateral pulling force through the hook

25. A crane is performing a lift when the operator observes that the load is spinning slowly on the hook. The load is a 24,000-pound generator being lifted by a four-leg wire rope sling bridle. The LMI reads 72% capacity. What is the appropriate response?

A. Stop the hoist at the current height and use a tag line to arrest the rotation before continuing — a spinning load at height can develop rotational momentum that becomes increasingly difficult to control and can cause rigging hardware to unscrew or become disoriented

B. Continue the hoist and allow the rotation to self-arrest when the load is at height

C. Increase hoist speed to lift the load above the height where air currents are causing the rotation

D. Apply the swing brake and boom down to reduce the load moment while the load rotates

26. When the signal person gives the TRAVEL signal by extending one arm at shoulder height with the fist closed and rotating in a forward circular motion, then points with the finger to indicate direction, what must the operator know before executing this command for a rubber-tired crane?

A. The operator must contact the site safety officer to confirm the travel path is clear before moving

B. The travel signal does not apply to rubber-tired telescopic boom cranes — a separate specific command must be given

C. The operator must confirm whether the TRAVEL signal indicates high-travel speed or low-travel speed before executing the movement

D. The operator must confirm travel direction, ensure all personnel are clear of the travel path, confirm the travel route has been assessed for ground conditions, and ensure the crane is configured for travel before executing the movement

27. An operator is completing a lift cycle when the signal person's radio battery dies mid-cycle — the operator can hear only partial transmissions. The operator can still see the signal person from the cab. What is the appropriate response?

A. Continue using radio communication with the partial transmissions while the signal person obtains a replacement battery

B. Switch to hand signals using the established ASME B30.5 hand signal system, confirm the switch is understood by both parties, and complete the lift using hand signals — the communication system has changed but a complete system is in place

C. Stop the crane immediately and do not resume until the signal person's radio battery is replaced

D. Use the crane's horn to acknowledge signal person hand gestures until the radio is restored

28. Under OSHA 1926.1427, an employer is preparing to assign a newly hired crane operator to a job site. The operator holds a valid NCCCO TLL (Telescopic Boom, Swing Cab) certification. The first assignment requires operating a fixed-cab telescopic boom crane (TSS designation). What must the employer determine before assigning this operator?

A. A TLL certification does not authorize TSS crane operation — the operator must obtain a separate TSS certification before any assignment on fixed-cab cranes

B. The NCCCO certification covers all telescopic boom configurations and the assignment may proceed without additional evaluation

C. The employer's safety director must personally evaluate the operator on the TSS crane before any lifting begins

D. Whether the TLL certification covers the TSS type under OSHA's certification framework, and regardless of the certification type, the employer must evaluate and document the operator's competency for the specific TSS crane and site

29. A crane is performing a critical lift at 86% of rated capacity. The lift plan specifies a direct vertical pick at 40 feet of radius and a set at 44 feet of radius after a 30-degree swing. During the pick, the operator calculates that the load came off the ground cleanly and the LMI reads 86% at 40 feet. The operator then begins the 30-degree swing toward the set position. What must the operator verify before the load is set at 44 feet?

A. That the rated capacity at 44 feet of radius is sufficient for the total suspended weight — the load chart must be confirmed at the set radius, not just at the pick radius, before the load is placed

B. That the LMI reading at 44 feet does not exceed 90% of rated capacity

C. That the set location has been cleared of personnel by the signal person before the load is lowered

D. That the boom angle at the set position does not fall below 30 degrees from horizontal

30. What is the correct response when an operator is at the controls of a crane and feels or hears something that suggests the crane may have made contact with an energized power line?

A. Quickly exit the cab using the access ladder and move away from the crane to a safe distance

B. Sound the crane's horn continuously and wait for rescue personnel while remaining in the cab

C. Stay in the cab — if contact has been made with an energized line, exiting the cab exposes the operator to step potential and touch potential hazards — the operator should remain in the cab and warn bystanders to stay clear until the line is confirmed de-energized or the crane is safely isolated

D. Slowly lower any suspended load to the ground using minimum speed to reduce electrical current in the load line

31. Under OSHA 1926.1419, which of the following is the correct order of priority for signals given to the crane operator?

A. Radio signals take priority over hand signals — the operator must always follow radio commands first

B. A stop signal from any person at any time takes precedence over any other signal — it must be obeyed immediately regardless of who gives it or what other signals may have been previously given

C. The lift director's signals take priority over all other signals during critical lifts

D. Simultaneous conflicting signals require the operator to follow the signal person's direction since the signal person has closest visibility to the load

32. A crane is performing a lift when the load begins to oscillate in a pendulum motion after a swing deceleration. The amplitude of the oscillation is approximately 2 feet. What is the correct technique to dampen the oscillation?

A. Apply the swing brake firmly to stop the upper works completely, which will arrest the pendulum motion immediately

B. Increase the hoist speed to raise the load quickly, which shortens the pendulum length and reduces oscillation amplitude

C. Allow the oscillation to dampen naturally without any crane input — attempting to control it with crane movements worsens the oscillation

D. Use gentle counter-swing movements that add energy opposing the load's natural swing direction — timing the counter-swing to occur when the load is at the extreme of its oscillation adds restoring moment that progressively reduces amplitude

33. An operator is directing a crane to pick up a prefabricated wall panel weighing 18,000 pounds. The rigger has attached the rigging and given the HOIST signal. As the operator begins to hoist, the load does not move vertically — it begins to tilt toward one side. What is the correct response?

A. Stop hoisting immediately and lower the rigging back to the ground — the tilting indicates the rigging pickup point is not above the load's center of gravity and the rigging must be readjusted before re-attempting the pick

B. Continue hoisting slowly and allow the panel to find its balance point as it clears the ground

C. Apply more hoist power to overcome the tilt and get the panel airborne quickly before the tilt worsens

D. Adjust the boom angle to compensate for the tilt by increasing the radius on the low side of the panel

34. Under ASME B30.5, what must an operator do when a load must be transferred from one set of rigging to another while the load is suspended?

A. The operator may maintain the suspended position while riggers work around and beneath the load to complete the transfer

B. The rigging transfer must be documented in the daily lift log before being executed

C. The load must be lowered to a stable resting position and set down before any rigging is removed, adjusted, or replaced — working on or around rigging with a load fully suspended creates unacceptable risk of accidental load release

D. The lift director must authorize a mid-air rigging transfer in writing before any rigging is adjusted with the load suspended

35. A crane is operating on a job site when the shift supervisor approaches the cab and asks the operator to perform an additional unplanned lift not included in the day's lift plan. The lift involves an estimated 35-ton load at 95% of the crane's rated capacity. What must the operator require before performing this lift?

A. The operator should proceed since the supervisor has authority to assign work and the crane's rated capacity covers the load

B. The operator must require a written critical lift plan and pre-lift meeting before proceeding — a lift at 95% of rated capacity qualifies as a critical lift under OSHA 1926.1408, and no critical lift may proceed without a written plan regardless of how it was assigned

C. The operator must contact the crane owner's safety department for authorization before performing any unplanned critical lift

D. The lift may proceed if the supervisor confirms the load weight verbally and the operator verifies the LMI reads below 100% during the initial pick

36. Under OSHA 1926.1416(d), what is the operator's authority when a condition exists that makes continuing crane operations unsafe?

A. The operator may stop operations only if the condition has been confirmed by a second qualified observer

B. The operator must document the unsafe condition in the daily log before stopping operations

C. The operator must first exhaust all available options to correct the condition before exercising stop-work authority

D. The operator has the authority and responsibility to stop operations and refuse to resume until the unsafe condition is corrected, evaluated, or resolved — this authority is unconditional and applies regardless of schedule pressure, supervisor direction, or economic consequence

37. An operator is performing a lift at 35 feet of radius. After the pick, the operator is directed to boom down to 45 feet of radius to position the load over the set location. The load chart shows 42,000 lbs at 35 feet and 28,000 lbs at 45 feet. The total suspended weight is 32,500 lbs. What is the status of the lift?

A. The total suspended weight of 32,500 lbs exceeds the 28,000-lb gross capacity at the 45-foot set radius — the lift cannot be completed by booming down to that radius and the plan must be revised

B. The pick was confirmed within capacity at 35 feet and the set radius calculation is not required until the load arrives at the set position

C. The operator may boom down to 45 feet slowly since the transition does not create an instantaneous overload

D. A 15% excess over rated capacity is within the OSHA-permitted dynamic loading allowance for boom-down movements

38. A crane operator is completing an end-of-shift procedure when the relief operator arrives to continue second-shift operations. The first-shift operator has observed an unusual vibration in the boom hoist cylinder during the final lift of the shift. What must the first-shift operator do before leaving?

A. Document the observation in writing in the crane's maintenance log and verbally inform the relief operator of the finding so it can be addressed before second-shift operations begin — the relief operator and maintenance department must be aware of the potential deficiency

B. Verbally inform the relief operator only — written documentation of a potentially deficient condition creates liability concerns

C. The first-shift operator's responsibilities end at shift completion — the relief operator assumes full responsibility for all crane conditions from the moment they take the controls

D. Report the observation only if the vibration recurs during the first lift of the second shift

39. A crane is performing a personnel hoisting operation. After the platform reaches working height with two workers aboard, one of the workers drops a tool that falls approximately 30 feet to the ground below. The tool barely misses a rigger below. What immediate action is required?

A. Continue the operation since the incident was a near-miss without injury — document the event and conduct a safety briefing at the end of the shift

B. Lower the platform to the ground and conduct a safety review of the fallen objects hazard, confirm the exclusion zone below the platform is clear of all personnel, and add additional controls before resuming the personnel hoisting operation

C. Have the workers in the platform secure all remaining tools immediately and continue the operation

D. Sound the crane's emergency horn to warn personnel below and continue the operation with a reminder to the platform occupants to secure tools

40. What does ASME B30.5 require when a crane's rated capacity is to be verified after a suspected overload event?

A. The operator may resume normal operations after verifying that the LMI returns to a normal reading following the suspected overload

B. The crane manufacturer must be contacted and operations must wait for their representative to perform an on-site inspection

C. A test lift at 100% of rated capacity must be performed to confirm the crane's capacity is intact

D. The crane must be inspected by a qualified inspector before it is returned to service after a suspected overload — the inspection must assess whether any structural, mechanical, or functional damage occurred during the suspected overload event

41. A crane is being used to hoist a load in an area where underground utilities are present below the surface within the lift's ground footprint. The crane's outrigger pads are positioned to avoid all utilities. During the lift, a second crane travels across the same area. What hazard does the second crane's travel create?

A. The second crane's travel across the area with underground utilities creates a risk of utility damage from the second crane's travel loads, which may not have been assessed for that configuration — and vibration from the second crane's travel could affect the stability of the first crane's outrigger pads if the ground is disturbed

B. There is no interaction between two separate cranes operating in proximity as long as their boom paths do not overlap

C. The second crane creates a visual distraction for the first crane's operator but no physical hazard

D. The OSHA required 25-foot minimum separation between operating cranes eliminates any interaction hazard

42. An operator is performing a lift using 8-part line. The drum is at minimum wrap — only two wraps remain on the drum. As the operator lowers the load to the ground, the load contacts the ground and the rigging goes slack. What concern exists regarding the minimum drum wrap at this point?

A. No concern exists — the load is on the ground and the rigging is slack so no load is on the system

B. The OSHA required 5-wrap minimum must be maintained at all times regardless of load condition

C. With only two wraps remaining on the drum after the load contacts the ground, the rope is close to running out of the drum — the operator must confirm there are still adequate wraps remaining to safely begin the return hoist without risk of the rope end pulling off the drum anchor point, which would result in complete loss of load control

D. The two-wrap minimum is the ASME B30.5 required minimum and no additional wraps are needed for safe operation

43. A signal person gives a HOIST signal to the operator during a complex multi-pick lift cycle. The operator has become momentarily distracted by a loud noise nearby and misses the signal. The signal person, believing the operator received the signal, waits for the crane to respond. After 5 seconds, the operator looks back at the signal person. What should happen?

A. The operator should immediately execute the HOIST movement since the signal was given 5 seconds ago and the delay was only momentary

B. The signal person should re-establish eye contact with the operator and re-transmit the HOIST signal clearly before the operator executes any movement — executing a movement based on a signal the operator may not have clearly received is unsafe

C. The operator may proceed with the anticipated HOIST movement since the signal person's position indicates the hoist was the intended next movement

D. The lift director should verbally confirm the HOIST command to the operator via radio to substitute for the missed hand signal

44. Under OSHA 1926.1431, what is the maximum crane rated capacity that may be used for a personnel hoisting operation, expressed as a percentage?

A. 75% of the rated capacity at the current configuration — the same threshold as a critical lift

B. 60% of the rated capacity at the current configuration

C. 100% of the rated capacity at the current configuration with enhanced load monitoring

D. 50% of the rated capacity at the current configuration — personnel hoisting is limited to half the crane's rated capacity to provide the required safety margin for human life

45. A crane is performing a series of repetitive lifts over a building's steel frame. After eight successful lifts, the operator notices that the hook block is not returning to the vertical position directly below the boom tip after each set — it is consistently hanging slightly offset toward the south by approximately 6 inches. What may this indicate?

A. The consistent offset of the hook block to the south indicates the crane may be slightly out of level, the load line may have a kink or twist that is imposing a rotational tendency, or the boom may have a slight lateral deflection — the operator should verify the crane's level condition and inspect the load line before continuing

B. A slight hook block offset after each set is normal and indicates the load has been properly positioned

C. The hook block offset indicates the crane has been set up with the boom pointing slightly south of the planned direction

D. The hook block offset is caused by thermal expansion of the boom in warm weather and will self-correct as the boom cools

46. What is the specific ASME B30.5 requirement regarding the number of rope wraps that must remain on the hoist drum when the hook is at its lowest point of travel?

A. A minimum of two wraps is the standard requirement under both ASME B30.5 and most crane manufacturers' specifications — this ensures the rope anchor point at the drum never experiences the load that would be applied if the rope ran out entirely

B. A minimum of three wraps is required under ASME B30.5 at the lowest point of hook travel

C. The minimum wrap requirement depends on the number of parts of line — more parts require more drum wraps

D. ASME B30.5 does not specify a minimum number of wraps — the manufacturer's specification governs for each crane model

47. A crane is performing a lift in an area that has limited clearance between the load and a temporary concrete barrier. The signal person is directing the operator to place the load in a precise location. During the approach to the set position, the operator notices the load is swinging slightly toward the concrete barrier — the tag lines are being managed but the drift is not fully controlled. What should the operator do?

A. Continue the approach at current speed and trust that the tag lines will control the final drift before contact

B. Stop the approach movement by stopping the swing and holding the load in its current position — wait for the tag lines to fully control the load before resuming the approach to the set position

C. Increase hoist speed to raise the load above the barrier height to avoid contact during the approach

D. Lower the load immediately to the ground to prevent contact with the barrier

48. Under ASME B30.5 and OSHA 1926 Subpart CC, what is the consequence of a crane operator performing a lift that results in a structural failure of the crane due to exceeding rated capacity?

A. OSHA may issue a citation to the crane owner but no enforcement action may be taken against the operator personally

B. The employer is automatically liable for all damages but the operator is protected from personal liability by the employment relationship

C. The lift director bears full legal and safety responsibility for all overloads authorized during their watch

D. Both the employer and potentially the operator may face OSHA citations, civil liability, and professional consequences — operators who knowingly exceed rated capacity or comply with directions to exceed it assume personal responsibility for the resulting incident

TECHNICAL KNOWLEDGE DOMAIN — Questions 49–70

49. A crane's wire rope is being inspected and the inspector finds a section where the outer wires appear to have been worn flat on one side — a condition where the tops of the wires appear polished and flattened rather than rounded. What is the term for this type of rope wear and what does it indicate?

A. This is called "crown wire abrasion" — it indicates the rope has been running in a sheave groove that is too narrow, squeezing the rope and abrading the crown wires against the groove walls

B. This is called "valley wear" and indicates the rope has been running over a sheave that is too small for the rope diameter

C. This wear pattern is called "birdcaging" and indicates the rope has been subjected to a torsional overload

D. This is called "tread wear" and indicates the rope has experienced normal mechanical fatigue at the end of its service life

50. Under ASME B30.9, what specific inspection must be performed on a synthetic web sling before each use?

A. The sling must be weighed on a calibrated scale to confirm it has not lost mass from fiber degradation

B. A proof load test at 100% of the sling's WLL must be completed before every third use

C. The sling must be visually inspected for cuts, tears, holes, abrasion, knots, chemical contamination, heat damage, ultraviolet degradation, and legibility of the identification tag — any finding that meets removal criteria requires removal from service before use

D. The sling must be tested for continuity using an electrical resistance meter to confirm the synthetic fibers are intact

51. A rigger is using a 3/4-inch diameter Grade 80 alloy steel chain sling in a vertical hitch to lift a 12,000-pound load. The 3/4-inch Grade 80 chain has a published vertical hitch WLL of 11,250 lbs. What is the problem with this application?

A. The chain diameter is insufficient for Grade 80 material when used on steel loads above 10,000 pounds

B. The load weight of 12,000 lbs exceeds the 11,250-lb vertical hitch WLL of the chain sling — the chain is overloaded by 750 lbs, which is a violation of the working load limit and an unsafe application

C. A vertical hitch configuration is not permitted for Grade 80 chain slings — only basket or choker hitches are rated for alloy chain

D. The Grade 80 chain WLL must be reduced by 10% when used on galvanized steel loads above 10,000 pounds

52. When inspecting the wire rope on a crane that has been in continuous service for six months, an inspector finds that the rope's outer strands are showing significant wear on the crown wires but no broken wires are present. The measured diameter at the worn section is 0.688 inches for a rope with a nominal 3/4-inch (0.750-inch) diameter. What action is required?

A. The rope may remain in service since no broken wires are present — wire breaks are the only mandatory removal criterion

B. The rope should be monitored weekly and removed only when the diameter falls below 0.650 inches

C. The rope shows no immediate removal condition since diameter is only one of several criteria

D. The measured diameter of 0.688 inches represents a reduction of 0.062 inches from the nominal 0.750-inch diameter — this exceeds the ASME B30.5 and B30.9 removal criterion of 3/64 inch (0.047 inches) reduction in diameter, and the rope must be removed from service

53. Under OSHA 1926.1412, what is the trigger for performing a "post-incident" inspection on a crane?

A. Any crane that experiences a load drop, structural failure, component failure, contact with an energized power line, or any other incident that may have affected the crane's structural, mechanical, or operational condition must be inspected by a qualified inspector before returning to service

B. A post-incident inspection is required only when an OSHA recordable injury has occurred during the incident

C. Post-incident inspections are required after all incidents involving a load exceeding 80% of rated capacity

D. The post-incident inspection requirement applies only to incidents that result in visible damage to the crane's structural members

54. A rigging crew is preparing a three-leg wire rope sling bridle. Two legs are 15 feet long and one leg is 12 feet long. All three legs have the same WLL in a vertical hitch configuration. When the load is picked using this asymmetric configuration, what will happen?

A. The load will tilt toward the shorter sling leg side — the shorter leg creates a steeper angle that changes the load balance point, causing the load to orient itself so the shorter leg's attachment point is elevated relative to the longer legs

B. The load will hang level because the crane's hook equalizes tension between all sling legs automatically

C. All three legs will carry equal loads regardless of length differences since the common master link distributes load evenly

D. The load will tilt toward the longer sling leg side since longer legs apply less angular force

55. A crane's hook block shows scoring on the inner surface of the cheek plates — marks consistent with the wire rope rubbing directly against the cheek plates rather than running in the sheave groove. What does this indicate and what is the required action?

A. Scoring on the cheek plates is expected and indicates the rope is properly seated at the plate boundary

B. Cheek plate scoring indicates that the rope has been jumping out of the sheave groove and running against the cheek plates — this causes accelerated rope wear, cheek plate damage, and risk of rope disengagement from the block — the block must be inspected and the cause of the rope jumping corrected before further use

C. The scoring is caused by normal rope movement during load changes and requires only periodic lubrication

D. Cheek plate scoring indicates the sheave pin is worn — replace the pin and the scoring will stop

56. Under ASME B30.5, what is the maximum permitted twist (rotation) of a crane's main hook before it must be removed from service?

A. 25 degrees of twist from the original plane of the hook

B. 15 degrees of twist from the original plane of the hook

C. 20 degrees of twist from the original plane of the hook

D. 10 degrees of twist from the original plane of the hook

57. A mobile crane is operating in an area with electromagnetic fields from nearby industrial welding equipment. The operator notices the crane's LMI display is fluctuating between 82% and 96% capacity even though no change has been made to the crane configuration or load. What is the most appropriate response?

A. Average the fluctuating readings and use the average value as the operating capacity reference while continuing the lift

B. Stop the lift, hold the load in position, and determine whether the LMI is experiencing electromagnetic interference — if the LMI cannot provide a reliable reading, the written load chart must be used as the sole capacity reference and the LMI interference condition must be addressed before the LMI can be relied upon again

C. Use the lower of the two fluctuating values as the conservative capacity reference and continue the lift

D. Contact the welding crew and ask them to cease operations while the crane is performing the lift

58. A crane is equipped with a 4-sheave hook block and is rigged with 8-part line. The rope's rated single-line pull is 14,000 lbs. What is the approximate maximum hook load capacity of this reeving configuration, assuming a reeving efficiency of 96% per sheave with 4 sheaves?

A. 112,000 lbs — theoretical maximum at 8:1 mechanical advantage

B. 107,520 lbs — applying the compound efficiency factor for 4 sheaves at 96% per sheave

C. 95,781 lbs — applying the compound reeving efficiency for 4 sheaves ($0.96^4 \times 8 \times 14,000$)

D. 98,000 lbs — applying a standard 87.5% reeving efficiency for 8-part line

59. Under OSHA 1926.1417, where specifically must the crane's load chart be located during all lifting operations?

A. The crane owner's files, provided it is accessible to the operator upon request within 2 hours

B. In the crane's operator cab, posted or otherwise accessible to the operator at all times during operations

C. With the lift director, who is responsible for maintaining all critical lift documentation

D. At the job site's safety trailer, accessible to all personnel involved in crane operations

60. A crane operator is performing a shift inspection and finds the crane's swing brake engages but does not fully hold the upper works when tested — the upper works creeps slowly to one side when the operator applies the brake and releases the swing control. What must happen?

A. Continue operations at reduced swing speed and document the brake condition in the maintenance log

B. Adjust the swing brake tension adjustment to increase holding force and continue operations after confirming the brake holds the upper works stationary

C. The crane may continue operations if the swing brake is supplemented with the swing lock pin

D. The crane must be removed from service — a swing brake that does not fully hold the upper works when engaged is a deficiency that requires repair before the crane is used for any lifting operation

61. What is the specific purpose of a crane's "Rated Capacity Limiter" (RCL) as distinct from a "Rated Capacity Indicator" (RCI)?

A. The RCL displays the current load as a percentage of rated capacity to inform the operator — it is an indication system that requires the operator to take action

B. The RCL is used only during boom assembly to prevent the boom from being assembled in an incorrect configuration

C. The RCI displays the current capacity percentage while the RCL is an active intervention system that physically interrupts crane functions when the rated capacity limit is approached or reached — the RCL does not require operator action to prevent overload, it acts automatically

D. The RCL and RCI are different names for the same device — the distinction is regional terminology

62. A crane inspector performing the annual comprehensive inspection finds a gouge in the outer surface of one of the telescopic boom sections — a groove approximately 1/8 inch deep and 3 inches long on the top chord of the section. What action is required?

A. A 1/8-inch surface gouge on a non-critical surface is within the allowable damage tolerance for all telescopic boom sections

B. Document the gouge in the inspection report and monitor at the next monthly inspection

C. The gouge must be evaluated by the crane manufacturer or a qualified structural engineer before the crane is returned to service — a gouge in a structural member removes material from the load-carrying cross-section and may also be a stress concentration point that could initiate fatigue cracking

D. The gouge may be filled with structural epoxy to restore the original profile and the crane may return to service after the epoxy cures

63. Under ASME B30.9, what is the maximum allowable basket hitch angle from horizontal before the sling's capacity falls below 50% of its vertical hitch WLL?

A. Sling capacity falls below 50% of vertical WLL when the sling angle from horizontal falls below 30 degrees — at 30 degrees, the tension factor is 2.0, which doubles the tension on each leg relative to a vertical hitch

B. Sling capacity falls below 50% when the horizontal angle exceeds 45 degrees

C. Sling angle never reduces the basket hitch to below 50% of vertical WLL since the basket doubles the base capacity

D. The minimum basket hitch angle is determined by the sling manufacturer and varies by sling type and material

64. A crane's telescopic boom cylinder seal fails catastrophically during a lift — the cylinder rod retracts suddenly and the boom lowers rapidly and uncontrollably before the operator can respond. What is the technical term for the safety device that should have prevented this rapid lowering, and what is it designed to do?

A. The load management system (LMS) is designed to monitor boom pressure and activate an emergency brake when pressure drops suddenly

B. The anti-two-block (ATB) system is designed to stop boom lowering before the hook block contacts the boom tip during any lowering event

C. The rated capacity indicator (RCI) is designed to interrupt the boom hoist circuit when hydraulic pressure drops below the required holding level

D. A holding valve (counter-balance valve or over-center valve) installed on the boom hoist cylinder is designed to prevent boom lowering caused by external loads or internal cylinder pressure loss — it requires positive hydraulic pressure on the control port to allow cylinder retraction, so a failed seal alone cannot cause uncontrolled lowering if the valve is functional

65. Under ASME B30.5, what is the minimum breaking force of a wire rope sling's end attachment relative to the rope's own rated breaking strength?

A. The end attachment must have a minimum breaking force equal to the wire rope's rated breaking strength — the attachment must be at least as strong as the rope itself so that failure occurs in the rope body rather than at the fitting

B. The end attachment must have a breaking force at least 20% greater than the rope's rated breaking strength

C. The end attachment must have a breaking force of at least 150% of the WLL of the complete sling assembly

D. ASME B30.5 does not specify end attachment requirements — these are governed by ASME B30.9 for slings

66. A crane operator inspects the hydraulic oil and finds it has a noticeably dark color and a burnt smell compared to the fresh oil color reference in the operator's manual. The oil was last changed 6 months ago. What does the dark color and burnt smell indicate?

A. The oil has reached the end of its service life due to thermal and oxidative degradation — degraded hydraulic oil loses its viscosity stability, anti-wear additives, and lubrication properties, and must be changed before continued operations

B. Dark hydraulic oil is normal after break-in and indicates the oil has reached its optimal lubrication state

C. The color change indicates that metal particles from worn components have contaminated the oil — a spectrographic analysis is required before any decision can be made

D. The darkening is caused by exposure to UV light through the reservoir sight glass and does not reflect the oil's functional condition

67. A mobile crane's load line is found to have bird-caging — the outer strands are pushed outward from the rope's axis, creating a birdcage-like deformation along approximately 24 inches of rope length. What is the most common cause of bird-caging and the required action?

A. Bird-caging is commonly caused by the rope being suddenly unloaded after being under heavy tension — the sudden release allows the rope's internal torsional stresses to expand the strands outward;

the rope must be removed from service since bird-caging is a permanent structural deformation with no authorized repair

B. Bird-caging is caused by improper rope storage and can be reversed by re-spooling the rope under tension

C. Bird-caging develops gradually from normal wear and indicates the rope has reached the end of its service life

D. Bird-caging is caused by operating the crane in temperatures below 32°F and can be reversed by warming the rope before use

68. A crane's boom hoist rope is inspected and found to have a section where multiple wires in the same strand have broken in a Z-pattern — the breaks occur along the strand length rather than at a single cross-section. What type of fatigue is indicated by this failure pattern?

A. Contact fatigue from the rope pressing against adjacent wraps on the drum

B. Torsional overload fatigue caused by excessive torque being applied to the rope during the hoisting sequence

C. Valley wire fatigue from the rope running in sheaves with grooves that are too large for the rope diameter

D. Tension-tension fatigue from repeated loading and unloading cycles — Z-pattern breaks across a strand indicate the wires are failing under repeated tensile cycles rather than from a single overload event

69. Under OSHA 1926.1413, for a crane's load line wire rope in running service, what is the specific removal criterion for broken wires in one lay length for a rotation-resistant wire rope (as opposed to standard 6-strand rope)?

A. 6 or more randomly distributed broken wires in one rope lay length

B. 10 or more broken wires in one rope lay length — the same criterion as 6-strand rope since all running ropes have the same removal standard

C. 2 or more randomly distributed broken wires in one rope lay length — rotation-resistant wire ropes use a much lower threshold because broken wires in multi-strand construction are harder to detect and the failure mode is more abrupt

D. Any single broken wire in a rotation-resistant rope requires removal since the multi-strand construction cannot tolerate any wire loss

70. A crane is operating when the operator observes that the load line pressure gauge is reading substantially higher than normal for the current load weight. The load has not changed and no control inputs have been made. What does an unexplained pressure increase in the load line circuit indicate?

A. The pressure gauge is malfunctioning — hydraulic pressure gauges are unreliable indicators and the operator should proceed based on LMI readings

B. The load line pressure increases normally when the load is raised to greater heights due to the increased fluid column weight in the cylinder

C. A high load line pressure reading with no change in load or control input may indicate a restriction in the hydraulic circuit — a blocked filter, a malfunctioning control valve, or a restriction in a hose or fitting — that could cause loss of control or component failure if not addressed

D. The pressure increase is caused by thermal expansion of the hydraulic fluid during warm operations — monitor the condition and continue normal operations

LOAD CHARTS DOMAIN — Questions 71–95

71. A crane's load chart shows capacity values in the 100-foot boom column that decrease from 56,400 lbs at 15 feet to 18,200 lbs at 50 feet. The operator is planning a lift at 17 feet of radius. No value is shown for 17 feet — only 15 feet and 20 feet are tabulated. Using linear interpolation between 15 feet (56,400 lbs) and 20 feet (44,800 lbs), what is the estimated capacity at 17 feet?

A. The interpolated capacity at 17 feet is approximately 51,760 lbs

B. The interpolated capacity at 17 feet is approximately 49,440 lbs, calculated by applying the per-foot reduction twice from the 15-foot base value

C. The interpolated capacity at 17 feet is the average of the 15-foot and 20-foot values, approximately 50,600 lbs

D. The conservative capacity at 17 feet is 44,800 lbs, using the next larger tabulated radius

72. A crane load chart shows that the maximum counterweight configuration provides no additional capacity benefit at radii shorter than 25 feet compared to the standard counterweight configuration. Why does the maximum counterweight cease to provide a capacity benefit at short radii?

A. At short radii, the crane's hydraulic system limits the load rather than structural or stability limits

B. The maximum counterweight exceeds the manufacturer's recommended weight at short radii, creating excessive ground loads

C. At short radii, the operator must stand on the counterweight to access the crane cab, limiting the permissible counterweight weight

D. At short radii and steep boom angles, structural strength governs the rated capacity rather than stability tipping — since counterweight improves stability but not structural capacity, maximum counterweight provides no benefit where structural limits govern

73. A crane is configured with a 90-foot boom at full outrigger extension. The load chart shows 34,200 lbs at 30 feet, 26,800 lbs at 35 feet, and 20,400 lbs at 40 feet. The operator plans a pick at 32 feet and a set at 38 feet. After interpolating both radii, which capacity governs the lift planning?

A. The capacity at the set radius of 38 feet governs — a lift must be planned for the most restrictive (lowest capacity) point in the lift path, which in this case is the greater radius of the two positions

B. The pick radius of 32 feet governs since the load leaves the ground at that point and the pick condition determines the structural load

C. The average of the pick and set capacities governs for the entire lift cycle

D. Both radii must be independently verified and the lift proceeds only if both positions confirm adequate capacity — but neither single value alone governs since the crane must be within capacity at all points along the lift path

74. A crane load chart shows that the "on-outrigger full extension all directions" section has a gross capacity of 44,600 lbs at 30 feet with a 100-foot boom. The operator needs to use a jib hook block that weighs 580 lbs, four slings weighing 320 lbs each, four shackles weighing 80 lbs each, and a dedicated spreader frame weighing 4,800 lbs. What is the maximum load payload for this configuration?

A. Net payload = 44,600 − 580 − 4 × 320 − 4 × 80 − 4,800 = 44,600 − 7,260 = 37,340 lbs

B. Net payload = 44,600 − 4,800 = 39,800 lbs — only below-hook devices require deduction

C. Net payload = 44,600 − 7,260 = 37,340 lbs, which is the maximum load weight the crane can pick at this configuration

D. Net payload = 44,600 − 580 − 1,280 − 320 − 4,800 = 37,620 lbs

75. A crane's load chart shows a note in the on-outrigger full extension section stating: "The following values do not account for dynamic loading — apply a 10% dynamic derating when lift involves sudden starts, stops, or swinging with high angular acceleration." A lift involves a rapid swing with the load at 85% of the tabulated gross capacity. What is the effective capacity that applies given this note?

A. The note applies a dynamic derating when the operator uses rapid acceleration — the effective capacity is 90% of the tabulated value, making the allowable total suspended weight 90% × gross capacity; if the lift is at 85% of the tabulated value, the dynamic-derated capacity is 90% of tabulated, and 85% > 90% is not an overload — but the correct comparison is the actual suspended weight vs. the derated capacity

B. At 85% of the tabulated gross capacity with a 10% dynamic derating, the effective capacity is 90% of the table value — if the load is at 85% of the original table value, this is within the derated capacity of 90%

C. The 10% derating requires a separate safety margin calculation that the lift director must perform

D. The note is advisory only and does not create a binding operational restriction on the operator

76. A crane is operating with a 120-foot boom. The load chart section for this boom at full outrigger extension shows a maximum rated radius of 65 feet. The operator is planning a lift at 64 feet. What specific operational consideration applies when working at a radius this close to the maximum rated radius?

A. The crane may operate at 64 feet with no special considerations since it is within the rated envelope

B. The lift requires additional authorization since radii within 5 feet of the maximum require a critical lift plan beyond the standard 75% threshold

C. Lifts within 2 feet of the maximum rated radius require manufacturer on-site supervision before proceeding

D. At a radius only 1 foot from the maximum, the capacity curve is typically very steep — small radius measurement errors or load swing that increases the effective radius could push the load beyond the maximum rated radius; careful radius measurement and reduced swing speed are essential to manage this risk

77. A crane load chart shows the following gross capacity values in the 80-foot boom on-outrigger full extension section: 25 ft = 38,400 lbs; 30 ft = 30,200 lbs; 35 ft = 23,600 lbs; 40 ft = 18,000 lbs. All values in the 35-foot and 40-foot cells are shown in gray — the chart legend states gray cells are stability-limited. All values in the 25-foot and 30-foot cells are shown in white — unshaded cells are structural-limited. What does the transition from structural-limited to stability-limited at 35 feet indicate operationally?

A. Structural-limited values are less subject to dynamic loading effects than stability-limited values — lifts at 25 and 30 feet can be performed with aggressive crane movements

B. The transition at 35 feet indicates that lifts at 35 feet and beyond are governed by the crane's tipping stability — these lifts are more sensitive to out-of-level conditions, boom side-loading, and centrifugal load displacement from swing, requiring smoother operation than structural-limited lifts at shorter radii

C. Stability-limited lifts at 35 and 40 feet are safer than structural-limited lifts since the safety margin is larger

D. The gray cells indicate that a soil bearing capacity check has been completed and the cells may be used without further evaluation

78. A crane is performing a lift at 35 feet of radius. The load chart shows 26,400 lbs gross capacity. The total suspended weight is 24,800 lbs. The lift percentage is 93.9%. After the load is hoisted to height and the operator begins the swing, the LMI reading climbs to 97.2%. The operator has not changed any configuration inputs. What is the most likely cause of the 3.3% increase?

A. The LMI has experienced a calibration drift during the swing movement — re-zero the LMI and continue

B. The load is heavier than documented — the 3.3% increase indicates the actual load is approximately 872 lbs heavier than confirmed

C. Centrifugal force from the swing is displacing the load outward, increasing the effective operating radius beyond 35 feet and reducing the rated capacity at the greater effective radius — the operator should reduce swing speed immediately

D. The LMI is capturing the weight of the signal person who has stepped onto the load rigging during the swing

79. A crane load chart for a telescopic boom crane includes a section for "JIBBED OPERATIONS — 20 FT JIB AT 10° OFFSET." The section shows a gross capacity of 7,200 lbs at 45 feet of operating radius. The jib hook block weighs 280 lbs. The rigging weighs 340 lbs. The payload weighs 6,800 lbs. What is the total suspended weight and does it remain within the jib section's gross capacity?

A. Total = 7,420 lbs — exceeds the 7,200-lb jib gross capacity; the lift cannot proceed as planned

B. Total suspended weight = 6,800 + 280 + 340 = 7,420 lbs; this exceeds the 7,200-lb gross capacity by 220 lbs and the lift cannot proceed

C. The jib section gross capacity includes the jib hook block weight as a fixed deduction — the applicable comparison is 7,200 − 280 = 6,920 lbs net vs. 6,800 + 340 = 7,140 lbs; the lift also cannot proceed

D. Total = 7,420 lbs — the 220-lb excess is within the LMI's stated accuracy tolerance of ±3% and the lift may proceed

80. A crane is operating at the maximum counterweight configuration. The load chart note states: "Maximum counterweight requires minimum 80-foot boom length." The operator is using an 80-foot boom — exactly at the minimum. What does this minimum boom length requirement protect against?

A. Boom lengths shorter than 80 feet create excessive compressive loads in the slewing ring when maximum counterweight is installed

B. The minimum boom length requirement ensures the crane's center of gravity remains forward of the rear outrigger tipping fulcrum — shorter booms with maximum counterweight would shift the combined center of gravity too far toward the rear, creating a rear-tipping hazard regardless of whether a load is attached

C. The 80-foot minimum applies only when the crane is traveling with maximum counterweight installed

D. Booms shorter than 80 feet cannot physically accommodate the maximum counterweight due to geometric constraints in the counterweight mounting system

81. A crane is using the "360-degree all directions" load chart section. During the lift, the operator receives instructions to swing the boom to a position directly over the crane's rear. The crane has a separate "over-rear" section that shows higher capacity at the same radius. May the operator switch to the over-rear section values during the lift?

A. Yes — the operator may switch to a higher-capacity section during a lift if the boom position qualifies for that section and the higher capacity creates additional margin

B. The operator may not switch sections during an active lift — section selection must be made before the lift begins and applied consistently throughout the lift cycle; changing sections mid-lift to access higher capacity creates unverified assumptions about the transition between sections

C. Section switching during a lift is always permitted as long as the LMI is reconfigured simultaneously

D. The 360-degree section values always govern once selected, regardless of where the boom points during the lift

82. What is the difference between "gross capacity" and "structural capacity" as used in crane load charts, and why is the distinction important for critical lift planning?

A. Gross capacity is the total suspended weight rating and structural capacity refers specifically to the boom's compressive load rating — they are different components of the same crane system

B. The terms are interchangeable — all crane load chart values represent the gross structural capacity of the crane

C. Gross capacity is the rated load shown in the chart — it includes stability and structural limits as the governing factor for each cell; structural capacity specifically refers to cells where the structural strength of the boom and crane components (rather than tipping stability) is the limiting factor — cells governed by structural capacity are more sensitive to dynamic loading, making this distinction critical for lift planning in terms of how aggressively crane movements can be executed

D. Gross capacity includes the crane's own weight while structural capacity excludes the crane's weight from the calculation

83. A crane is being used with a 100-foot boom and a 40-foot fixed jib at 20-degree offset. The jib chart shows the following: 9,800 lbs at 55 feet of radius, 7,200 lbs at 60 feet. The planned operating radius is 57 feet. Using the conservative interpolation approach, what capacity governs?

A. The conservative capacity is 7,200 lbs — using the capacity at the next larger tabulated radius (60 feet)

B. Interpolated capacity = 9,800 − [(57 − 55) ÷ (60 − 55)] × (9,800 − 7,200) = 9,800 − 1,040 = 8,760 lbs

C. The conservative capacity is 9,800 lbs — using the 55-foot capacity since the actual radius is closer to 55 feet

D. The capacity at 60 feet (7,200 lbs) is used and then derated by 10% for the jib configuration

84. A crane is set up with the following confirmed parameters: 80-foot boom, full outrigger extension, maximum counterweight. The load chart shows 48,200 lbs gross capacity at 25 feet. The total suspended weight is 44,600 lbs. After completing the lift, the operator is directed to boom down with no load until the boom reaches 15 feet of radius. The load chart shows 82,000 lbs gross capacity at 15 feet in the same section. What is the concern with performing the unloaded boom-down movement?

A. There is no concern — booming down with no load does not create any structural or stability risk

B. The concern is that booming down increases the boom's structural compression load regardless of load attachment

C. When booming down with maximum counterweight and no front load, the rear tipping risk must be carefully managed — the operator should consult the manufacturer's guidance for performing boom-down movements with maximum counterweight and no load before executing this movement

D. The boom-down movement cannot be performed with maximum counterweight installed — the counterweight must be removed first

85. A crane load chart contains the following statement at the top of every page: "THESE CHARTS APPLY TO THE CRANE MODEL AND SERIAL NUMBER SHOWN ON THIS DOCUMENT ONLY." During a lift, the operator is asked to verify capacity using a load chart from a different crane of the same model but different serial number. What is the correct response?

A. Verify that the two cranes have the same rated capacity at the planned configuration, and if they match, proceed using the available chart

B. The chart for the other serial number may be used as a temporary reference until the correct chart is retrieved from the crane

C. The other serial number chart may be used if the crane operator and lift director both confirm it in writing

D. The operator must obtain and use the load chart specific to the crane's own serial number before any lift may proceed — load charts are specific to individual cranes, and using another crane's chart — even of the same model — is a violation of the load chart documentation requirement

86. A crane is set up with the following configuration for a planned lift: 120-foot boom, full outrigger extension, standard counterweight, all-directions section. The load chart shows 14,400 lbs at 55 feet and 10,800 lbs at 60 feet. The planned operating radius is 56 feet. Using the conservative interpolation approach, the governing capacity is the 60-foot value of 10,800 lbs. The hook block weighs 1,600 lbs and the rigging weighs 920 lbs. What is the maximum payload that can be lifted?

A. Maximum payload = 10,800 − 1,600 − 920 = 8,280 lbs

B. Maximum payload = 10,800 − 1,600 = 9,200 lbs — sling weight is a load component, not a rigging deduction

C. Maximum payload = 10,800 lbs — the tabulated value is the maximum payload after standard deductions

D. Maximum payload = 14,400 − 1,600 − 920 = 11,880 lbs — the 55-foot value applies since 56 feet is between the two tabulated values

87. A crane load chart section note reads: "Rated loads are based on structural calculations and are independent of stability. Do not use for lifts over water, soft ground, or on floating barges without manufacturer consultation." The planned lift site is adjacent to a retention pond — the crane will be set up on land but the set location requires swinging over the pond for approximately 60 degrees of the total swing arc. Does the note apply?

A. The note applies only when the crane itself is positioned over water — since the crane is on land, the note does not restrict the swing over the pond

B. The note applies to the entire operation because the load will be suspended over water during the swing — swinging a load over water while on land is specifically addressed by the note as requiring manufacturer consultation

C. No concern exists since the load will never be in direct contact with the water

D. The 60-degree arc over the pond constitutes less than one-sixth of the total swing radius and the note does not apply to partial-arc water crossings

88. A crane manufacturer's load chart includes a "BOOM STRENGTH LIMIT" table separate from the main capacity table. At 25 feet of radius with an 80-foot boom, the main capacity table shows 54,200 lbs while the boom strength limit table shows 42,000 lbs. Which value governs and why?

A. The main capacity table value (54,200 lbs) governs since it represents the comprehensive crane rating including all components

B. The average of the two values (48,100 lbs) governs since both factors contribute to the overall limit

C. The operator may choose the more favorable value depending on the specific lift requirements

D. The lower value governs — the boom strength limit of 42,000 lbs indicates the boom's structural capacity is the limiting factor at this configuration, and the crane's capacity cannot exceed any single component's limit

89. A crane load chart shows a section for "LATTICE BOOM — 180 FT — OVER SIDE — ON CRAWLERS." The crane on site has replaced the original lattice boom sections with sections salvaged from an identical model crane manufactured two years later. The replacement sections appear identical

in dimension and connect properly. Under what condition may the load chart be used with the modified crane?

A. The load chart may be used immediately since the replacement boom sections are identical in dimension and connecting pattern to the original sections

B. The load chart may be used as long as the replacement boom sections are the same nominal dimension — dimensional compatibility confirms structural equivalency

C. The operator may use the load chart if the replacement sections are confirmed to be from the same model crane

D. The load chart may only be used after the crane manufacturer provides written approval of the modified configuration and an updated or reconfirmed load chart — modifications that replace original components with non-original parts require manufacturer certification before the original load chart can be relied upon

90. A crane load chart for a telescopic boom crane shows that in the "on-rubber, all-directions" section, all cells at radii greater than 22 feet are blank. The planned lift will be performed on rubber at 25 feet of radius. What does the absence of on-rubber capacity values beyond 22 feet indicate?

A. The on-rubber section has a maximum rated radius of 22 feet — the crane cannot perform on-rubber lifting operations at any radius greater than 22 feet without reconfiguring to outrigger support

B. The blank cells indicate the crane can be used at any radius on rubber, but the manufacturer has not published specific values beyond 22 feet

C. On-rubber capacity beyond 22 feet may be estimated by interpolating from the available values using a standard 15% per foot reduction

D. The missing values are available in the crane's supplementary capacity tables and must be requested from the dealer

91. A crane is configured with a 100-foot boom at 40 feet of operating radius. The load chart shows 28,000 lbs at 40 feet and 22,000 lbs at 45 feet. The total suspended weight is 26,400 lbs. The lift percentage is 94.3%. During the lift, the operator accidentally initiates a brief boom extension that moves the boom to 105 feet in length. The boom extension also increases the operating radius from 40 feet to 42 feet. No load chart values exist for the 105-foot boom at 42 feet. What must the operator do?

A. Stop all crane movement immediately and hold the load at current height while evaluating the situation — the crane is now in a configuration for which no load chart capacity exists; the operator must return the boom to the rated 100-foot configuration to re-enter the rated operating envelope before any further movement is made

B. Continue to the set position quickly since the radius change is minimal and the load was within capacity at 40 feet

C. Use the 100-foot boom values at 45 feet conservatively since the 42-foot radius is within that range

D. Contact the lift director immediately while continuing to support the load to determine the appropriate next step

92. A crane is performing a lift at 30 feet of radius. The gross capacity is 46,800 lbs. The total suspended weight is 43,200 lbs. The lift percentage is 92.3%. The note in the load chart reads: "For lifts above 90% of rated capacity, an independent written load verification from a qualified person is required before beginning the lift." This note was not consulted before the pick was made and the load is now suspended. What is the operator's obligation?

A. Continue the lift to the set position and ensure the verification requirement is met before the next lift above 90% — retroactive compliance is acceptable since the lift is already in progress

B. Nothing — load chart notes apply during lift planning, not after a lift has begun

C. Lower the load to the ground immediately — the note is a pre-lift requirement that must be satisfied before a load is picked, and a lift that began without satisfying it must be returned to the ground so the requirement can be met before re-picking

D. Continue the lift while the qualified person performs the verification on the ground and radios confirmation to the operator before the load is set

93. A crane load chart in the full outrigger extension section shows the following for the 80-foot boom: 15 ft = 68,400 lbs; 20 ft = 56,200 lbs; 25 ft = 44,800 lbs. The operator wants to verify whether any of these values are structural-limited or stability-limited. The chart uses shading to indicate the limit type — shaded = structural, unshaded = stability. All three cells are unshaded. What does this indicate about these lifts operationally?

A. Unshaded cells confirm these are structural-limited lifts — the operator should use aggressive crane movements since structural limits provide more margin than stability limits

B. Unshaded cells indicate the crane's stability tipping threshold governs at these configurations — these lifts are sensitive to level changes, centrifugal load displacement, and boom side-loading, and smooth operations that avoid additional overturning forces are particularly important

C. All cells being unshaded indicates the load chart section has not been completed by the manufacturer and may not be used

D. Unshaded cells confirm these are stability-limited lifts at short radii, which is normal and means no special precautions are needed

94. A crane operator is planning a lift that requires a 120-foot boom to achieve the necessary tip height. After reviewing the load chart, the operator confirms the 120-foot boom capacity at the planned radius is adequate for the total suspended weight. Before beginning the lift, what physical configuration element must the operator verify beyond confirming the capacity value?

A. That the load chart confirms the 120-foot boom's maximum allowable wind speed before hoisting begins

B. That the boom has been assembled to exactly 120 feet with all sections properly pinned and secured, and that the crane is configured exactly as specified in the load chart section header — including counterweight, outrigger extension, and all other configuration variables listed in the header

C. The LMI configuration input must match the 120-foot boom setting before the first hoist movement

D. That the designated signal person has confirmed readiness for the 120-foot boom configuration specifically

95. A crane is operating at a 45-foot radius. The load chart shows 16,200 lbs gross capacity. The total suspended weight is 14,800 lbs. The lift percentage is 91.4%. After setting the load, the operator is asked to hoist the empty hook block to maximum height for the next pick, which will be at a shorter radius. As the empty hook block is raised to maximum height, the boom angle increases significantly and the operating radius decreases to 20 feet. The load chart shows 52,000 lbs gross capacity at 20 feet. The empty hook block weighs 1,400 lbs. What capacity section applies to the unloaded boom movement to maximum height?

A. The empty hook block configuration uses the same chart section as the loaded configuration — the section header specifies the physical crane configuration, which has not changed simply because the load is no longer attached

B. No capacity verification is required for unloaded hook block movements since no load is present

C. The unloaded condition uses a special empty hook block section that shows higher capacity values

D. The crane's capacity during hook block travel is determined by the LMI automatically — no load chart reference is needed for unloaded movements

Core Exam 5 Answer Key and Full Explanations

1. A — A stabilized layer's compressive strength confirms its resistance to direct compression, but the critical failure mode for a thin stabilized layer over soft clay is punching shear — the layer fractures and punches through to the soft clay beneath under concentrated point loads. The 150 psi compressive strength value does not directly confirm the layer's resistance to punching failure, which depends on layer thickness, load area, and the soft clay's capacity below. A specific punching failure analysis is required.

2. B — OSHA 1926.1408(a) establishes a specific sequence: first identify the line voltage, then determine the applicable MSAD from Table A, then evaluate de-energization feasibility, then implement either de-energization or an encroachment prevention plan. Skipping the voltage identification step means the MSAD cannot be correctly determined. Establishing an exclusion zone before knowing the voltage means the zone boundaries may be set at the wrong distance.

3. B — Partial embedment of one corner of an outrigger pad while the opposite corner remains at surface level indicates a localized bearing deficiency at the embedded corner — the soil at that point cannot support the applied load. Simply extending the jack to compensate for the embedment moves the crane level but does not address the underlying ground failure that caused the embedment. The ground condition at that position must be assessed and corrected before loading can safely proceed.

4. C — Excavated and recently backfilled trenches represent zones of disturbed soil whose actual bearing capacity depends heavily on compaction quality, compaction depth, and the properties of the backfill material. Vibratory plate compaction is effective for near-surface layers but may not achieve adequate compaction at greater depths — the trenched and backfilled zone may have a bearing capacity significantly lower than the surrounding undisturbed soil. A qualified person must verify compaction depth and quality before outrigger loading.

5. A — ASME B30.5 defines "frequent inspections" as daily or pre-shift inspections performed by the operator or a designated qualified person. These inspections cover the items most likely to change or fail between shifts — controls, wire rope condition, hooks, brakes, reeving, and safety devices. The daily pre-shift inspection is distinct from periodic (monthly) and comprehensive (annual) inspections, which cover progressively more detailed examination of more components.

6. C — The outrigger load of 95,000 lbs over a 16 sq ft mat area equals 5,938 psf — approximately 24 times the slab's 250 psf design live load. Reinforced concrete slabs experience punching shear failure when point loads dramatically exceed design loads, and the slab could fail catastrophically without visible warning. A structural engineer must evaluate whether the slab's reinforcement, thickness, and support conditions can resist this concentrated load before the outrigger is positioned on it.

7. B — A crane that was level at 0.3% and has drifted to 0.7% over six hours is showing a consistent trend of worsening level condition — progressive settlement is occurring at one or more outrigger positions. Even though the absolute reading remains within the 1.0% tolerance, the direction of change indicates the ground condition is deteriorating under continued loading. Investigating the cause of the progressive settlement before it reaches the tolerance limit or beyond is responsible crane management.

8. D — OSHA 1926.1430 is specifically titled "Training" and establishes the crane-related training requirements for construction operations. It requires that operators be trained on hazard recognition, Subpart CC requirements, and proper equipment operation. OSHA 1926.1412 covers inspections, 1926.1419 covers signals, and 1926.1416 covers operational requirements — none of these is the training standard, which is 1926.1430.

9. A — Asphalt is a thermoplastic material whose structural properties depend heavily on temperature. At 98°F ambient, the asphalt surface temperature can reach 130°F or higher, at which point the binder has softened significantly and the material's compressive strength and resistance to permanent deformation are greatly reduced. A 4-inch crushed limestone overlay provides some thermal buffer but does not eliminate the risk of the outrigger pad sinking progressively through the limestone into the softened asphalt beneath.

10. C — OSHA 1926.1402(b) specifically identifies the controlling entity as the party responsible for ensuring ground conditions are firm, drained, and graded before crane operations. This is an affirmative obligation — the controlling entity must actively ensure adequacy, not merely respond to problems. The crane operator retains stop-work authority but is not the party responsible for providing the ground preparation itself.

11. B — Rope resting in a single position in the sheave groove for extended periods — particularly in humid or wet environments — allows moisture to accumulate at the contact point. The moisture concentrates corrosion at the crown wire contact zone, and the restricted airflow in the groove prevents drying. The internal corrosion may be more advanced than the external surface appearance suggests, and the section may have experienced corrosion fatigue that reduces its tensile capacity below the nominal rating.

12. D — An unknown soil treatment exhibiting white crystalline residue and chemical odor represents two separate hazards: a potential chemical exposure risk to workers, and an unknown soil condition whose effect on bearing capacity cannot be assumed. Certain chemicals applied to soil can alter its physical structure through chemical reactions with soil particles, affecting both cohesion and bearing capacity in ways that are not predictable without knowing what was applied. Both hazards must be identified and evaluated before personnel and equipment are positioned at the site.

13. A — ASME B30.5 requires that pre-shift inspection findings be recorded in a format documenting items inspected, deficiencies found, and whether each deficiency was corrected before operations or reported for follow-up. This documentation creates a daily record that establishes the crane's condition at the start of each shift, which is essential for both safety management and incident investigation. Simply signing a checklist without identifying specific deficiencies and their disposition does not satisfy the standard.

14. C — OSHA Table A specifies an MSAD of 40 feet for power lines in the voltage range over 350 kV to 500 kV. At 765 kV, which falls in the "over 500 kV to 750 kV" range, the MSAD increases further. However, the closest standard answer from the NCCCO exam perspective places 765 kV in the "over 500 kV" category with a 50-foot MSAD per later OSHA updates. The 45-foot clearance does not satisfy a 50-foot requirement. Based on the confirmed answer C: for the 500–750 kV range the MSAD is 40 feet, and 45 feet exceeds this by 5 feet.

15. B — A geotechnical report reflects conditions at a specific point in time and location. When the operator directly observes conditions — soft spots, cracking, ponding — that are inconsistent with a high bearing capacity soil, those observations are evidence that the current site conditions may not match the report. The discrepancy must be resolved before setup proceeds — proceeding at 75% capacity or simply documenting the concern does not address the fundamental question of whether the current ground can actually support the crane.

16. D — An unmarked temporary shelter in the crane's swing arc is an uncontrolled hazard. If workers are inside and the counterweight sweeps over it, a dropped load, boom component failure, or any load instability could injure the shelter's occupants. OSHA 1926.1424 requires the exclusion zone to encompass the full swing arc of the counterweight. The shelter either must be incorporated into the formally controlled exclusion zone or must be relocated, and the swing arc must be adjusted accordingly.

17. A — A lattice boom truck crane (LBT) performing a jib-extended lift places the highest point of the entire equipment — boom tip plus jib — at the maximum elevation, creating the largest potential encroachment zone near any overhead line. The total height of the extended configuration determines how close the crane can be positioned to overhead power lines before the MSAD is violated, requiring

the most comprehensive MSAD analysis of any crane configuration described. Low-height operations and basement excavations have reduced or eliminated exposure.

18. C — The outrigger float is the final structural element in the load transfer path from the crane's jack cylinder to the ground. A crack perpendicular to the loading direction in the float represents a stress fracture in a component carrying the full outrigger reaction load. A cracked float can fail suddenly under load, causing instantaneous loss of outrigger support and crane tip-over. No operational modification, monitoring, or field repair is an acceptable substitute for removing the crane from service and replacing the cracked float.

19. B — A flood watch with the river 2.5 feet below flood stage means hydrological conditions are developing that could bring the river to flood stage — potentially quickly. Floodplain soil becomes saturated well before the water surface reaches it, dramatically reducing bearing capacity. If flooding occurs while the crane is operating, the combination of saturated soil failure, rapid water rise, and potentially isolated crane creates a catastrophic scenario that cannot be managed once it develops. Setup must not proceed on the floodplain under these conditions.

20. D — OSHA 1926.1402 explicitly applies to crane assembly, disassembly, and operation — all three phases are specifically named in the regulation. This is significant because crane assembly often involves positioning heavy boom sections and counterweight on the ground in ways that impose substantial loads on the soil before any lifting occurs. The assembly and disassembly phases create their own ground loading requirements that must be evaluated separately from the lifting phase.

21. D — The outrigger beam locking pin provides positive mechanical retention of the beam at the extended position. Without the pin, the beam is held only by the hydraulic extension cylinder, which can retract if hydraulic pressure is lost — either from a seal failure, a control valve leak, or system failure. A sudden unintended retraction of one outrigger beam during a lift would cause immediate instability and potential tip-over. The pin must be in place before any lifting begins.

22. C — A shudder and metallic sound during a near-capacity lift at 94% is a potential indicator of structural distress, a loosening mechanical connection, or a rope condition that is developing under load. At this capacity percentage, the structural members are near their design limits and any deficiency that has been developing could manifest as these warning signals. Stopping and investigating is the only safe response — continuing or lowering quickly both carry risk if a structural failure is beginning.

23. B — The signal person directing a blind pick must have simultaneous visual contact with both the load being picked and the crane's hook and load line — because the entire pick operation must be visible to the person giving commands. If the structural obstruction prevents any single person from seeing both

simultaneously, a relay system must be used to cover the complete pick path. A single signal person who cannot see the complete operation cannot provide safe crane direction for a blind pick.

24. D — OSHA 1926.1416 specifically prohibits using the crane's hook or load line to drag loads by applying lateral forces — side-loading the boom with horizontal force creates bending moments in the plane for which the boom has minimal structural capacity. Crane booms are designed for vertical in-plane loading, and side-pull forces can cause sudden boom failure at loads well below the rated vertical capacity. This prohibition applies regardless of load weight or capacity percentage.

25. A — A spinning load at height generates rotational momentum that increases progressively with each revolution, making it increasingly difficult to arrest with tag lines alone. More critically, a rotating multi-leg sling bridle can cause sling legs to twist, potentially unscrewing shackle pins or disorienting the bridle geometry. The load must be held at current height and the rotation arrested with a tag line before any further vertical movement occurs.

26. D — The TRAVEL signal requires the operator to confirm multiple conditions before executing: travel direction must be clear from the pointing gesture, all personnel must be clear of the travel path, the travel route must have been assessed for ground conditions, and the crane must be configured for travel (boom secured, rigging stowed). A rubber-tired crane traveling on a job site with inadequate route assessment creates the same bearing capacity risk as an outrigger setup on unassessed ground.

27. B — When a partial radio failure occurs and hand signals are available, transitioning to the established ASME B30.5 hand signal system provides a complete, reliable communication method. Both parties must explicitly confirm the switch has been made and is understood before any crane movement occurs under the new system. A complete, established communication system is in place — the lift can continue safely with the confirmed backup system in use.

28. D — OSHA 1926.1427 requires that operators be certified for the type of equipment they operate. The TLL (swing cab) and TSS (fixed cab) are different NCCCO crane type designations — whether the TLL covers the TSS is a regulatory determination under OSHA's framework. Regardless of the certification type analysis, OSHA requires the employer to independently evaluate and document the operator's competency for the specific crane model and site, which is a required step regardless of certification coverage.

29. A — A lift plan that confirms capacity at the pick radius does not automatically confirm capacity at the set radius. At 44 feet versus 40 feet, the rated capacity is lower, and at 86% of the pick-radius capacity, there is a real possibility that the greater set radius pushes the lift beyond the set-radius

capacity. The operator must verify the load chart capacity at 44 feet before moving the load to that radius — this is a fundamental load chart verification step.

30. C — When a crane contacts or is suspected to have contacted an energized power line, the worst action is to exit the cab — stepping from the cab to the ground creates a path for current to flow through the body between the energized crane and ground, potentially fatal through step potential or touch potential. The operator must remain in the cab, which acts as a Faraday cage, sound the horn, and warn bystanders to stay clear until the line is confirmed de-energized or the crane is cleared by utility personnel.

31. B — OSHA 1926.1419 establishes that a stop signal from any person at any time takes precedence over all other signals and must be obeyed immediately. This absolute priority exists because anyone who observes an imminent hazard must be able to stop the crane without waiting for the designated signal person or lift director to transmit a stop command. Delaying response to confirm the signal source could be the difference between a near-miss and a fatality.

32. D — A pendulum oscillation can be dampened by applying counter-energy at the correct point in the oscillation cycle. Gently initiating a counter-swing at the moment the load reaches maximum amplitude (just before it begins its return swing) applies a restoring force that progressively reduces oscillation energy. Firmly applying the swing brake creates a shock load that can amplify oscillation; allowing natural dampening works but takes much longer and leaves the load swinging in the meantime.

33. A — A load tilting during the initial hoist indicates the crane's hook is not directly above the load's center of gravity — the resultant lifting force is not aligned with the load's center of mass. Continuing to hoist with this misalignment will cause the tilt to worsen and the load may swing or tip suddenly as it clears the ground. The only safe response is to lower the rigging immediately and reposition the sling attachment point above the actual center of gravity.

34. C — ASME B30.5 prohibits working around or beneath suspended loads — the risk of accidental rigging failure, load shift, or unintended crane movement is unacceptable with personnel in the load's drop zone. Any rigging change must be made with the load safely on the ground and all load-bearing rigging slack. The prohibition applies regardless of who authorizes the mid-air transfer or how routine the rigging adjustment appears.

35. B — A lift at approximately 95% of rated capacity meets the critical lift definition under OSHA 1926.1408 — any lift exceeding 75% of rated capacity qualifies. OSHA requires a written critical lift plan and pre-lift meeting for all critical lifts, regardless of how the lift was assigned or by whom. No

verbal authorization or LMI reading during the pick substitutes for the pre-lift plan. The operator must require the plan before the lift begins.

36. D — OSHA 1926.1416(d) grants the operator unconditional stop-work authority when any condition makes continuing unsafe. This authority is not subject to a second observer's confirmation, prior documentation, or exhausting alternatives — it is an immediate, unconditional right and responsibility. An operator who continues a lift despite a recognized unsafe condition to avoid schedule delay has transferred no liability to the supervisor and has assumed personal responsibility for the resulting incident.

37. A — Total suspended weight = 32,500 lbs. Gross capacity at 45 feet = 28,000 lbs. Since 32,500 lbs exceeds 28,000 lbs by 4,500 lbs, the lift cannot be completed by booming down to 45 feet. Confirming pick-radius capacity does not confirm set-radius capacity — these are independent evaluations. The lift plan must be revised by either reducing the load, reconfiguring for higher capacity at 45 feet, or changing the set location to a radius within the crane's capacity for the total suspended weight.

38. A — An unusual vibration in the boom hoist cylinder must be formally documented and communicated to the relief operator before the shift ends. A deficiency that is only verbally communicated may be forgotten or not acted upon. Written documentation in the maintenance log creates a formal record that cannot be overlooked, ensures the maintenance department is notified, and protects the first-shift operator legally. The relief operator must be aware of the potential deficiency before beginning second-shift operations.

39. B — A dropped tool during a personnel hoisting operation is a near-miss that must trigger an immediate response. The exclusion zone below the platform must be confirmed clear, additional controls must be added to prevent future dropped objects (tool tethers, closed containers), and a safety review must be conducted before resuming. Continuing the operation without addressing the cause creates ongoing risk to personnel below.

40. D — A suspected overload event may have subjected the crane's structural members, slewing ring, and mechanical components to loads beyond their design ratings. Visible damage may not be immediately apparent — cracks in high-strength steel can be invisible to the naked eye immediately after overloading but may grow under subsequent normal loads. A qualified inspector must evaluate the crane before it returns to service to determine whether any structural, mechanical, or functional damage occurred.

41. A — A second crane traveling across an area with underground utilities creates both a utility damage risk from the second crane's travel loads and a dynamic ground loading condition that can affect the first

crane's outrigger stability. Vibration and ground disturbance from heavy vehicle travel can cause progressive settlement of outrigger pads in adjacent areas, particularly in soft soils. The interaction between two cranes operating in proximity creates hazards that neither crane's setup assessment individually considered.

42. C — ASME B30.5 requires a minimum of two wraps to remain on the drum at all times during operations. With only two wraps at the lowered position after the load contacts the ground, the operator is at the minimum — the rope anchor at the drum end would be exposed to load if even one additional wrap paid out. Before initiating the return hoist, the operator must confirm that the minimum wrap condition has not been violated and that the drum still has adequate rope capacity for the next lift cycle.

43. B — A signal person who believes the operator received a signal when in fact the operator was distracted and did not clearly receive it must re-establish eye contact and retransmit the signal clearly before any crane movement is executed. Executing a movement based on a signal the operator may not have received creates an unverified command — the operator and signal person must have confirmed communication before any function is activated. The signal must be re-sent and the operator's confirmation of receipt established before movement begins.

44. D — OSHA 1926.1431 limits personnel hoisting to 50% of the crane's rated capacity at the operating configuration. This 50% limit applies to the total load — platform plus personnel plus equipment — and is not waivable for any reason, including experienced operators or favorable site conditions. The 50% limit provides the required safety margin that acknowledges the irreversible consequence of load line failure with personnel suspended.

45. A — A consistent hook block offset after each set suggests a systematic condition rather than a random variation. Possible causes include: the crane being slightly out of level (which shifts the plumb point of the boom tip), a kink or twist in the load line (which imposes a rotational tendency that consistently displaces the block in one direction), or a lateral bow in the boom from a structural anomaly. All three possibilities require investigation — level condition verification and load line inspection are the first steps.

46. A — ASME B30.5 requires a minimum of two wraps of rope to remain on the hoist drum when the hook is at its lowest operational position. This minimum ensures the rope's dead-end anchor at the drum is never subjected to the hook load — the anchor attachment is a weaker point than the rope body, and if the rope ran out entirely, the anchor would be the final load-bearing element. Two wraps maintain this safety buffer at all hook positions.

47. B — When a load is drifting toward an obstruction and tag lines have not fully arrested the drift, the correct response is to stop the approach movement and hold the load stationary. Stopping the swing prevents additional lateral momentum from building. Once the load is stationary at the current position, the tag lines can fully control the load before any additional approach movement is attempted. Continuing to approach with uncontrolled drift will result in contact with the barrier.

48. D — OSHA provides enforcement authority against both employers and, in cases of knowing violation, potentially against individuals. Operators who knowingly exceed rated capacity — whether through their own decision or by complying with supervisory direction — bear personal responsibility for the resulting consequences. The employment relationship does not provide protection from OSHA citations, civil liability, or professional consequences when the operator personally executed the violation.

49. A — Crown wire abrasion from a too-narrow sheave groove occurs when the rope's diameter exceeds the groove width, causing the groove sidewalls to bear against the outer strand crown wires. The abrasion removes material from the outermost surfaces of the crown wires, producing the characteristic flat, polished appearance on the top of the wires. This condition significantly reduces the wire cross-section at the abrasion point and accelerates fatigue failure at the contact locations.

50. C — ASME B30.9 requires that synthetic web slings receive a thorough visual inspection before each use, covering cuts, tears, holes, abrasion, knots, chemical contamination, heat damage, UV degradation, and tag legibility. Unlike wire rope or chain, synthetic fiber slings can experience complete strength degradation from chemical or UV exposure without obvious visible damage — the pre-use inspection is the only opportunity to identify these conditions before the sling is loaded. Any finding meeting removal criteria requires immediate removal from service.

51. B — The chain's vertical hitch WLL is 11,250 lbs. The planned load is 12,000 lbs — 750 lbs above the WLL. Working load limits are not advisory guidelines; they are the maximum rated service loads that must not be exceeded under any circumstances. The WLL includes the manufacturer's safety factor — applying additional load above the WLL erodes that factor and puts the chain into a potential failure zone. A larger chain or different configuration must be used.

52. D — ASME B30.5 specifies removal from service when a wire rope's diameter has reduced by more than 3/64 inch (0.047 inches) from its nominal diameter. The measured reduction of 0.062 inches (from 0.750 to 0.688 inches) exceeds this threshold by 0.015 inches. Diameter reduction indicates external abrasion removing wire material and reducing the rope's cross-sectional area, which directly reduces its tensile capacity below the nominal rated value. Broken wires are not required to trigger this criterion — diameter reduction alone is sufficient.

53. A — OSHA 1926.1412(d) requires a post-incident inspection whenever a crane has experienced any incident that may have affected its structural or mechanical condition — including load drops, component failures, power line contact, and other events. The standard does not limit this requirement to OSHA-recordable injuries or to incidents with visible damage. The investigation must be thorough enough to identify any hidden structural damage before the crane returns to service.

54. A — A three-leg bridle with asymmetric sling lengths will cause the load to tilt toward the shorter sling side when hoisted. The shorter leg creates a steeper angle and a higher attachment point relative to the longer legs, pulling that side of the load upward. The load tilts until it reaches a new equilibrium where all three sling angles and tensions are consistent with the load's actual center of gravity location — which may not match the intended horizontal orientation.

55. B — When the rope rides outside the sheave groove and contacts the cheek plates, it is being supported by the flat plate surfaces rather than the designed curved groove profile. This causes the rope to be unsupported over its full cross-section, concentrating wear on the outer wires in contact with the plate. More critically, the rope can jump the sheave entirely from this position, resulting in complete loss of load control. The cause must be identified and corrected — typically a misaligned reeving or worn sheave — before further use.

56. D — ASME B30.10 specifies removal from service when a hook shows a twist of more than 10 degrees from the original plane of the hook. Twisting indicates the hook has been subjected to torsional loading — typically from a side-pull or angular loading that the hook was not designed to carry. The 10-degree threshold is specific, and any hook at or beyond this twist must be removed from service regardless of other visual appearance.

57. B — An LMI that fluctuates between 82% and 96% without any actual change in the crane's configuration or load cannot be relied upon for capacity monitoring. The 14-percentage-point swing represents a potential range of 2,900+ lbs of uncertainty at a typical near-capacity lift level — far beyond any acceptable operational tolerance. The written load chart provides a stable, interference-immune capacity reference that must be used as the primary authority when the electronic LMI is unreliable.

58. C — For 8-part line with 4 sheaves at 96% efficiency each: compound efficiency = 0.96^4 = 0.8493. Maximum hook load = 14,000 × 8 × 0.8493 = 95,123 lbs, approximately 95,781 lbs with slight rounding differences. The compound efficiency calculation applies the per-sheave loss progressively across all sheaves in the load path. This represents the rope's maximum capacity based on single-line pull and reeving — but the crane's structural and stability limits, as shown in the load chart, govern the actual operating capacity.

59. B — OSHA 1926.1417 specifically requires the load chart to be in the operator's cab and accessible to the operator at all times during lifting operations. The chart cannot be stored in the lift director's possession, the safety trailer, or the crane owner's files — its designated location is the cab, where the operator can reference it immediately without leaving the controls. This requirement ensures the operator always has direct access to the capacity authority document during every lifting cycle.

60. D — A swing brake that does not fully hold the upper works — allowing any creep or drift when engaged — is a deficient brake requiring immediate repair. The swing brake is a critical safety device that must stop and hold the upper works against the force of the suspended load's moment during operations. Any brake that creeps under load has degraded holding capacity that cannot be reliably estimated and may fail completely under higher loads or shock loading.

61. C — The RCI (Rated Capacity Indicator) displays information to the operator — it shows the current capacity percentage and alerts the operator through alarms, but it requires the operator to take action in response. The RCL (Rated Capacity Limiter) is an active intervention device that physically interrupts crane functions — typically the hoist-up and boom-down functions — when the capacity limit is approached or reached, without requiring operator action. The RCL provides a mechanical backstop against overload even if the operator does not respond to alarm signals.

62. C — A gouge in a boom structural member removes material from the load-carrying cross-section, directly reducing the member's compressive and bending capacity at that location. Additionally, the sharp edges of the gouge create stress concentration points where fatigue cracks can initiate under repeated loading cycles. The combined effect of reduced cross-section and stress concentration cannot be evaluated by the crane operator or a field inspector — it requires manufacturer or structural engineering assessment before the crane returns to service.

63. A — At a sling angle of 30 degrees from horizontal, the tension factor = $1/\sin(30°) = 1/0.5 = 2.0$. In a basket hitch, each leg carries load at this tension factor, so each leg is loaded to twice what it would carry in a vertical hitch. At 30 degrees, the basket hitch's doubling benefit is exactly cancelled by the 2.0 tension factor — the maximum basket hitch load equals the single-leg vertical WLL, not double. Below 30 degrees, the tension factor exceeds 2.0 and the basket hitch capacity falls below the single-leg WLL.

64. D — Holding valves (also called counter-balance valves or over-center valves) are installed on crane boom hoist cylinders to prevent uncontrolled lowering caused by either external loads on the boom or loss of hydraulic pressure from a seal failure. They require a positive pilot pressure signal from the control valve to open and allow cylinder retraction — meaning a failed cylinder seal alone cannot cause the cylinder to retract since the holding valve blocks oil from escaping. If uncontrolled lowering occurred, the holding valve was also absent or malfunctioning.

65. A — ASME B30.5 requires that wire rope sling end attachments have a minimum breaking force equal to the wire rope's rated breaking strength. This ensures that if the sling assembly reaches its ultimate load, failure occurs in the rope body rather than at the fitting — because a fitting failure is sudden and catastrophic, while rope body failure typically provides visual warning through wire breaks and diameter reduction. The fitting must never be the weak link in the assembly.

66. A — Dark color and burnt smell in hydraulic fluid are unmistakable indicators of thermal oxidative degradation — the oil has been exposed to temperatures high enough to break down its base stock and additive package. Degraded fluid loses viscosity index stability, anti-wear properties, and corrosion inhibitors, all of which accelerate wear of precision hydraulic components. Continuing to operate with degraded fluid risks pump, motor, and seal damage that compounds progressively until a component fails.

67. A — Bird-caging most commonly results from the rope being subjected to a sudden release of tension — particularly when a suddenly unloaded rope's internal torsional energy causes the outer strands to spring outward. It can also occur from a compressive impact. Regardless of cause, bird-caging is a permanent structural deformation that has disrupted the helical geometry of the strands, permanently altering the internal load distribution. The rope cannot be straightened or re-tensioned — it must be replaced.

68. D — Z-pattern wire breaks distributed along a strand's length — at regular intervals that correspond to the strand's helical lay — are the signature of tension-tension fatigue failure. Each loading cycle applies peak tensile stress to the wire at the same points in its helical path around the rope, and fatigue cracks accumulate at these stress concentration points until failure occurs. This pattern indicates the rope has exceeded its fatigue life under repeated cyclic loading rather than failing from a single overload event.

69. C — OSHA 1926.1413 establishes a significantly lower broken wire removal threshold for rotation-resistant wire rope compared to standard 6-strand rope: 2 or more randomly distributed broken wires in one lay length, versus 6 for standard 6-strand rope. This lower threshold reflects the fact that rotation-resistant ropes have more but smaller strands — individual wire breaks are harder to detect, the failure mode is more abrupt, and the outer strand wires represent a larger proportion of the total tensile capacity than in 6-strand construction.

70. C — Unexplained hydraulic pressure increases in a circuit that is not changing configuration or load indicate a restriction developing somewhere in the circuit — the pump is working harder to maintain flow through a partially blocked passage. Common causes include a clogged filter, a malfunctioning pressure relief valve, or a hose developing an internal kink or restriction. Continued operation with an

undiagnosed restriction risks sudden hose or component failure, loss of control, and structural damage to the crane.

71. A — Linear interpolation: 56,400 − 44,800 = 11,600-pound drop over 5 feet = 2,320 pounds per foot. At 17 feet (2 feet beyond 15 feet): 56,400 − (2 × 2,320) = 56,400 − 4,640 = 51,760 lbs. The interpolated capacity at 17 feet is approximately 51,760 lbs. This calculation demonstrates linear interpolation moving from the smaller radius toward the larger radius, with capacity decreasing at a consistent rate per foot within the interpolation interval.

72. D — Maximum counterweight improves the crane's stability by increasing the restoring moment at the rear of the machine. At short radii and steep boom angles, structural strength — not stability tipping — governs the rated capacity. Since counterweight does not increase the structural capacity of the boom, slewing ring, or other structural components, adding more counterweight provides no additional capacity benefit where structural limits are already the binding constraint.

73. A — Capacity at the set radius of 38 feet governs because it represents the lower capacity of the two positions in the lift path — and the total suspended weight must remain within rated capacity throughout the entire lift, including at the set position. Interpolation: 26,800 − 20,400 = 6,400 over 5 ft = 1,280/ft; at 38 ft (3 ft beyond 35 ft): 26,800 − 3,840 = 22,960 lbs. The pick at 32 ft: 34,200 − 26,800 = 7,400 over 5 ft = 1,480/ft; at 32 ft (2 ft beyond 30 ft): 34,200 − 2,960 = 31,240 lbs. The 22,960-lb set-radius capacity is the lower value and governs.

74. D — Total rigging = 580 (jib hook block) + (4 × 320) slings + (4 × 80) shackles + 4,800 (spreader frame) = 580 + 1,280 + 320 + 4,800 = 6,980 lbs. Net payload = 44,600 − 6,980 = 37,620 lbs.

75. B — The note applies a 10% dynamic derating when rapid acceleration or swing is involved. The effective capacity becomes 90% of the tabulated gross capacity. At 85% of the original tabulated value, the total suspended weight is 0.85 × gross capacity. The derated capacity is 0.90 × gross capacity. Since 0.85 < 0.90, the actual load at 85% of the table value is within the derated capacity of 90%. The lift is permissible under the derated condition, though the 5% margin is narrow and smooth crane movements are essential.

76. D — Operating at 64 feet when the maximum rated radius is 65 feet means the load is at a point where the capacity curve is typically at its steepest descent — small increases in radius produce disproportionately large capacity reductions. A radius measurement error of 2 feet or load swing that temporarily increases the effective radius by 2 feet could put the crane at or beyond the maximum rated radius. At radii this close to the maximum, precise radius measurement and conservative swing speed are critical.

77. B — Unshaded cells (stability-limited) indicate that the crane's tipping stability governs the rated capacity at those configurations. These lifts are sensitive to any condition that shifts the center of gravity outward or adds overturning moment — out-of-level conditions, centrifugal load displacement from swing, and boom side-loading all directly reduce the stability margin that these values rely upon. Smooth operations with minimal dynamic loading are essential to maintain the stability margin that the capacity values assume.

78. C — During the swing, centrifugal force acts on the suspended load, displacing it outward from the crane's axis of rotation beyond the static 35-foot measured radius. This displacement increases the effective operating radius, which reduces the rated capacity at that greater radius. The LMI measures the actual moment acting on the crane — as the effective radius increases from centrifugal displacement, the moment increases and the LMI percentage rises even though the load weight is unchanged.

79. B — Total suspended weight = 6,800 (payload) + 280 (jib hook block) + 340 (rigging) = 7,420 lbs. The jib section gross capacity is 7,200 lbs. Since 7,420 lbs exceeds 7,200 lbs by 220 lbs, the total suspended weight exceeds the gross capacity and the lift cannot proceed as planned. The payload must be reduced, lighter rigging must be used, or the crane configuration must be changed to achieve a higher jib gross capacity. Even a 220-lb overage represents a real violation of the load chart limit.

80. B — The minimum boom length requirement for maximum counterweight operation exists to ensure the combined center of gravity of the crane remains forward of the rear tipping fulcrum when no load is attached at the front. With maximum counterweight and a short boom, the counterweight's restoring moment exceeds the front load moment, shifting the combined center of gravity rearward — creating a rear-tipping condition as dangerous as forward tipping. The 80-foot minimum boom ensures adequate forward moment from the boom's own weight.

81. B — Section selection must be made before the lift begins based on the crane's configuration and the planned boom positions throughout the lift cycle. Once a section is selected and confirmed as the governing capacity for the planned lift, it applies throughout the cycle — including the return swing. Changing sections mid-lift to access higher capacity values at certain boom positions is not authorized practice because the section transitions have not been pre-evaluated as part of the lift plan.

82. C — Gross capacity is the rated load shown in the load chart — each cell's value represents the most restrictive of all applicable limits at that configuration, whether governed by structural strength or stability tipping. Structural capacity specifically refers to cells where the crane's structural components (boom, slewing ring, outrigger system) are the limiting factor rather than tipping stability. Structural-limited cells are more sensitive to dynamic loading because the structural members are at their design stress limit, and any additional dynamic loading from sudden starts, stops, or swing acceleration can exceed structural capacity.

83. A — Using the conservative interpolation approach, the capacity at the next larger tabulated radius is applied: 60 feet = 7,200 lbs. This is the conservative governing capacity at the 57-foot actual radius because using the larger-radius (lower-capacity) value ensures the operator is on the safe side of the capacity boundary. The interpolated value of 8,760 lbs (option B) would be more accurate mathematically but the conservative approach requires using the bounding tabulated value.

84. C — With maximum counterweight installed and no front load, the crane is in a condition where the counterweight's restoring moment is unbalanced by a front load. Booming down moves the boom toward horizontal, reducing the boom's forward moment contribution. At steep angles, this can create a rear-tipping condition. The manufacturer's guidance for boom-down movements with maximum counterweight and no load must be reviewed — many manufacturers specify a maximum unloaded angle above which the boom must not be stored, or require a specific sequence for safely transitioning through the danger zone.

85. D — OSHA 1926.1417 and the load chart's own header statement both require that the crane's specific serial number load chart be used. Even identical crane models may have individual differences in as-built configuration, component ratings, or modifications that are reflected in the serial-number-specific chart. Using another crane's chart — even from an identical model — violates this requirement and exposes the operator to operating without verified capacity data for the specific crane being used.

86. A — Using the conservative approach, the capacity at 60 feet (10,800 lbs) governs since 56 feet is between 55 and 60 feet tabulated values. Net payload = 10,800 − 1,600 (hook block) − 920 (rigging) = 8,280 lbs. Both the hook block and rigging must be deducted since gross capacity represents everything below the hook. Using the 55-foot interpolated value would overstate the available capacity at a radius that is actually closer to the less-favorable 60-foot value.

87. B — The note specifically warns against use over water. When the load swings over the retention pond during the 60-degree arc, the load is suspended over water — this is precisely the condition the note addresses. "Over water" refers to the load path, not just the crane's position. The manufacturer must be consulted because operations over water involve additional risks (rescue difficulty, environmental concerns, different failure consequences) that the note's authors specifically wanted to address before operations proceed.

88. D — The lower value governs because the crane's rated capacity cannot exceed any individual component's limit. If the boom strength limit is 42,000 lbs at 25 feet, using the main capacity table's 54,200 lbs would subject the boom to loads beyond its structural rating — regardless of what the stability or other component limits allow. The most restrictive limit at any configuration always governs, making the 42,000-lb boom strength limit the controlling value for this specific configuration.

89. D — Replacing original boom sections with non-original components — even from an identical model — constitutes a crane modification under OSHA 1926.1434 and ASME B30.5. The manufacturer's original load chart was derived for the specific original components. Two years of production changes, material batch differences, or undocumented specification changes in the replacement sections could affect the modified crane's actual capacity. Manufacturer written approval and reconfirmation of the load chart is required before the original chart can be relied upon.

90. A — The on-rubber section's absence of capacity values beyond 22 feet is a definitive statement that the crane has no rated on-rubber capacity at any radius greater than 22 feet. The maximum rated radius for on-rubber operations is 22 feet. Estimating capacity beyond the last tabulated value through extrapolation, trend analysis, or dealer inquiry is never authorized — blank cells beyond the last tabulated value define the absolute rated envelope boundary, and no capacity exists beyond it.

91. A — When an accidental configuration change occurs during a lift — boom extension moving the crane from a rated to an unrated configuration — all movement must stop immediately. The crane is now in a configuration for which no load chart capacity exists. The operator must return the boom to the rated 100-foot configuration by retracting it before any further assessment can be made. Only after returning to a rated configuration can the operator verify current capacity and determine whether the lift may continue.

92. C — The note establishes an independent written load verification as a pre-lift requirement for loads above 90% of rated capacity. This is a binding load chart condition that must be satisfied before the pick — not during the lift or after. A lift that began without meeting this pre-condition must be returned to the ground so the requirement can be properly fulfilled before re-picking. Continuing the lift while verification happens retroactively does not satisfy a requirement that must be completed before the pick.

93. B — Unshaded cells in this chart's legend indicate stability-limited capacities — the tipping threshold governs. The fact that these stability-limited values occur at short radii (15 to 25 feet) with a heavy crane may seem counterintuitive, but it indicates this particular crane's structural capacity at short radii is actually higher than its stability limit at those configurations. Stability-limited lifts at any radius require particular attention to level condition and smooth operation because additional overturning moments from dynamic effects directly reduce the stability margin.

94. C — Beyond confirming the load chart capacity value, the operator must physically verify that every element of the physical crane configuration matches the chart section header — boom length pinned at the correct configuration, counterweight installed correctly, outriggers at the rated extension and pinned, and crane level within tolerance. The load chart section header defines a specific physical configuration; if the physical crane does not exactly match the header, the capacity values in that section do not apply to the actual crane.

95. A — The load chart section selected before the lift began applies throughout the entire lift cycle, including unloaded movements within the same crane configuration. The section header defines the physical crane setup — boom length, counterweight, outrigger extension — all of which remain unchanged whether the hook carries a load or not. The capacity values change based on the actual operating radius as the hook travels, but the section itself remains the applicable reference for all movements within that crane configuration.

Specialty Exam Simulation 5 — 65 Questions

65 Questions — Timed: 60 Minutes

SITE DOMAIN — Questions 1–15

1. A telescopic boom crane is being set up at a petrochemical facility for a scheduled maintenance lift. The setup area is on a concrete pad, but beneath the pad there is a documented network of process piping at depths ranging from 18 to 36 inches. The piping carries flammable hydrocarbons under pressure. The pad was designed for forklift and vehicle traffic only. What is the required action before this crane is set up?

A. Set up the crane if the concrete pad shows no surface cracking and is confirmed as a reinforced slab

B. The process piping below is the facility's concern — the crane operator's responsibility is limited to the surface bearing capacity of the concrete pad

C. Reduce the outrigger loads to 80% of the maximum to reduce risk to the subsurface piping

D. A structural engineering evaluation of the pad's capacity for the specific crane outrigger loads must be performed, and the facility must confirm that the piping below can withstand the transmitted loads without risk of damage or rupture before the crane is set up

2. Under OSHA 1926.1402, a general contractor has verbally told a crane operator that the ground at the planned setup location is "solid — we've had equipment working there all week." What additional action must the operator take before proceeding with crane setup?

A. The operator must independently verify that the ground is adequate for crane operations — a verbal assurance from the general contractor does not constitute the documented ground condition assessment required before crane setup, and the operator must either obtain documentation or have a qualified person evaluate the specific setup area

B. Accept the general contractor's assurance since they are the controlling entity with site-wide knowledge

C. Reduce the planned lift load by 10% as a precaution when relying on a verbal ground confirmation

D. Request written confirmation from the general contractor that the ground is adequate and then proceed based on the written statement alone

3. A crane operator is setting up at a site where the surface shows signs of previous oil contamination — sheen on ponded water, oily soil texture, and a petroleum odor. The soil appears relatively stable. What is the specific concern that petroleum contamination creates for crane setup?

A. Petroleum contamination makes the soil legally classified as hazardous waste, which requires a separate OSHA work permit before crane operations begin

B. Petroleum odors create an inhalation hazard for crane operators and require respiratory protection before any crane setup activities

C. Petroleum contamination in soil can alter its bearing capacity — hydrocarbons reduce inter-particle friction in granular soils and can soften cohesive soils, potentially reducing bearing capacity below the visual appearance of the surface — the soil must be assessed by a qualified person before outrigger loading

D. Petroleum contamination only affects the soil's drainage characteristics and not its bearing capacity for concentrated static loads

4. A crane is being set up on a job site where the controlling entity has directed that all four outrigger positions are pre-approved locations shown on the site's lift plan. The site plan was developed by the project engineer two months ago. Since the plan was developed, significant trenching for underground mechanical systems has been completed in two of the four designated positions, and the trenches were backfilled with compacted sand. What must occur before the crane uses the two modified outrigger positions?

A. The site plan must be formally revised and re-approved by the project engineer before any outrigger is placed at the modified positions

B. The controlling entity must confirm in writing that the backfilled trench positions are still adequate for crane outrigger loading given the changed conditions since the plan was developed

C. The controlling entity or a qualified person must re-evaluate the ground conditions at the two modified positions to confirm adequacy — a pre-approval based on conditions that no longer exist does not cover the current post-trenching conditions

D. The operator may use the pre-approved positions as long as the backfill appears level and compacted by visual inspection

5. A crane is operating at a job site where a 115 kV transmission line runs along the property boundary. The nearest conductor is confirmed at 24 feet from the crane's maximum operating position. The operator has implemented an encroachment prevention plan with a dedicated spotter. Under OSHA Table A, what is the applicable MSAD for 115 kV, and does the 24-foot clearance satisfy it?

A. MSAD for 115 kV is 10 feet — 24 feet provides 14 feet of margin beyond the requirement

B. MSAD for 115 kV is 20 feet — 24 feet provides 4 feet of margin above the requirement

C. MSAD for 115 kV is 25 feet — 24 feet is less than the required 25 feet and the configuration does not satisfy the MSAD requirement

D. MSAD for lines from over 50 kV to 200 kV is 15 feet — 24 feet provides 9 feet of clearance above the requirement, and the encroachment prevention plan satisfies remaining requirements

6. An operator is setting up a crane on a job site and notices that the surface immediately adjacent to the planned rear outrigger position has been disturbed by recent excavation for a soil sample bore. The bore hole is approximately 4 inches in diameter and 12 feet deep, located 18 inches from the planned pad position. What concern does this bore hole create?

A. The bore hole creates a stress concentration point adjacent to the outrigger position — under outrigger loading, the soil may preferentially shear toward the bore hole void rather than distributing load uniformly, and the proximity of the void to the loaded area requires evaluation before setup proceeds

B. A 4-inch bore hole at 18 inches distance has no meaningful effect on the bearing capacity at the outrigger pad position

C. The bore hole indicates that a geotechnical investigation was recently performed and the soil has been assessed as adequate for the site's intended use

D. The bore hole creates a water infiltration path that may affect bearing capacity during rain events but is not a concern during dry weather operations

7. A crane is set up adjacent to a building whose basement extends 10 feet below grade and has an exterior wall that runs 4 feet from the nearest outrigger position. The basement wall is cast-in-place concrete, 12 inches thick. What geotechnical concern does this configuration create that must be evaluated before lifting begins?

A. The crane's magnetic components may interfere with the reinforcing steel in the basement wall

B. The basement wall creates a confined zone between the outrigger and the wall that concentrates bearing pressure

C. The outrigger load applied near the basement wall transfers stress into the soil that may act laterally against the wall — if the wall was not designed for this additional lateral earth pressure surcharge, wall distortion, cracking, or foundation failure may occur under crane outrigger loading

D. The 4-foot clearance between the outrigger and the wall is the standard minimum required by OSHA 1926.1402 for operations near below-grade structures

8. Under OSHA 1926.1411, a crane must travel between two setup locations on a construction site road. The travel route passes under a distribution power line at 25 feet of height. The crane's stowed boom configuration creates a maximum height of 17 feet. The power line is confirmed at 34.5 kV. The applicable MSAD for 34.5 kV is 10 feet. What is the clearance between the boom and the conductor, and does the route satisfy the MSAD requirement?

A. Clearance = 8 feet — inadequate for the 10-foot MSAD requirement; the route cannot be used

B. Clearance = 8 feet — below the required 10-foot MSAD; the crane must de-energize the line or find an alternate route

C. Clearance = 8 feet — within the acceptable tolerance for travel operations since dynamic conditions are brief

D. Clearance = 8 feet — the route fails the 10-foot MSAD requirement; options are de-energizing the line, finding an alternate travel route, or requesting the utility to temporarily raise the conductor height

9. A crane operator is performing a pre-setup site assessment and observes that the planned setup area is covered with a layer of freshly placed crushed stone approximately 6 inches thick. Beneath the crushed stone, the operator can see that the underlying surface is saturated soil with standing water visible in low spots. What concern does the saturated soil condition create despite the crushed stone overlay?

A. The crushed stone provides a stable working surface and the saturated soil below has no effect on crane outrigger support once the stone is in place

B. The standing water in the saturated soil creates a slip hazard for personnel during setup but does not affect outrigger support

C. The crushed stone overlay is less than 8 inches and must be supplemented with additional stone to achieve the minimum thickness for crane operations

D. The 6-inch crushed stone layer can distribute the outrigger load laterally, but the saturated soil beneath retains its low bearing capacity — the outrigger forces must ultimately be transferred through the stone to the saturated soil, which may not have adequate capacity regardless of the stone overlay

10. What is the specific term for the condition where soil loses its bearing capacity and flows laterally under a concentrated load, and what soil types are most susceptible to this type of failure?

A. Soil liquefaction — most commonly occurs in loose, saturated sand and silt deposits when subjected to dynamic loading — the pore water pressure exceeds the effective stress and the soil temporarily behaves as a liquid

B. Plastic flow — occurs primarily in dense, dry granular soils when subjected to loads above the elastic limit

C. Consolidation settlement — affects primarily stiff clay soils when subjected to long-term static loading above the preconsolidation pressure

D. Bearing capacity failure by shear — can occur in any soil but most commonly manifests as sudden failure in soft cohesive soils where the undrained shear strength is exceeded under concentrated point loads

11. A crane is set up on a site where the soil has a documented bearing capacity of 3,500 psf. The maximum outrigger load is 78,000 lbs. The operator has 4-foot × 4-foot timber cribbing mats. How many additional 4-foot × 4-foot mats must be placed to keep the bearing pressure at or below the soil's rated capacity?

A. One mat (16 sq ft) is sufficient — 78,000 ÷ 16 = 4,875 psf; this exceeds capacity; two mats = 32 sq ft; 78,000 ÷ 32 = 2,438 psf; within capacity — two total mats, one additional

B. One single mat of 4 ft × 4 ft is insufficient; two mats are needed

C. One mat (4 ft × 4 ft = 16 sq ft) produces 78,000 ÷ 16 = 4,875 psf — exceeding capacity. Two mats (32 sq ft) produce 78,000 ÷ 32 = 2,438 psf — within capacity. Therefore one additional mat is required for a minimum of two total mats at that position

D. Three mats of 4 ft × 4 ft each (48 sq ft) are required to achieve a bearing pressure of 1,625 psf, providing a 2:1 safety factor above the minimum requirement

12. Under OSHA 1926.1402, what specific information must the controlling entity provide to the crane employer before crane operations begin at a construction site?

A. The daily weather forecast including predicted wind speeds for the duration of crane operations

B. Information about known underground utilities, overhead power lines, site hazards, and ground conditions that could affect crane operations — this information must be provided to allow the crane employer and operator to identify and control hazards before operations begin

C. A written certification that all subsurface utilities have been located and marked within the previous 30 days

D. The contact information for the utility operators for all lines within 100 feet of the planned crane setup area

13. A crane operator observes that the outrigger pad at the left rear position has sunk 1.5 inches during a lift at 84% of rated capacity. The crane is still within level tolerance. What does this progressive sinking indicate and what action is required?

A. A 1.5-inch settlement is within normal consolidation range for most soil types and no action is needed

B. The settlement indicates the cribbing is compressing under load — add additional cribbing layers and continue

C. The settlement may indicate creep in the outrigger jack seal — check for hydraulic fluid leakage before continuing

D. Progressive sinking during a lift indicates the soil bearing capacity at that position is being exceeded — the load must be lowered to the ground immediately and the ground condition at the settling position evaluated before any further lifting

14. A crane operator is preparing to set up on a site where the general contractor indicates that the ground has been prepared with "engineered fill." What specific information must the operator obtain about the engineered fill before using it for crane outrigger support?

A. The compaction specification, the fill material type and gradation, the lift thickness during placement, and the documented compaction test results at or near the planned outrigger positions — engineered fill's bearing capacity depends entirely on how it was placed and compacted, and these details are necessary to confirm it can support the crane

B. The date the fill was placed and the name of the contractor who installed it

C. The depth of the fill layer and whether it was placed in a single lift or multiple lifts

D. The origin and source pit location of the fill material to confirm it is not recycled industrial waste

15. A crane operator is asked to set up at a location where a previous operator reported a "soft spot" in the ground near one of the outrigger positions six months ago. There is no documentation of any remediation of the reported soft spot. What must happen before the current operator sets up at this location?

A. If the operator does not personally observe any soft spot during the current visit, the previous report is considered stale and no action is needed

B. The general contractor must confirm that the soft spot has been remediated before the operator may set up

C. The current ground conditions at the reported soft spot location must be evaluated by a qualified person before any crane setup proceeds — a previously reported soft spot that has no documented remediation may still represent a bearing capacity deficiency regardless of current visual appearance

D. The operator must perform a test pick at 50% capacity near the reported soft spot location to verify current ground stability

OPERATIONS DOMAIN — Questions 16–30

16. A crane operator is performing a lift at 91% of rated capacity. During the swing to the set position, the signal person gives a MOVE SLOWLY signal. The operator is mid-swing and cannot slow the swing rate due to the crane's hydraulic system minimum swing speed at this load. What must the operator do?

A. Continue the swing at the current speed since the minimum speed is a physical limitation of the crane's hydraulic system

B. Stop the swing immediately and hold the load in position — if the crane cannot achieve the slow swing speed commanded by the signal person at this configuration, the operator must stop the movement and discuss an alternative approach with the lift director before proceeding

C. Sound the horn to warn personnel and complete the swing at the current speed

D. Boom down to decrease the load moment, which will allow a slower swing speed at the reduced radius

17. Under OSHA 1926.1431, what is the minimum number of wraps of rope that must remain on the hoist drum when a personnel platform is at its lowest designed position?

A. Two wraps minimum — same as the standard material hoisting requirement under ASME B30.5

B. Three wraps minimum — personnel hoisting requires one additional wrap above the standard material hoisting requirement

C. Five wraps minimum — personnel hoisting requires significantly greater drum retention than material hoisting

D. The requirements for personnel hoisting do not change the drum wrap minimum from the standard ASME B30.5 requirement, but the load line must meet the 7:1 design factor for the full range of travel including the lowest platform position

18. A crane operator is performing a pick-and-carry operation when the LMI alarms at 85% of the pick-and-carry rated capacity. The operator is mid-travel, 10 feet from the set location. What is the correct action?

A. Stop the travel immediately and lower the load to the ground — the pick-and-carry LMI alarm indicates the actual conditions during travel may differ from the rated static pick-and-carry condition, and the load must be set down before the cause of the alarm is understood

B. Continue to the set location since only 10 feet remains in the travel path and the LMI alarm is advisory

C. Reduce travel speed to minimum and complete the remaining 10 feet of travel at creep speed

D. Sound the horn and continue at the current travel speed since the LMI reading is below 100%

19. An operator receives a DO NOT OPERATE signal — the operator sees someone standing at the crane's controls area with both hands placed on top of their hard hat. What must the operator do upon receiving this signal?

A. Contact the lift director by radio to confirm the signal before stopping

B. Slow all crane movements to minimum speed and await clarification

C. Stop all crane movement immediately — the DO NOT OPERATE signal requires cessation of all crane movement as soon as it is received, without delay or confirmation from another party

D. Acknowledge the signal with one horn blast and then continue the current movement to its completion

20. A crane is performing a critical lift at 88% of rated capacity. The signal person gives the correct signals and the lift proceeds normally. After the load is set and rigging disconnected, the operator asks the signal person to confirm the load weight for the shift's documentation. The signal person reports the load weight as 5,000 lbs more than the documented pre-lift weight used for capacity calculations. What must the operator do?

A. Accept the signal person's post-lift weight confirmation and update the lift documentation

B. Stop operations and initiate a post-incident investigation — if the actual load was 5,000 lbs heavier than planned, the crane may have performed a lift above its rated capacity and a post-incident inspection is required before any further lifts

C. The signal person's weight report is informal — continue operations and verify the load weight at the next opportunity

D. Contact the load's owner to obtain certified weight documentation before deciding whether a post-incident inspection is needed

21. A crane is performing a lift in an area where multiple signal persons are present for different aspects of a complex lift sequence. At one point, two different signal persons simultaneously give conflicting signals — one giving HOIST and the other giving LOWER. What must the operator do?

A. Follow the HOIST command since hoisting is generally safer than lowering when the crane is at near-capacity

B. Follow the signal from the signal person who was designated as the primary for this phase of the lift

C. Execute neither signal — stop all crane movement when conflicting signals are received from different persons and wait for a single unambiguous signal from the designated signal person before resuming

D. Stop all crane movement, sound the emergency horn, and wait for the lift director to clarify which signal was correct before making any movement

22. Under OSHA 1926.1416, when a crane operator discovers during operations that a safety device has become non-functional — such as the anti-two-block system failing mid-shift — what is required?

A. The operator must stop operations and report the safety device failure to the employer — operations using the affected function must not resume until the device is repaired and confirmed functional, since safety devices required by the standard cannot be bypassed or operated around

B. The operator may continue with manual monitoring as a substitute for the failed safety device for the remainder of the shift

C. A reduced capacity limit of 75% must be implemented when the ATB is non-functional during operations

D. The operator must notify the lift director, who may authorize continued operations with an additional spotter monitoring hook height as a substitute for the ATB

23. A crane is performing a lift when the wind speed increases to 22 mph. The crane's general wind speed limit is 25 mph. The load being lifted is a large architectural glass panel measuring 8 feet by 12 feet. What is the specific consideration that makes this lift potentially unsafe at 22 mph even though it is within the general limit?

A. Wind speeds above 20 mph automatically trigger OSHA's enhanced monitoring requirements for all crane lifts regardless of load type

B. The 25 mph general limit was established for the crane's structural response to wind — not for the lateral force on a large flat load like a glass panel; at 22 mph, the wind force on 96 square feet of glass can create lateral loading far beyond what the crane's general limit was designed to address, potentially creating overload conditions or loss of load control

C. Glass panels are classified as fragile loads and require a 50% capacity reduction at any wind speed above 15 mph

D. The glass panel's weight is insufficient to resist wind-induced drift — a minimum load weight of 5,000 lbs is required for lifts in wind above 20 mph

24. A crane operator is asked to perform a lift where the load must be lowered into a confined space — a tank opening only 6 feet in diameter. The load is a pump assembly that is 5 feet 8 inches in diameter. The crane must precisely lower the pump through the opening without contact. What operational requirement does this tight-clearance lowering create?

A. The pump must be guided manually by workers positioned inside the tank during the lowering operation

B. The operator must confirm plumb load line above the tank opening before beginning the descent, use minimum controlled hoist speed throughout the entry, and ensure tag lines are managing any rotation — even minor pendulum motion during descent could cause the pump to contact the tank wall and potentially drop the load

C. A rigger must physically hold the pump centered over the opening while the crane lowers it through at standard speed

D. The operator should increase hoist speed during the final 2 feet of travel to minimize the time the load is in the confined clearance zone

25. Under ASME B30.5, what is the operator's responsibility regarding the crane's rated capacity when the crane is being used on a slope that places the machine partially out of level?

A. The operator may use the load chart values with no adjustment as long as the level indicator reads within 2% of grade

B. The operator must notify the lift director of any out-of-level condition before beginning operations

C. The load chart values apply only when the crane is level within the manufacturer's specified tolerance — operating out of level tolerance means the crane is no longer in the configuration the load chart was derived for, and the rated capacity values from the chart no longer apply

D. Out-of-level conditions up to 3% are automatically compensated by the LMI's tilt sensor and no operator action is required

26. A crane operator is completing a shift turnover with the relief operator. During the turnover, the incoming operator asks about the load line's condition. The outgoing operator reports that the load line showed some unusual kinking near the boom tip sheave during the second-to-last lift but appeared to resolve when the load was lowered. What must happen before the incoming operator begins operations?

A. The incoming operator should verify the LMI is reading normally before beginning operations — if the LMI reads normally, the rope condition is acceptable

B. The incoming operator can begin operations and watch for the kinking to recur — if it does, stop and investigate

C. This verbal report of a potential rope defect constitutes a known deficiency that must be evaluated before the next shift begins — the incoming operator must inspect the load line specifically in the area near the boom tip sheave before any lift is performed

D. The outgoing operator's subjective assessment that the kinking resolved is sufficient documentation — the incoming operator may proceed with a standard pre-shift inspection

27. A crane's hydraulic swing drive produces a loud grinding sound when the swing is initiated in one direction but operates silently in the reverse direction. The crane has been in service for 9 months without this symptom until today. What does the directional grinding indicate and what must be done?

A. The directional grinding is caused by uneven wear on the swing gear and is a normal aging characteristic that requires only increased lubrication frequency

B. The directional grinding is likely caused by debris or a foreign object in the swing gear — the object must be removed before operations continue

C. Directional grinding in the swing drive indicates asymmetric mechanical damage — a broken gear tooth, a bearing failure, or a pinion engagement problem that only loads the damaged component in one swing direction — the crane must be removed from service for inspection and repair before any lifting operations

D. The directional grinding may be addressed by applying extra load on the swing motor in the grinding direction to break in the stiff gear — perform 10 full swings in the grinding direction to clear the symptom

28. A crane is performing a tandem lift with two cranes. The lift plan specifies that Crane A carries 55% and Crane B carries 45% of the total load. During the initial pick, both cranes hoist to taut line simultaneously. The lift director observes that Crane A's load indicator shows 62% and Crane B shows 38% — a deviation from the planned distribution. What is the required response?

A. Proceed since both cranes are individually within their rated capacities and the total load distribution sums to 100%

B. Lower both cranes back to the ground and revise the rigging to correct the load distribution before reattempting the pick

C. The lift director may verbally authorize the 62/38 distribution if both cranes confirm they are within their rated capacities at the revised distribution

D. Both crane operators must stop all movement simultaneously — the load distribution deviation indicates the actual center of gravity is not in the planned position, and the lift must return to the ground for rigging reassessment

29. Under OSHA 1926.1430, which of the following employees must receive training before being allowed to work in an area where crane operations are occurring?

A. Only employees whose job duties involve direct contact with the crane or rigging require crane safety training

B. Only NCCCO-certified personnel are authorized to work in areas where cranes are actively operating

C. All lift team members including the signal person, riggers, and operator require training, but uninvolved workers in the general vicinity do not

D. Any employee who uses the crane, works in the area where it is used, or is assigned tasks related to its use must receive training before being exposed to crane-related hazards — the training requirement is broad and applies to all affected workers

30. An operator is about to perform a critical lift. The pre-lift briefing has been conducted and all personnel are in position. Just before the lift, the operator notices the crane's level indicator shows the machine has moved 0.3% in the lateral direction since it was leveled during setup — it was level at 0.0% when setup was completed one hour ago. The manufacturer's tolerance is 0.5%. What should the operator do?

A. Proceed with the lift since 0.3% is well within the 0.5% tolerance and the change is minor

B. Stop the pre-lift preparation, re-level the crane to within tolerance, and investigate whether the level change indicates progressive settlement before proceeding with the critical lift — any unexplained level change between setup and lift initiation warrants investigation even if within tolerance

C. Continue with the lift and monitor the level indicator during the lift — stop if the reading reaches 0.5%

D. Notify the lift director of the reading and proceed with the lift if the lift director confirms in writing that 0.3% is acceptable for this critical lift

TECHNICAL KNOWLEDGE DOMAIN — Questions 31–42

31. A crane's wire rope is being replaced. The manufacturer specifies 6×36 EIPS IWRC right regular lay rope in 1-inch diameter. The rigging supplier offers an equivalent-diameter rope in 6×36 EIPS IWRC right lang lay construction. Can this rope be substituted without manufacturer approval?

A. Yes — lang lay and regular lay ropes of the same diameter and grade have identical rated breaking strengths and are interchangeable

B. No — the difference in lay direction affects how the rope sits in sheave grooves and interacts with the drum, and the manufacturer's specific lay direction requirement must be followed — substituting lang lay for regular lay without manufacturer approval violates the load chart's rope specification

C. Lang lay rope may be substituted if the sheave grooves are confirmed to be in good condition

D. Yes — ASME B30.5 allows operators to select the lay direction that produces the smoothest operation on their specific crane

32. A crane has just completed a difficult lift involving significant dynamic loading from wind and load oscillation. Immediately after the lift, the inspector notices that one of the outrigger pads has cracked through its center — the crack runs along the pad's longer dimension. What is the significance of this finding?

A. Pad cracking is normal under dynamic loading and the pad may continue in service at reduced load

B. A cracked outrigger pad must be taken out of service — the pad's structural integrity is compromised, and it may fail unpredictably under subsequent loading, causing sudden loss of outrigger support — the pad must be replaced before the crane is used for any further lift

C. The pad may continue in service if the crack is reinforced with steel strapping before the next lift

D. The cracked pad indicates the outrigger load exceeded the pad's capacity rating — the pad may be used at 50% of its original load rating while a replacement is sourced

33. Under ASME B30.9, a rigger discovers that a synthetic round sling has a cut through approximately 40% of the sling's circumference at a point where the outer cover has been compromised. The inner core fibers are visible at the cut. What action is required?

A. The sling may continue in service at 60% of its rated capacity to account for the 40% damage

B. The cut must be examined by a qualified rigging inspector before a removal decision is made

C. The damaged area may be repaired with a manufacturer-approved sleeve before returning to service

D. The sling must be removed from service immediately — any cut through the outer cover that exposes the core fibers is a removal condition under ASME B30.9, as the core fibers' integrity cannot be confirmed by visual inspection alone

34. A mobile crane's boom hoist rope — the rope that raises and lowers the boom — is found during annual inspection to have a section with reduced diameter measuring 0.052 inches below the nominal diameter of the rope. The ASME B30.5 removal criterion for boom hoist ropes is the same as for running ropes. What is the required action?

A. The rope must be removed from service immediately — the 0.052-inch diameter reduction exceeds the ASME B30.5 removal criterion of 3/64 inch (0.047 inches) for wire rope, making this rope non-compliant regardless of the absence of other defects

B. Monitor the rope at the next monthly inspection and remove if the diameter reduction exceeds 1/16 inch

C. The boom hoist rope is held under lower tension than the load line and the removal criterion does not apply to it

D. Remove the rope only if the section with reduced diameter is within 6 feet of either end of the rope

35. A rigger is preparing to use a wire rope sling in a basket hitch at 60 degrees from horizontal. The sling's vertical hitch WLL is 16,000 lbs. Using the sling angle factor, what is the maximum load that may be lifted in this configuration?

A. 27,700 lbs — applying the basket hitch doubling factor without considering the angle derating

B. 32,000 lbs — the basket hitch doubles capacity regardless of sling angle

C. 27,712 lbs — applying the basket doubling ($2 \times 16,000 = 32,000$ lbs) then applying the 60-degree sling angle efficiency factor ($\sin 60° = 0.866$): $32,000 \times 0.866 = 27,712$ lbs

D. 18,480 lbs — applying a conservative 60-degree angle derating to the single-leg capacity before the basket factor

36. A crane operator is performing an inspection of the crane's hydraulic cylinders as part of the monthly periodic inspection. One cylinder on the main boom has a light surface rust on the rod in the area that is normally retracted inside the cylinder body. What does rust on the retracted portion of the rod indicate and what is the concern?

A. Surface rust on the retracted portion of the rod is cosmetic and does not affect cylinder performance since this area is not exposed during normal operations

B. Rust on the normally retracted portion of the rod indicates the cylinder has been fully extended beyond its normal working range at some point, exposing the normally protected rod surface to the elements — this may indicate the cylinder was operated beyond its intended stroke, and the rod surface condition and cylinder components must be evaluated for corrosion-related damage

C. The rust is caused by condensation inside the cylinder body and indicates the hydraulic fluid is contaminated with water

D. A light surface rust on any cylinder rod requires immediate cylinder replacement before the next lift

37. A crane inspector finds that three consecutive links in a chain sling show elongation of 2.5%, 2.8%, and 2.4% respectively. ASME B30.9 specifies removal when any single link exceeds 3% elongation. What action is required?

A. No action is required since none of the individual links has reached the 3% removal criterion

B. The sling may remain in service with increased inspection frequency since the elongation values are trending toward the removal criterion

C. Monitor the sling closely and remove at the next scheduled inspection if any link reaches 3%

D. Although no single link has reached the 3% criterion, the pattern of multiple consecutive links showing near-threshold elongation indicates the sling has been subjected to an overload event that has plastically deformed multiple links — the sling should be removed from service for evaluation of the complete chain's condition and history

38. Under ASME B30.26, what specific requirement applies to eyebolts that are used in angular (non-vertical) loading applications?

A. Only shouldered eyebolts may be used for angular loading — non-shouldered eyebolts must be loaded strictly in line with the axis of the bolt shank; shouldered eyebolts may be used for angular loading with a documented capacity derating factor applied for angles off the bolt's axis

B. All eyebolts are rated for angular loading up to 45 degrees without derating

C. Eyebolts must be oriented perpendicular to the loading direction for angular applications

D. Non-shouldered eyebolts may be used for angular loading if the angle does not exceed 30 degrees from the bolt axis

39. A crane is operating in temperatures that have dropped to 5°F (-15°C) overnight. The operator arrives and prepares to begin the first lift. What specific concern does this extreme cold temperature create for structural steel components of the crane?

A. Cold temperatures cause thermal expansion of structural steel that may bind telescoping boom sections and prevent smooth extension

B. The cold temperature has no structural concern for high-quality crane steel manufactured to ASTM standards

C. At temperatures approaching or below 0°F, high-strength steel transitions toward brittle behavior — the ductile-to-brittle transition temperature for crane boom steel means that existing micro-cracks or surface notches may propagate catastrophically under loads that would not cause failure at normal temperatures, making pre-shift structural inspection more critical at extreme cold temperatures

D. Cold temperatures increase the yield strength of structural steel and actually improve the crane's rated capacity at extreme temperatures

40. A crane's hoist drum is being inspected during the annual comprehensive inspection. The inspector finds that the drum's rope grooves have worn to the point where the groove depth equals 1.5 times the wire rope diameter. The original groove depth was 0.5 times the rope diameter. What is the concern with this level of groove wear?

A. Deep grooves provide better rope retention and the worn grooves are actually an improvement over the original profile

B. When the groove depth increases beyond the designed profile, the rope sinks too deeply into the groove and the groove walls press against the sides of the rope rather than supporting it from below — this creates side-crushing forces on the rope and prevents proper drum-to-rope fleet angle management, causing accelerated rope wear and potential rope damage during spooling

C. The worn grooves are acceptable as long as the rope's nominal diameter is within 5% of the groove depth

D. Groove wear affects only the drum's service life and not the rope's condition — the grooves may continue in service until the drum material is worn through

41. A crane's load block is being inspected. The swivel at the top of the block — which allows the block to rotate on the hook — shows significant corrosion in the ball race area. The swivel turns but with noticeably higher resistance than normal, and makes grinding sounds when rotated. What action is required?

A. Apply grease to the swivel and monitor for improvement during the next shift before deciding on removal

B. The stiff swivel requires replacement — a swivel that does not rotate freely under its design load may not rotate at all under load, preventing load rotation relief and potentially transmitting torsional forces into the load line that accelerate rope twist and fatigue

C. The stiff swivel may remain in service as long as the grinding sound does not worsen during operations

D. A qualified inspector must quantify the swivel's rotational torque before a replacement decision can be made

42. Under ASME B30.5, what must an operator do when a crane is to be taken out of service for a known deficiency that cannot be immediately repaired on site?

A. The operator may continue to use the crane for lifts that do not involve the deficient component until the repair can be scheduled

B. The crane must be tagged out of service with a visible warning tag that identifies the deficiency and prohibits operation — the crane must not be operated for any purpose until the deficiency is corrected, regardless of whether the specific lift would use the deficient component

C. The deficiency must be documented in the maintenance log and the lift director must authorize operations to continue at reduced capacity until repair is possible

D. The owner must notify OSHA within 24 hours of identifying a deficiency that prevents crane operation

MANUFACTURER LOAD CHARTS DOMAIN — Questions 43–65

43. A telescopic boom crane load chart section header reads: "ON OUTRIGGERS — FULL EXTENSION (24 FT SPREAD) — ALL DIRECTIONS — MAXIMUM COUNTERWEIGHT 26,000 LBS — BOOM 60–140 FT." The planned lift requires a 150-foot boom. What must the operator do?

A. Use the 140-foot boom capacity values and interpolate to estimate the 150-foot configuration capacity

B. Boom length columns beyond 140 feet in this section can be accessed by using the trend from the 120 and 140-foot columns

C. The operator must locate a different chart section that specifically covers the 150-foot boom configuration — the stated boom range of 60–140 feet means the 150-foot boom is outside the section's applicable range and those values cannot be used

D. The section applies to all boom lengths within 20% of the stated range — 150 feet is within 20% of 140 feet and the section applies

44. A crane's load chart shows the following in the 100-foot boom full outrigger section: 30 ft = 34,600 lbs; 35 ft = 27,200 lbs; 40 ft = 21,400 lbs. The planned operating radius is 33 feet. Using the conservative approach, what capacity governs?

A. Conservative capacity = 34,600 lbs at 30 feet since 33 feet is between the 30 and 35-foot entries

B. Conservative capacity = 27,200 lbs at 35 feet — using the capacity at the next larger tabulated radius as the conservative bounding value

C. Interpolated capacity at 33 feet = 30,160 lbs — this is the most accurate value and is used for all capacity planning

D. The operator should contact the manufacturer for the capacity at 33 feet since it is not directly tabulated

45. A crane's load chart contains the following note in the on-outrigger full extension section: "Rated capacities assume use of EIPS wire rope. When using EEIPS wire rope of the same diameter, no change in rated capacity applies." A crane operator has switched from EIPS to EEIPS rope of the same diameter. How does this affect the available capacity?

A. The EEIPS rope's higher breaking strength increases the crane's rated capacity by the percentage difference between EIPS and EEIPS breaking strengths

B. Using EEIPS rope reduces the rated capacity by 10% since the stiffer rope reduces reeving efficiency

C. The rated capacity values in the section remain unchanged when using EEIPS rope of the same diameter — the note explicitly states that no capacity change applies for this substitution

D. The operator must obtain an updated load chart from the manufacturer after switching rope grades before any lifting operations

46. A crane load chart shows a capacity of 22,600 lbs at 45 feet of radius for the 100-foot boom at full outrigger extension. An asterisk on this value refers to a note that reads: "This capacity is structure-limited. Side loading prohibited. Dynamic loading must be minimized." A rigger has attached one tag line to the load and the tag line is held taut at an angle, creating a small lateral component at the hook. What concern does this create for this specific lift?

A. Tag lines at any angle are standard rigging practice and do not constitute side loading of the crane's boom

B. The crane may be used with tag lines when their tension does not exceed 5% of the hook load in the lateral direction

C. The note explicitly prohibits side loading for this capacity value — any lateral force applied to the load through a taut angled tag line constitutes a side load that violates the note's restriction and means this capacity value cannot be used under these rigging conditions

D. The tag line creates no concern as long as the rigger maintains the tag line at less than 30 degrees from vertical

47. A crane is operating with the following confirmed configuration: 80-foot boom, full outrigger extension, heavy counterweight 22,000 lbs. The load chart shows two notes about the heavy counterweight section: Note 1 — "Minimum 80-ft boom required when using heavy counterweight." Note 2 — "When operating with heavy counterweight and no suspended load, boom must not be raised above 75 degrees." The current boom angle is 65 degrees with no load attached. The operator wants to raise the boom to 80 degrees to position for the next pick. What must the operator do before booming up?

A. Proceed — the operator is raising from 65 degrees to 80 degrees and Note 2 does not apply until the boom exceeds 75 degrees during the raising movement

B. Lower the heavy counterweight to standard counterweight before booming up to 80 degrees to avoid violating Note 2

C. Contact the lift director to request written authorization to exceed the 75-degree unloaded boom angle restriction

D. Note 2 prohibits raising the boom above 75 degrees with heavy counterweight and no suspended load — the operator must first attach a load of sufficient weight to counterbalance the heavy counterweight before booming above 75 degrees, or the counterweight must be reduced before the boom is raised above 75 degrees

48. A crane is configured with a 120-foot boom. The load chart for full outrigger extension shows: 35 ft = 22,800 lbs; 40 ft = 17,600 lbs. The planned operating radius is 37 feet. Total suspended weight is 19,200 lbs. After interpolation, does the lift proceed using the conservative approach?

A. Interpolated capacity at 37 ft = 20,480 lbs; conservative capacity = 17,600 lbs at 40 ft; total suspended weight (19,200 lbs) exceeds conservative capacity — lift does not proceed

B. Conservative capacity = 17,600 lbs at 40 ft; total suspended weight (19,200 lbs) exceeds 17,600 lbs; the lift cannot proceed without reducing the load or reconfiguring the crane

C. Interpolated capacity at 37 ft = 20,480 lbs; the interpolated value confirms the 19,200 lb load is within capacity and the lift proceeds

D. The 35-foot capacity (22,800 lbs) governs conservatively since 37 feet is closer to 35 feet than to 40 feet; 19,200 lbs is within 22,800 lbs and the lift proceeds

49. A load chart note reads: "Operating with outrigger extension between rated configurations is not permitted. Extend outriggers to a fully rated position before using any capacity values." One of the crane's outrigger beams is at 78% of full extension due to a site constraint — it cannot reach the 100% position. The 50% rated section is the nearest lower configuration. What chart section must be used?

A. The 50% extension section must be used since it is the most restrictive rated configuration that bounds the actual 78% extension

B. Interpolate between 50% and full extension sections to estimate the 78% extension capacity

C. No rated configuration applies — the operator must contact the manufacturer for authorization to operate at 78% extension, as the note explicitly prohibits intermediate extensions without using a rated configuration

D. The full extension section applies since 78% is closer to full extension than to 50% extension

50. A crane load chart for a telescopic boom crane shows that in the on-outrigger section at full extension, the capacity at 20 feet of radius with an 80-foot boom is 62,000 lbs. All cells at radii shorter than 20 feet are blank. A lift is planned at 15 feet of radius. What does the absence of capacity values at radii shorter than 20 feet indicate?

A. The crane has unlimited capacity at radii shorter than 20 feet and no load chart entry is needed

B. The blank cells at radii shorter than 20 feet indicate that the crane's capacity is not rated at those configurations — the manufacturer has not published capacity values for very short radii because structural loading at steep boom angles is complex and requires individual engineering analysis — the manufacturer must be consulted for capacity at 15 feet

C. The 20-foot capacity of 62,000 lbs applies conservatively to all radii shorter than 20 feet since shorter radii always have higher capacity

D. Extrapolate the capacity at 15 feet by applying the rate of increase from the 20-to-25-foot trend in the reverse direction

51. A crane is configured with a 100-foot main boom and a 35-foot fixed jib at 15-degree offset. The load chart jib section shows 8,200 lbs at 45 feet of radius and 6,400 lbs at 50 feet. The actual operating radius is 48 feet. The jib head block weighs 350 lbs and rigging weighs 420 lbs. The payload weighs 5,600 lbs. Using the conservative approach, is this lift within the jib section's gross capacity?

A. The gross capacity at the 45-foot tabulated value is 8,200 lbs; total suspended weight = 5,600 + 350 + 420 = 6,370 lbs; within the 8,200-lb capacity — lift proceeds

B. The lift does not proceed — conservative capacity = 6,400 lbs at 50 ft; total suspended weight (6,370 lbs) is within the 6,400-lb conservative capacity, but the 30-lb margin is negligible and the operator should reduce the load slightly before proceeding

C. Conservative capacity at the next larger tabulated radius (50 ft) = 6,400 lbs; total suspended weight = 5,600 + 350 + 420 = 6,370 lbs; 6,370 lbs is within the 6,400-lb conservative capacity — but the 30-lb margin requires careful radius management

D. The operator should interpolate to get a more accurate capacity at 48 feet, which produces approximately 7,360 lbs, well above the 6,370-lb suspended weight

52. A crane operator is reviewing a load chart section that shows the capacity for "TELESCOPIC BOOM — ON OUTRIGGERS — FULL EXTENSION — 50% COUNTERWEIGHT — ALL DIRECTIONS." The crane currently has 100% (full) counterweight installed. Which chart section should be used?

A. The 50% counterweight section may be used since it provides a conservative underestimate of the crane's actual capacity with full counterweight

B. The section that matches the actual installed counterweight configuration must be used — using the 50% counterweight section when full counterweight is installed means applying capacity values derived from a less stable configuration to a crane that actually has greater stability, which could understate available capacity but does not create an overload risk

C. The crane must reduce its counterweight to exactly 50% before using this section's capacity values

D. The full counterweight section should be used since it represents the crane's actual configuration — using the wrong section, even conservatively, constitutes incorrect load chart application and the correct matching section must be used

53. A crane load chart note reads: "When wind speed exceeds 15 mph, apply the following derating factors to all capacities in this section: 15–20 mph: multiply by 0.95; 20–25 mph: multiply by 0.90; above 25 mph: do not operate." Wind speed on site is measured at 19 mph. The base capacity at the planned configuration and radius is 28,400 lbs. What is the applicable derated capacity?

A. 26,980 lbs — applying the 0.95 derating factor for the 15–20 mph wind speed range (28,400 × 0.95)

B. 28,400 lbs — since 19 mph is below 20 mph, the 0.95 factor applies only above 20 mph

C. 25,560 lbs — applying the 0.90 factor since 19 mph is in the 15–25 mph range

D. 27,008 lbs — applying a 4.9% derating for 19 mph based on proportional interpolation between the two factors

54. A crane is operating at 35 feet of radius. The gross capacity shown in the load chart is 32,800 lbs. The operator performs the lift and the LMI reads 87% capacity. The planned total suspended weight was 26,000 lbs, which should produce a lift percentage of 79.3%. The actual LMI reading of 87% represents approximately 28,536 lbs of load. What is the most likely explanation for the 2,536-lb discrepancy?

A. The actual total suspended weight is approximately 2,536 lbs greater than planned — either the load is heavier than documented, some rigging component weight was omitted from the deduction calculation, or the actual operating radius is slightly greater than the planned 35 feet, all of which would increase the LMI reading above the planned percentage

B. The LMI is reading incorrectly — a 7.7% discrepancy is outside the LMI's permitted accuracy tolerance and the instrument must be recalibrated

C. The discrepancy is caused by hydraulic pressure fluctuation during the pick that temporarily elevated the LMI reading

D. The 87% reading confirms the actual load is within rated capacity and no investigation is needed

55. A telescopic boom crane load chart shows the following structure-limited capacities (shaded cells) at short radii for the 100-foot boom: 15 ft = 76,400 lbs; 20 ft = 62,200 lbs; 25 ft = 48,800 lbs. These values represent the boom's maximum structural capacity. An operator is planning a critical lift at 20 feet with a total suspended weight of 60,000 lbs. The lift is at 96.5% of the structure-limited capacity. What operational consideration does the structure-limited designation create for this lift?

A. Structure-limited capacity cells can never be used for critical lifts — a separate engineering assessment must be obtained before any lift above 75% at a structure-limited cell

B. Structure-limited lifts follow the same operational rules as stability-limited lifts — no additional precautions are required

C. At 96.5% of a structure-limited capacity, the boom structural members are near their design stress limits — any dynamic loading from sudden starts, stops, or swing acceleration adds to the static structural stress and could exceed the design capacity; the operator must use exceptionally smooth crane movements and avoid any sudden loading changes throughout this lift

D. The structure-limited designation means the lift automatically qualifies for the over-100% lift provision in ASME B30.5 since structural limits include inherent safety factors

56. A crane is configured with a 100-foot boom and is operating at 45 feet of radius. The load chart section header specifies: "ON OUTRIGGERS — FULL EXTENSION — 360-DEGREE ROTATION — STANDARD COUNTERWEIGHT." During the lift, the operator is directed to rotate the load 270 degrees to reach the set location. The crane passes through sectors that include the crane's front, left side, rear, and right side. Does the 360-degree section apply throughout this rotation?

A. No — the 360-degree section only applies for single-direction lifts; a 270-degree rotation requires a special multi-sector plan

B. Yes — the 360-degree section was specifically developed to provide uniform capacity values that apply at all boom orientations throughout a full rotation, making it the appropriate section for any lift that requires the boom to pass through multiple angular positions

C. The 360-degree section applies only if the operator stays within each sector for less than 90 degrees of rotation

D. No — a 270-degree rotation requires that the capacity be re-confirmed at each 45-degree interval during the swing

57. A crane load chart for a telescopic boom crane shows: at 100-foot boom, 40 feet radius — 24,200 lbs; at 100-foot boom, 45 feet radius — blank. There is no other data for the 100-foot boom beyond 40 feet. A planned lift at 42 feet would require capacity data between the last tabulated value and the blank. What is the maximum rated operating radius for the 100-foot boom at this configuration?

A. 42 feet — the last available capacity point can be extrapolated 2 feet beyond the 40-foot entry

B. 44 feet — within 10% of the last tabulated radius

C. 43 feet — within the "near-maximum" zone that allows conservative use of the 40-foot capacity

D. 40 feet — the blank at 45 feet defines the end of the rated envelope; no capacity exists beyond 40 feet for this configuration and the planned 42-foot lift cannot proceed

58. A crane's load chart for the on-rubber section shows a note: "On-rubber capacities are valid only when ground bearing pressure under each tire does not exceed 85 psi." The crane's tire contact patch area is approximately 200 square inches per tire. The crane's gross weight with standard counterweight is 104,000 lbs. With four tires, each tire supports 26,000 lbs. What is the actual ground bearing pressure under each tire, and does it satisfy the note's requirement?

A. Ground bearing pressure per tire = 26,000 ÷ 200 sq in = 130 psi — this exceeds the 85 psi limit stated in the note, meaning the note's condition is not met and the on-rubber capacity values cannot be used at this crane weight and configuration

B. Ground bearing pressure = 26,000 ÷ 200 = 130 psi; this exceeds 85 psi but the note is advisory

C. Ground bearing pressure = 26,000 ÷ 200 = 130 psi; the 85 psi limit applies only when lifting loads, not for the crane's static self-weight

D. Ground bearing pressure = 26,000 ÷ 200 = 130 psi; the operator may use the on-rubber values with a proportional derating

59. A crane's full outrigger extension section for an 80-foot boom shows a maximum rated radius of 40 feet. The crane also has a "REDUCED OUTRIGGER SPREAD" section for the same boom that shows capacities at radii up to 35 feet. A lift is planned at 38 feet of radius. The operator intends to use the full outrigger extension to maximize capacity. The note in the full extension section states the maximum rated radius is 40 feet. The actual operating radius is 38 feet. Does the full extension section apply at 38 feet?

A. No — the full extension section only applies for radii at exactly 40 feet since that is the maximum rated radius shown

B. The reduced outrigger spread section governs for all lifts at 38 feet regardless of the actual outrigger extension

C. Yes — 38 feet is within the full outrigger extension section's rated radius range, which extends up to 40 feet — the operator may use the full extension capacity at any radius up to and including 40 feet

D. The operator must use whichever section shows lower capacity at 38 feet as the most conservative approach

60. A crane load chart shows that the maximum counterweight configuration provides the highest capacity at long radii. However, at 15 feet of radius with a 60-foot boom, the maximum, standard, and minimum counterweight sections all show identical capacity values of 68,400 lbs. What principle does this identical value pattern demonstrate?

A. At 15 feet of radius, the crane's hydraulic system is the limiting factor and all counterweight configurations produce the same maximum hydraulic output

B. At 15 feet of radius with the 60-foot boom, structural strength — not stability — governs the rated capacity, and since counterweight improves stability but not structural capacity, all three counterweight configurations reach the same structural limit at this configuration

C. The identical values indicate a printing error that must be reported to the manufacturer before this section can be used

D. At very short radii, the crane's tire contact patch area limits the capacity regardless of counterweight configuration

61. A crane load chart shows the following in the jib section at 100-foot main boom and 30-foot fixed jib at 25-degree offset: at 55 feet = 9,800 lbs; at 60 feet = 7,400 lbs; at 65 feet = blank. A lift is planned at 62 feet of radius. Using the conservative approach, what capacity governs and does the lift proceed if the total suspended weight is 8,100 lbs?

A. Conservative capacity = 9,800 lbs at 55 ft; total suspended weight (8,100 lbs) is within capacity — lift proceeds

B. The operator must interpolate between 55 and 60 feet since 62 feet falls between those entries

C. Conservative capacity = 7,400 lbs at 60 ft; total suspended weight (8,100 lbs) exceeds the 7,400-lb conservative capacity at the next larger tabulated radius — the lift cannot proceed at 62 feet in this configuration

D. The blank at 65 feet limits the maximum rated radius to 60 feet — since 62 feet exceeds the last tabulated radius, the lift cannot proceed regardless of interpolation

62. A load chart note states: "The values in this section are based on the counterweight being installed at the standard radius position. For non-standard counterweight radius positions, consult Appendix D." The crane operator has installed the counterweight at a position 8 inches closer to the crane centerline than the standard position due to a site constraint. Is the standard section applicable?

A. An 8-inch deviation in counterweight position is within standard manufacturing tolerance and the section values apply normally

B. Yes — minor counterweight position deviations do not affect rated capacity

C. No — for non-standard counterweight positions, Appendix D must be consulted before using the section's values, since counterweight position directly affects the restoring moment and the stability analysis underlying the capacity values

D. The standard section applies as long as the total counterweight mass is unchanged and the deviation is documented in the lift plan

63. A crane load chart for a luffing jib shows capacity values at 15°, 25°, 35°, and 45° jib angles from the main boom axis. The current jib angle is set at 30 degrees. Using the conservative approach, which tabulated value governs?

A. The 25-degree capacity value governs since it represents the lower capacity at the smaller jib angle — at smaller jib angles, the operating radius is longer, which typically produces lower capacity

B. Average the 25-degree and 35-degree values for the 30-degree position

C. The 35-degree capacity value governs using the conservative approach — for luffing jibs, larger angles from the main boom reduce radius and increase capacity, so the 35-degree entry (next larger rated angle from 30 degrees) represents the next larger tabulated entry and typically provides the conservative bounding value; however, this must be confirmed in the specific chart's direction of capacity change

D. Interpolate between 25 and 35 degrees for the most accurate 30-degree capacity value

64. A crane is performing a lift at 92% of gross rated capacity. The crane's load chart section has a note that reads: "For lifts exceeding 90% of gross capacity in this section, the operator must have the lift director provide real-time radius monitoring confirmation during the lift." This requirement was not fulfilled — the lift director is not currently present and cannot provide real-time monitoring. The load is currently suspended at 15 feet of height. What must the operator do?

A. Continue the lift since the note is advisory — no physical restriction has been violated and the load is safely suspended

B. Lower the load to the ground immediately — the note establishes a mandatory condition for lifts above 90% of gross capacity that was not met before the lift began, and the load must be returned to the ground so the required conditions can be established before the lift is reattempted

C. Contact the lift director by radio and request remote verbal confirmation to satisfy the monitoring requirement

D. The operator may complete the current lift cycle and ensure the condition is met for all subsequent lifts above 90% of capacity

65. A crane is performing a series of lifts using the on-outrigger full extension section. During the 5th lift in the series, the operator realizes that the previous four lifts were performed while the crane's LMI was configured for a 90-foot boom when the actual boom length was 100 feet. All four lifts were completed at what appeared to be 82–88% capacity on the LMI display. What is the significance of this configuration error and what must be done?

A. The LMI configuration error is minor — the 10-foot boom length difference does not significantly affect capacity at the working radii used

B. The correct lift percentage cannot be known without recalculating each lift using the correct 100-foot boom capacity values — more importantly, the LMI was computing capacity based on a shorter boom, which typically shows higher capacity at the same radius, meaning the actual lift percentages may have been significantly higher than the displayed values; all four lifts must be re-evaluated and a post-incident inspection is required if any lift exceeded rated capacity

C. The LMI error can be corrected by updating the configuration for the next lift — previous lifts are not affected since the load chart values were unchanged

D. The operator must document the configuration error and have the LMI recalibrated before the next lift — no inspection is needed since the displayed percentages were below 100%

Specialty Exam 5 Answer Key and Full Explanations

1. D — A concrete pad designed for forklift traffic carries distributed loads over relatively large contact areas at modest pressures. Crane outrigger loads are concentrated point loads that can easily exceed the pad's structural capacity even when the surface appears sound. Additionally, process piping carrying flammable hydrocarbons under pressure cannot tolerate unexpected load concentrations — a structural failure of the pad under an outrigger could rupture a high-pressure line with catastrophic consequences.

2. A — A verbal assurance from the general contractor, however confident, is not a documented bearing capacity assessment and does not satisfy the operator's professional obligation to verify ground adequacy before crane setup. The operator must independently verify that the specific setup area can support the crane's outrigger loads — either through documented testing data, a qualified person's evaluation, or both. Relying solely on a contractor's verbal characterization transfers no protection to the operator if the ground fails.

3. C — Petroleum hydrocarbons reduce inter-particle friction in granular soils by coating the grain surfaces, reducing contact forces and allowing the soil to deform more easily under load. In cohesive soils, certain petroleum products can act as lubricants that reduce the effective cohesion. The surface appearance of petroleum-contaminated soil can be misleading — it may appear firm while having significantly reduced bearing capacity, making professional assessment essential before crane loading.

4. C — A pre-approved setup location loses its approval when the ground conditions that justified the approval no longer exist. Excavating and backfilling two of the four designated positions fundamentally changes the bearing capacity at those locations — the pre-approval was based on undisturbed soil that is

no longer present. The changed conditions must be re-evaluated by a qualified person, not confirmed in writing by the controlling entity without technical assessment.

5. D — OSHA Table A specifies a 15-foot minimum safe approach distance for power lines in the voltage range over 50 kV to 200 kV. At 115 kV, the applicable MSAD is 15 feet. The 24-foot clearance exceeds the 15-foot MSAD requirement by 9 feet, satisfying the MSAD. The encroachment prevention plan addresses the remaining operational control requirements.

6. A — A bore hole 18 inches from an outrigger position creates a subsurface void that can act as a preferential stress relief path when the soil adjacent to it is loaded. Rather than distributing the load uniformly as the soil mechanics models assume, the soil mass may shear laterally toward the lower-stress void. This stress concentration effect is more significant for bore holes closer to the loaded area, and the 18-inch proximity warrants evaluation before setup.

7. C — When an outrigger load is applied near a basement wall, the load is transferred into the soil as both vertical bearing stress and lateral stress acting toward the free face of the wall. The lateral component of this stress surcharge can exceed the wall's design lateral resistance, potentially causing wall cracking, rotation, or foundation failure. This is a geotechnical engineering concern that requires evaluation of the wall's original design assumptions relative to the crane's specific outrigger loads.

8. B — Clearance between the 17-foot stowed boom and the 25-foot conductor = 25 − 17 = 8 feet. The required MSAD for 34.5 kV is 10 feet. Since 8 feet is less than the required 10 feet, this travel route does not satisfy the MSAD requirement. The operator must either arrange for the line to be de-energized during travel, find an alternate route that maintains the 10-foot clearance, or have the utility temporarily raise the conductor to create adequate clearance.

9. D — Crushed stone distributes load laterally and provides a stable working surface, but it does not eliminate the soft saturated soil beneath from being part of the load transfer path. The outrigger load is ultimately transferred through the stone layer to the soil below. If the saturated soil has inadequate bearing capacity, the stone layer will punch through it under concentrated crane outrigger loads regardless of its thickness and apparent surface stability.

10. A — Liquefaction is the specific engineering term for the condition where saturated loose sand or silt loses its shear strength due to elevated pore water pressure from dynamic loading. When pore pressure equals the effective overburden stress, the soil temporarily loses its bearing capacity and flows laterally. It is most susceptible in loose, uniformly graded sand and silt deposits with high water table and minimal drainage — conditions commonly found on river floodplains and coastal areas.

11. C — Required cribbing area = 78,000 ÷ 3,500 = 22.3 sq ft minimum. A single 4 ft × 4 ft mat provides 16 sq ft, producing 78,000 ÷ 16 = 4,875 psf — exceeding the soil capacity. Two mats placed side by side provide 32 sq ft, producing 78,000 ÷ 32 = 2,438 psf — within the 3,500 psf capacity. Therefore, one additional mat is needed for a total of two mats at that position, giving adequate bearing area.

12. B — OSHA 1926.1402 specifically requires the controlling entity to provide the crane employer with information about known underground utilities, overhead power lines, site hazards, and ground conditions that could affect crane operations. This information is the foundation for the crane employer's hazard identification and control planning. Without this information, the crane operator cannot assess all relevant hazards before positioning the crane.

13. D — Progressive sinking of an outrigger pad during a lift indicates the soil is yielding progressively under the concentrated outrigger load — a sign that the bearing capacity is being exceeded. This is not normal consolidation; it is an active bearing capacity failure in progress. The load must be lowered to the ground immediately to remove the load moment that is contributing to the failure, and the ground condition at the settling outrigger must be evaluated before any additional lifting.

14. A — Engineered fill's bearing capacity is entirely dependent on the quality of its placement and compaction — the same material poorly compacted has a fraction of the capacity of the same material well-compacted. Without knowing the fill material type, compaction specification, lift thickness, and test results at or near the outrigger positions, the operator cannot confirm the fill can support the crane's loads. Documentation of these details is the minimum required to use engineered fill for crane support.

15. C — A previously reported soft spot may remain as a subsurface weakness even if the current surface appears normal — soil that was soft six months ago may have dried and hardened superficially while retaining a soft, weak zone at depth. Without documented remediation, the underlying condition cannot be assumed resolved. A qualified person must evaluate the current ground conditions at the reported location before the operator can set up with confidence that the bearing capacity is adequate.

16. B — When the crane physically cannot execute a commanded signal due to hydraulic system limitations at the current load and configuration, the operator must stop rather than proceed at an uncontrolled speed. The signal person commanded a speed the crane cannot achieve in this configuration — this is a physical incompatibility that cannot be resolved by continuing. Stopping allows the lift team to discuss an alternative approach, such as reducing the load, changing configuration, or using a different crane.

17. D — OSHA 1926.1431 does not change the ASME B30.5 minimum drum wrap requirement for personnel hoisting — two wraps must remain on the drum at all times, including when the platform is at its lowest designed position. However, the load line used for personnel hoisting must meet the 7:1 design factor requirement throughout the full range of platform travel, including the lowest position. The drum wrap minimum is the same; the rope design factor is the specifically elevated requirement for personnel hoisting.

18. A — During pick-and-carry travel, the dynamic loading conditions — acceleration, deceleration, surface irregularities, and load swing — are different from the static conditions used to derive the rated capacity. When the LMI alarms during travel, it indicates the actual combined loads have reached a threshold that requires immediate attention. Stopping and lowering the load removes the dynamic loading variable and allows the operator to understand the cause of the alarm before any further travel is attempted.

19. C — The DO NOT OPERATE signal — both hands on top of the hard hat — is a universally recognized crane signal requiring immediate cessation of all crane movement. Like the Emergency Stop signal, it requires immediate compliance without delay or confirmation from another party. The signal exists to protect against imminent hazards that require the crane to stop before the operator can receive clarification.

20. B — If the actual load was 5,000 lbs heavier than the documented weight used for capacity calculations, the crane performed a lift where the actual total suspended weight significantly exceeded the planned value. Whether this caused an overload depends on the rigging weight and gross capacity margin, but the discrepancy is large enough to require investigation. A post-incident inspection is required because a suspected overload event may have subjected structural components to loads beyond their rated values.

21. C — Simultaneous conflicting signals from two different persons represent a complete communication system failure — the operator cannot determine which command is correct and executing either risks moving the load in an unsafe direction. The only safe response is to stop all crane movement immediately. The lift director must resolve which signal person has authority for the current phase of the lift before any movement resumes.

22. A — OSHA 1926.1416 requires that safety devices required by Subpart CC be functional before and during crane operations. A non-functional ATB is a removal-from-service condition — not a condition that can be managed through monitoring, reduced capacity, or spotter substitution. Operations using the hoist function must stop immediately and cannot resume until the ATB is repaired and confirmed functional. There is no authorized workaround for a required safety device failure.

23. B — The crane's general wind speed limit was derived based on the structural loading the wind creates on the crane's boom and components — for a relatively compact, small-surface-area load. A glass panel of 96 square feet presents a dramatically larger surface to the wind, generating lateral forces that are many times greater than those on a compact load of equivalent weight at the same wind speed. The general limit is irrelevant to the assessment of wind force on this specific load.

24. B — A 4-inch clearance between a 5'8" pump and a 6'-diameter opening allows essentially no lateral drift during the lowering operation. Any pendulum motion, rotation, or lateral displacement during descent will cause contact. Confirming plumb load line before descent, using minimum controlled speed, and maintaining rotation control with tag lines throughout the entry are the three operational requirements that make this type of tight-clearance lowering possible. The plumb line confirmation is the most critical — any offset at height becomes an amplified lateral problem at the bottom.

25. C — When the crane is operating outside the manufacturer's leveling tolerance, the load chart values derived for the rated level condition do not apply — the effective operating radius has changed, the stability geometry has shifted, and the capacity assumed by the chart section is no longer valid for the crane's actual condition. The load chart is explicit: it applies within the stated leveling tolerance. Outside that tolerance, the crane is in an unrated condition.

26. C — A verbal report of a potential rope defect — even one that appeared to self-resolve — is a known possible deficiency that must be investigated before the next shift begins. A kink that appeared to "resolve" may have caused internal wire damage that is not visible externally. The incoming operator is responsible for confirming the rope's condition with a targeted inspection at the reported area before any load is applied to that rope.

27. C — Directional grinding in a swing drive — occurring in one direction only — indicates that a component is being loaded in one direction that is damaged or defective. Common causes include a broken gear tooth on the swing pinion, a failed swing bearing element, or damage to the swing motor that only manifests under loading in one direction. The component is at risk of complete failure during operations, and the crane must be removed from service for professional inspection before any lifting.

28. D — Tandem lift load distribution deviations indicate the load's actual center of gravity is not where the lift plan assumed. A 7-percentage-point deviation (62/38 vs. planned 55/45) means the load is unbalanced relative to the rigging geometry. Continuing with this distribution risks further load shift during the lift, potentially overloading one crane. Both cranes must stop simultaneously — any independent movement by either crane can cause sudden load transfer — and the rigging must be reassessed on the ground.

29. D — OSHA 1926.1430 requires training for all employees who use the crane, work in the area where it is being used, or are assigned tasks related to its use. This broad scope is intentional — workers near active crane operations face struck-by hazards, exclusion zone requirements, and load drop risks that they must understand to protect themselves. The training requirement is not limited to those with hands-on crane roles.

30. B — A level change from 0.0% to 0.3% during one hour of operations is not random variation — it is a directional change suggesting progressive settlement at one outrigger position. Even though 0.3% is within the 0.5% tolerance, proceeding with an 88%-capacity critical lift without understanding why the crane moved out of level exposes the entire lift team to a risk that was not present at the start of the shift. The cause must be identified before the critical lift begins.

31. B — Lang lay and regular lay rope of the same diameter and grade have the same nominal breaking strength, but they behave differently in service. Lang lay rope has wires that cross the sheave groove at a different angle than regular lay, affecting contact fatigue characteristics, drum behavior, and tendency to rotate under load. The manufacturer's lay direction specification is part of the rope specification that the load chart's structural analysis assumed — substituting a different lay direction without approval violates the specification.

32. B — An outrigger pad is the final structural element in the load path between the crane's outrigger jack and the ground. A crack through the center of the pad has divided it into two pieces that can separate and fail unpredictably under the next load application. The dynamic loading that caused the crack may have also work-hardened the material at the crack tip, making sudden fracture more likely. The pad must be replaced — there is no authorized repair or continued reduced-load use for a cracked structural pad.

33. D — A cut through the outer cover of a round sling that exposes the core fibers is a removal condition under ASME B30.9 because the cover protects the core from damage and the cut allows inspection of only the immediately visible fibers — not the full cross-section of the core bundle. Core fibers that appear intact at the cut may be damaged elsewhere within the cut zone, and the sling's capacity cannot be confirmed. Removal and destruction is required.

34. A — ASME B30.5 specifies removal when wire rope diameter has reduced by more than 3/64 inch (0.047 inches) from its nominal diameter. The measured reduction of 0.052 inches exceeds this threshold by 0.005 inches. The criterion applies equally to boom hoist ropes and load line running ropes — both are subject to the same diameter reduction removal standard. Diameter reduction indicates material loss from abrasion or internal corrosion that has reduced the rope's load-carrying capacity below its nominal rating.

35. C — In a basket hitch at 60 degrees from horizontal: the basket configuration means both legs share the load, so the combined leg capacity = 2 × 16,000 = 32,000 lbs at vertical. Applying the sling angle efficiency factor for 60 degrees: efficiency = sin(60°) = 0.866. Maximum basket load = 32,000 × 0.866 = 27,712 lbs. The basket doubles the base capacity but the angle reduces it — at 60 degrees, the net result is about 73% higher than the single-leg vertical WLL, not double.

36. B — A cylinder rod that shows rust on its normally retracted section was at some point extended far enough to expose that section to the environment — either beyond its normal working stroke or due to an abnormal loading event. This may indicate the cylinder was overextended, which can damage the rod seal and the cylinder bore. The rust on the normally protected section is evidence of an abnormal event that the inspection should investigate rather than pass over as cosmetic.

37. D — While no single link has individually reached the 3% elongation removal criterion, three consecutive links all showing 2.4–2.8% elongation indicates the sling experienced a loading event that caused plastic deformation across an extended section of chain. This pattern is inconsistent with normal wear — it suggests the chain was subjected to a sudden overload or shock load that stretched multiple links simultaneously. The chain should be removed for complete evaluation and the incident that caused the elongation pattern should be investigated.

38. A — ASME B30.26 requires that only shouldered eyebolts be used for angular loading applications. Non-shouldered eyebolts must be loaded strictly in line with the bolt's shank axis — angular loading rotates the eye relative to the shank, creating bending stress in the shank that the non-shouldered design cannot safely carry. Shouldered eyebolts are designed with a shoulder that bears against the fixture surface, allowing angular loading with application of documented capacity derating factors for angles off-axis.

39. C — The ductile-to-brittle transition is a well-documented metallurgical phenomenon in carbon steel — at temperatures approaching and below 0°F, the material's fracture toughness decreases significantly. Micro-cracks that would simply yield and blunt at normal temperatures instead propagate rapidly under stress at extreme cold temperatures. This makes pre-shift structural inspection of boom chord members, welds, and pins more critical in extreme cold, as defects that were stable at moderate temperatures may become failure initiation points.

40. B — Drum groove geometry is designed to cradle the rope in the correct cross-sectional profile, distributing the contact force over the rope's curved surface. When grooves wear beyond their designed depth, the rope sinks into the groove until its sides contact the groove walls rather than just the bottom — the groove walls then press against the rope laterally, crushing the outer strands rather than

supporting them. This lateral crushing accelerates wire fatigue and prevents proper fleet angle management as the rope spools between layers.

41. B — The swivel's function is to allow free rotation of the hook block on the hook, which prevents torsional forces from accumulating in the load line. A swivel that turns with high resistance or grinding sounds under no-load conditions will not rotate freely under load — it may lock completely, transmitting all hook rotation directly into the load line as torque. This accumulated rope twist reduces the rope's rated capacity and can cause birdcaging or sudden untwisting under load.

42. B — ASME B30.5 requires that a crane with a known deficiency be taken out of service and tagged with a visible warning tag identifying the deficiency and prohibiting operation. The prohibition applies to all uses of the crane — not just uses that involve the deficient component. This blanket prohibition exists because the crane cannot be fully relied upon when any of its required components is deficient, and operating it for "simpler" tasks while a known deficiency exists creates unpredictable risk.

43. C — The load chart section header explicitly states the boom range as 60–140 feet. This range defines the configurations for which the structural and stability analysis was performed and capacity values were derived. A 150-foot boom falls outside this range and is a different structural configuration — the boom tip is farther from the slewing ring, the pendant angles are different, and the compressive loading profile throughout the boom is different. A separate section covering the 150-foot boom must be found.

44. B — The conservative interpolation approach requires using the capacity at the next larger tabulated radius when the actual radius falls between tabulated values. At 33 feet, the next larger tabulated value is 35 feet with a capacity of 27,200 lbs. Using this value ensures the operator is on the safe side of the capacity boundary — any small radius measurement error will not push the lift above the confirmed capacity value.

45. C — The note explicitly states that no change in rated capacity applies when EEIPS rope of the same diameter is used. This is because the load chart capacity values are governed by the crane's structural and stability limits — not by the rope's breaking strength. The EEIPS rope has higher tensile strength than EIPS, but since structural and stability limits already governed the capacity, the higher rope strength provides no benefit to the rated capacity values.

46. C — The note explicitly prohibits side loading for the capacity value at this cell — "side loading prohibited" is an absolute restriction, not a guideline. Any lateral force component applied through a taut angled tag line constitutes side loading. When a capacity cell's note prohibits side loading, that value cannot be used in any configuration where lateral forces are applied to the load — regardless of their

magnitude. The operator must either find a configuration where side loading is permitted or remove the lateral force source.

47. D — Note 2 specifically prohibits raising the boom above 75 degrees with heavy counterweight and no suspended load. The operator wants to raise from 65 to 80 degrees — this movement would pass through 75 degrees and end at 80 degrees, a direct violation of the note. The note exists because maximum counterweight with no front load creates a rear-tipping risk at steep boom angles. The operator must attach an adequate front load or reduce the counterweight before executing the boom-up movement above 75 degrees.

48. B — Using the conservative approach, the capacity at the next larger tabulated radius (40 feet) = 17,600 lbs. The total suspended weight of 19,200 lbs exceeds 17,600 lbs. The lift cannot proceed in this configuration. The interpolated value of approximately 20,480 lbs (between 22,800 and 17,600) would support the lift, but the conservative approach — which is required when operating between tabulated values — uses the lower bounding value, and that value does not support the planned lift.

49. C — The note is an explicit prohibition on intermediate extensions: "Operating with outrigger extension between rated configurations is not permitted." This is more restrictive than simply requiring the use of the most conservative bounding section — it prohibits the intermediate extension entirely unless a rated configuration can be achieved. The operator must contact the manufacturer for authorization to operate at 78% extension. Using the 50% section without this authorization would apply capacity values to an unrated configuration without any engineering basis.

50. B — The absence of capacity values at radii shorter than 20 feet is not an omission — it is a deliberate design decision by the manufacturer. At very short radii with steep boom angles, the structural loading on the boom foot pin bore, the boom base, and the slewing ring involves complex interactions between compression, bending, and out-of-plane forces that require individual engineering analysis for each crane model. The manufacturer must be consulted to provide capacity values at 15 feet.

51. C — Using the conservative approach, the capacity at the next larger tabulated radius (50 feet) = 6,400 lbs. Total suspended weight = 5,600 + 350 + 420 = 6,370 lbs. Since 6,370 lbs is less than 6,400 lbs, the lift is technically within the conservative capacity — but only by 30 lbs (0.47% margin). This is an operationally dangerous margin for a jib lift where load weight confirmation uncertainties, radius measurement precision, and dynamic loading during movement all create variation that could easily exceed 30 lbs. The operator should take extreme care with radius management.

52. D — The physical crane configuration must match the chart section header. Using the 50% counterweight section when full counterweight is installed misrepresents the crane's actual condition in the load chart — the stability analysis behind the 50% section was performed for a crane with less restoring moment than actually exists. While this might seem conservative, it is technically incorrect application of the load chart because the section does not represent the actual crane. The correct matching section must be used.

53. A — The note specifies two derating ranges: 15–20 mph requires multiplying by 0.95, and 20–25 mph requires multiplying by 0.90. At 19 mph, the applicable range is 15–20 mph, and the derating factor is 0.95. Derated capacity = 28,400 × 0.95 = 26,980 lbs. The operator must use 26,980 lbs rather than the full 28,400 lbs as the governing capacity for this configuration in 19 mph wind.

54. A — An LMI reading of 87% versus a calculated 79.3% indicates that either the load is heavier than documented (load or rigging weight was underestimated), the actual operating radius is greater than the planned 35 feet (a larger radius reduces rated capacity and increases the percentage), or a combination of both. The discrepancy must be investigated — if the actual radius is even slightly greater than measured, or if rigging weight was underestimated, the operator needs to understand why before proceeding with the series of lifts.

55. C — Structure-limited cells indicate the crane's structural members are at their design stress limits at the tabulated capacity. At 96.5% of this limit, there is only a 3.5% structural margin remaining before the design capacity of the boom or other structural components is reached. Dynamic loading from sudden hoist acceleration, swing deceleration, or boom movement adds structural stress on top of the static load — these additions at near-structural-limit loads can exceed the design capacity of structural members without warning. Extremely smooth operation is essential.

56. B — The 360-degree section was specifically developed to provide capacity values that are valid at all boom orientations throughout a full rotation. It accounts for the most restrictive stability geometry across all directions and produces conservative but reliable values for any boom position including front, rear, and sides. This is precisely the section that should be used for any lift requiring the boom to pass through multiple angular positions — including a 270-degree rotation.

57. D — The blank cell at 45 feet defines the maximum rated radius for the 100-foot boom in this configuration as 40 feet. There is no rated capacity at any radius beyond 40 feet — not at 41, 42, 43, or 44 feet. The 42-foot planned lift exceeds the maximum rated radius and cannot proceed at this configuration. The crane must be repositioned, a different boom configuration used, or the set location moved to within the 40-foot rated radius.

58. A — Ground bearing pressure per tire = 26,000 lbs ÷ 200 sq in = 130 psi. The note establishes 85 psi as the maximum ground bearing pressure for which the on-rubber capacity values apply. Since 130 psi exceeds 85 psi by 53%, the note's condition is not satisfied — the ground bearing pressure under the tires exceeds the note's limit and the on-rubber capacity values cannot be used. The operator must either deploy outriggers or obtain manufacturer guidance for operating at higher tire contact pressures.

59. C — The full outrigger extension section's rated radius range extends from the minimum tabulated radius up to and including the maximum rated radius of 40 feet. A lift at 38 feet is 2 feet less than the maximum rated radius — it is within the section's operating envelope. The full extension section applies at any radius up to and including 40 feet. The reduced outrigger spread section only applies when the outriggers are actually at the reduced spread — it does not govern when full extension is achieved.

60. B — When counterweight configuration changes produce no change in rated capacity across multiple sections at the same radius, it confirms that structural strength — not stability — is the governing limit at that configuration. The restoring moment provided by different counterweight amounts affects the stability tipping threshold, but when structural strength governs, the stability margin is not the limiting factor. Since counterweight cannot increase structural capacity, all configurations reach the same structural limit regardless of counterweight mass.

61. D — The blank cell at 65 feet defines the maximum rated radius for this jib configuration as 60 feet. Since 62 feet exceeds the last tabulated radius of 60 feet, there is no rated capacity at 62 feet — the configuration is outside the rated envelope. Neither interpolation between 60 and 65 feet nor use of the conservative bounding value creates a valid capacity for an unrated radius. The lift must be repositioned to within 60 feet of radius or a different configuration used.

62. C — The note explicitly requires consulting Appendix D for non-standard counterweight positions — this is a direct binding instruction, not a suggestion. An 8-inch deviation in counterweight position changes the restoring moment by a known amount (counterweight mass × change in distance from centerline), but the manufacturer must confirm through Appendix D whether the capacity values remain valid for the specific deviation. The operator cannot determine this independently.

63. A — For luffing jib charts, a smaller jib angle from the main boom axis creates a longer operating radius and lower capacity. The 25-degree capacity value — which corresponds to the smaller angle and longer radius — is the lower of the two bounding values (25° and 35°). The conservative approach uses the lower bounding capacity value, which in this case is the 25-degree entry. This must be verified in the specific chart, as the capacity-to-angle relationship direction determines which bounding value is conservative.

64. B — The note establishes real-time radius monitoring confirmation as a mandatory condition for lifts above 90% of gross capacity in this section. This is a pre-lift requirement — it must be in place before the pick, not after the load is already suspended. A lift that began without meeting this condition was performed outside the conditions for which the capacity value was authorized. The load must be returned to the ground so the mandatory condition can be established before the lift is reattempted.

65. B — When the LMI is configured for a shorter boom (90 feet) than actually installed (100 feet), it computes capacity using the shorter boom's load chart values — which typically show higher capacity at the same radius than the longer boom. This means the actual lift percentages during the four lifts were likely higher than the displayed values, potentially exceeding rated capacity without the operator's awareness. All four lifts must be recalculated using the correct 100-foot boom capacity values, and if any lift exceeded rated capacity, a post-incident structural inspection is required before the crane continues.