

SIMULATION SET 11

SITE DOMAIN — Questions 1–21

1. A crane operator is preparing to set up at an industrial facility that has an elevated concrete equipment pad — 18 inches above grade — supported on a grid of reinforced concrete piers. The facility manager shows the operator a loading diagram from the original structural design stamped by a PE in 1989. The diagram shows the pad was designed for 1,200 psf uniform loading. The crane's maximum outrigger reaction is 92,000 lbs and the outrigger float is 2.5 sq ft. What must happen before setup?

A. The bearing pressure from the outrigger = $92,000 \div 2.5 = 36,800$ psf — approximately 30 times the pad's 1,200 psf uniform design loading; a structural engineer must evaluate the current structural condition of the pad and confirm it can resist the specific concentrated point load before any crane setup proceeds on this elevated structure

B. The 1989 PE-stamped drawing confirms the pad is structurally adequate for all industrial equipment loading

C. The pad's 1,200 psf capacity is for the entire surface — divide by the number of piers to determine adequacy per outrigger

D. Request that the facility manager confirm the load in writing before proceeding

2. A crane is set up at a construction site where the previous night's rainfall totaled 2.3 inches. The setup area consists of sandy loam that was confirmed at 3,400 psf during last week's dry weather assessment. The operator probes the surface with a 1/2-inch rod and finds it penetrates 8 inches with hand pressure alone. What does this probe result indicate about the current bearing capacity?

A. The 8-inch penetration is acceptable for granular materials like sandy loam following rainfall

B. Nothing — bearing capacity is always measured at depth, not at the surface; surface softness has no effect on structural bearing conditions

C. The rod penetrating 8 inches by hand pressure indicates the surface soil has been significantly softened by the rainfall — bearing capacity has been reduced well below the dry-weather 3,400 psf assessment; additional investigation and potentially ground preparation are required before crane outrigger loading

D. The 8-inch penetration confirms the soil is at optimal moisture content for maximum bearing capacity

3. Under OSHA 1926.1402, what specific obligation does the controlling entity have when an underground utility is discovered during excavation work adjacent to the crane's planned setup area — a utility that was not on any existing utility map?

A. The controlling entity must call 811 immediately and wait 3 days for a new locate before notifying the crane employer

B. The controlling entity must promptly notify the crane employer of the newly discovered utility's location, type, and any available information about its condition — the crane employer cannot safely plan outrigger positions without knowing about all underground hazards; a utility discovered during excavation may extend beneath the planned setup area and could be damaged or cause ground failure under crane loading

C. The crane employer must perform their own investigation of the newly discovered utility

D. The utility discovery is the excavation contractor's responsibility and does not create any obligation for the controlling entity regarding crane operations

4. A crane operator is evaluating a setup location on a large commercial construction project. The planned left front outrigger position will be 7 feet from a 12-foot-deep trench that has been excavated but not yet shored. The soil in the excavated zone is described by the geotechnical report as "medium dense silty sand." What concern must be addressed before setup?

A. The 7-foot setback from the trench edge is within the standard 10-foot minimum — additional assessment is required

B. Medium dense silty sand is classified as Type B soil under OSHA and requires no special treatment within 10 feet of a crane outrigger

C. Nothing — unshored trenches more than 5 feet from crane outriggers are outside the zone of concern

D. The 7-foot setback from a 12-foot-deep unshored trench in medium dense silty sand requires evaluation — the crane's outrigger load creates a surcharge on the soil adjacent to the trench that could trigger slope failure or loss of passive resistance on the trench side; a qualified person must evaluate whether this setback is adequate for the planned outrigger loads before operations begin

5. A crane operator is performing a site walk before setup when they discover that the planned outrigger zone has small, circular depressions approximately 4 to 6 inches in diameter scattered across the surface — each depression is roughly 1 to 2 inches deep. There are approximately 15 such depressions visible in the area. What do these small circular depressions most likely indicate?

A. The surface depressions are consistent with subsurface void development — possibly from dissolving limestone, collapsing buried voids, or deteriorating underground pipes; scattered multiple depressions indicate multiple subsurface voids developing at various points; crane setup in this area is not safe until the cause of the surface subsidence is identified and the subsurface is confirmed stable

B. Small surface depressions in the 4-6 inch diameter range are normal consolidation points in compacted aggregate surfaces

C. The depressions indicate animal activity near the surface — no structural concern applies

D. The surface depressions are caused by rainfall impact on the surface soil — no bearing capacity concern applies

6. A crane is set up at a waterfront project where the setup area is on a barge deck. Before operations begin, what must be confirmed about the barge to ensure crane stability throughout all planned lifts?

A. The barge's buoyancy rating must confirm it can support the crane's total weight

B. The barge captain must confirm the barge is sea-worthy before crane operations begin

C. The barge's stability under the crane's outrigger reaction loads must be confirmed — the barge's stability at any given load distribution must be analyzed to ensure the crane's operating loads do not cause the barge to list or roll in a way that places the crane outside the manufacturer's operating slope

tolerance; the barge's load planning and stability analysis must account for both the static crane weight and the dynamic changes during lift operations

D. The barge must be anchored on all four sides before crane operations begin

7. Under OSHA 1926.1408, what specific action must be taken when a crane operator discovers — for the first time during setup — that a power line crosses the planned outrigger spread at an unknown voltage?

A. Proceed with outrigger setup while the voltage is being determined — the outrigger spread is not a crane movement

B. Stop all crane positioning activities and determine the voltage through the utility operator or other reliable sources before continuing any crane setup — the MSAD cannot be established without confirmed voltage; even positioning the crane during setup may place the crane within the yet-to-be-established MSAD

C. Estimate the voltage based on the line's wire diameter and use that estimate for the MSAD calculation

D. Contact the lift director before deciding whether to proceed or stop setup activities

8. A crane is being set up when the operator observes that the surface of the ground directly beneath the planned outrigger pad position shows efflorescence — a white crystalline mineral deposit on the soil surface consistent with water carrying dissolved salts upward through capillary action. This is occurring in dry weather conditions. What does surface efflorescence indicate about subsurface conditions?

A. Efflorescence indicates the soil has high mineral content that increases bearing capacity through cementation

B. Efflorescence indicates the soil is well-drained and moisture content is controlled

C. Nothing — efflorescence is a cosmetic surface condition that has no bearing on structural soil capacity

D. Surface efflorescence in dry weather indicates that water is moving upward through the soil by capillary action from a subsurface water source — this upward moisture migration means the soil at

depth is saturated or near-saturated, and the surface soil moisture content is higher than visible surface conditions suggest; the bearing capacity assessment may overstate the actual capacity at the affected position

9. A crane operator is setting up on a job site when they notice a strong sulfurous odor (rotten egg smell) coming from the soil surface in the area of the planned outrigger zone. What does this odor indicate and what action is required?

A. The sulfurous odor indicates anaerobic decomposition of organic material — this strongly suggests the presence of peat or organic soil beneath the surface, which has very low bearing capacity and is compressible; the setup zone must be investigated for organic soil depth and extent before any crane outrigger loading; organic soils can compress dramatically and suddenly under crane loads

B. The sulfurous odor is caused by soil microorganisms and indicates healthy, well-structured soil

C. The odor indicates the presence of sulfur mineral deposits that improve soil cementation and bearing capacity

D. A sulfurous odor in soil is typically caused by nearby agricultural activity and has no bearing capacity implications

10. Under OSHA 1926.1402(c), when may the crane operator resume operations after stopping due to ground condition concerns?

A. The operator may resume operations when the controlling entity verbally confirms the concern has been addressed

B. Nothing — once operations are stopped for ground condition concerns, a full new engineering assessment is required regardless of the nature of the concern

C. The operator may resume when the employer has addressed the concern — either by confirming the existing conditions are adequate through investigation, by implementing additional ground preparation measures, or by changing the crane configuration to reduce outrigger loads; the employer's determination must be based on facts about the current ground conditions, not on schedule pressure

D. Operations may resume automatically after 2 hours to allow ground conditions to naturally stabilize

11. A crane is operating when a sinkhole approximately 8 feet in diameter and 4 feet deep develops in the soil surface between the crane's front right and rear right outrigger positions — directly beneath the crane's travel position. The load is at 20 feet of height mid-swing. What is the critical concern?

A. Nothing — the sinkhole is between the outrigger pads and does not affect the outrigger support directly

B. The sinkhole developing between outrigger positions on the same side of the crane indicates that the subsurface void responsible for it may extend beneath both outrigger pads on that side — the outrigger pads may be supported on soil that is hollowed out beneath them; all crane movement must stop immediately and the load lowered; the outrigger conditions on the affected side must be evaluated before any further operations

C. Lower the load and then drive the crane away from the sinkhole to a safe location before reassessment

D. The sinkhole is between the outriggers and therefore confirms the outriggers themselves are on solid ground

12. A crane operator is evaluating a site where the access road to the setup area requires the crane to travel over an unpaved road through a low-lying area that is currently holding standing water approximately 6 inches deep after recent rain. The standing water covers approximately 80 feet of the planned travel path. What must be confirmed before the crane travels this route?

A. The crane's water crossing capacity is specified in the operator's manual — follow the manual's guidance

B. Standing water up to 6 inches deep is within the standard clearance for crane travel on unpaved roads

C. Water crossings of any depth require written authorization from the crane manufacturer

D. The bearing capacity of the subgrade beneath the standing water must be confirmed before crane travel — standing water in a low-lying area indicates the soil is saturated and may have very low bearing capacity; a 186,000-lb crane traveling through saturated soil can become stuck or cause the soil to fail under the travel loads; the route must be confirmed stable before the crane enters the water crossing

13. A crane is set up at a job site when a severe thunderstorm warning is issued for the area. The storm is estimated to arrive in 35 minutes. Lightning is expected. What must the operator do?

- A. Lower all loads to the ground, secure the crane, and move all personnel to shelter before the storm arrives — a crane boom is the highest structure in most construction environments and is an excellent lightning conductor; remaining in or near the crane during a lightning storm creates a life-safety hazard; the crane must be secured and personnel must be in shelter before the storm arrives, not after lightning begins
- B. Continue operations for the remaining 35 minutes and then secure the crane before the storm arrives
- C. Reduce operations to essential lifts only during the warning period
- D. Ask the lift director to monitor the storm's actual approach before deciding whether to stop operations

14. A crane is set up at a hospital campus project. The planned outrigger zone is adjacent to the hospital building, and there is a network of underground steam tunnels connecting buildings at 6 feet of depth running beneath the planned setup area. Steam tunnels are concrete-lined passages approximately 5 feet wide and 7 feet tall. What concern do underground steam tunnels create for crane outrigger support?

- A. Steam tunnels are reinforced concrete structures capable of supporting any crane operation
- B. The steam tunnels are at 6 feet of depth — beyond the zone of influence for surface crane outrigger loading
- C. The concrete-lined steam tunnels represent large subsurface voids — 5 feet wide by 7 feet tall — that reduce the effective bearing area of the soil above them and can fail in punching shear under concentrated outrigger loads; the tunnel structural capacity under the crane's concentrated point loads must be evaluated by a structural engineer before setup proceeds
- D. Steam tunnels always have reinforced concrete roofs designed for surface loading — no evaluation is needed

15. A crane is set up and operating when the general contractor begins operating a large hydraulic breaker — a demolition tool mounted on an excavator — to break up concrete pavement 45 feet from the crane's right rear outrigger position. The breaker creates significant ground vibration felt throughout the job site. What specific concern does the breaker vibration create?

A. Nothing — vibration from demolition equipment 45 feet away is outside the zone of concern for crane operations

B. The vibration from the hydraulic breaker can cause progressive densification of loose soil near the outrigger positions, potentially causing settlement of the outrigger mats; simultaneously, the dynamic nature of the impulse loading from the breaker can temporarily reduce the bearing capacity of saturated fine-grained soils through pore pressure generation; the operator must monitor the crane's level condition during breaker operations

C. Vibration only affects crane operations when the source is within 20 feet of an outrigger position

D. The contractor must stop the hydraulic breaker operations whenever the crane is performing a lift

16. Under OSHA 1926.1402, what is the difference between the controlling entity's "initial" ground condition obligation and the "ongoing" ground condition obligation during crane operations?

A. The controlling entity's ground obligation ends after the initial site assessment — ongoing monitoring is the crane operator's responsibility

B. Nothing — the controlling entity has one obligation that applies from beginning to end without distinction

C. Nothing — the crane employer bears both the initial and ongoing ground condition obligations

D. The controlling entity must provide initial ground condition information before operations begin AND must promptly notify the crane employer whenever ground conditions change during operations — the ongoing obligation means any changes from construction activity, weather, or adjacent work must be communicated so the crane employer can re-evaluate whether the changed conditions are still adequate for continued crane operations

17. A crane is being set up adjacent to a building when the operator discovers that the building has a basement that extends to the property line — directly beneath the planned right outrigger spread. The basement is currently used as a parking garage. What action is required?

A. A structural engineer must evaluate whether the parking garage structure can carry the crane's outrigger reaction loads — parking garage foundations and slab-on-grade or suspended slabs are

typically designed for vehicle loads, which are fundamentally different from concentrated crane outrigger point loads; the garage structure must be specifically analyzed for the crane's loads before any setup proceeds

B. Nothing — parking garages are commercial structures engineered for high vehicle loading

C. The parking garage must be closed to vehicles during crane operations

D. Place 4×4 timber mats over the garage roof surface to distribute the outrigger loads

18. A crane is operating when the operator notices that water is beginning to pool on the surface immediately adjacent to the right front outrigger mat — the water appears to be coming from a subsurface source rather than from the surface. No precipitation has occurred. What does subsurface-sourced water pooling adjacent to a loaded outrigger mat during dry weather indicate?

A. The pooling confirms the soil drainage is functioning correctly — pooling near the outrigger is expected

B. Nothing — surface water pooling is a normal occurrence near any heavy equipment

C. Subsurface water emerging adjacent to a loaded outrigger in dry weather may indicate that the soil beneath the mat is consolidating under the load and squeezing pore water upward and laterally — this pore pressure expression indicates the soil is under stress approaching its bearing capacity and the upward water movement indicates potential bearing capacity issues developing at that position; operations must be monitored carefully and may need to stop for evaluation

D. The pooling water is from a broken pipe elsewhere on the site and does not affect bearing conditions

19. A crane operator is performing a site walk when they find that someone has placed a concrete jersey barrier 4 feet from the planned right rear outrigger position to redirect vehicle traffic on the site road. The jersey barrier weighs approximately 4,000 lbs. What concern does the jersey barrier placement create?

A. Nothing — the jersey barrier has improved the site safety by redirecting vehicles away from the setup area

B. The jersey barrier represents a surcharge load placed adjacent to the planned outrigger position — while 4,000 lbs is relatively light compared to the crane's outrigger loads, the jersey barrier placement also indicates vehicles will be routed close to the outrigger area; heavier vehicles traveling on the adjacent road will create their own surcharge that compounds with the barrier's surcharge effect on the soil supporting the outrigger; the vehicle routing and barrier placement must be assessed relative to their surcharge effect on the outrigger's soil support

C. A 4,000-lb jersey barrier is within normal operational tolerances at any distance from a crane outrigger

D. The jersey barrier must be removed before crane setup since it is a structure within the exclusion zone

20. A crane is being set up at a remediated brownfield site. The site remediation report indicates that contaminated soil was excavated to 8 feet of depth and replaced with clean engineered fill that was compacted to 95% Modified Proctor density. The compaction testing was performed 18 months ago. A geotechnical report from the remediation indicates 4,800 psf bearing capacity for the engineered fill. Is the 18-month-old bearing capacity documentation adequate for current crane setup?

A. Nothing — 18-month-old compaction documentation is within the standard 2-year validity period for geotechnical reports

B. Nothing — the 95% Modified Proctor density confirms the fill is at maximum bearing capacity

C. Nothing — engineered fill certified by a PE is valid indefinitely for construction purposes

D. The 18-month-old documentation confirms what the bearing capacity was at time of testing — it does not confirm current conditions; in 18 months, the fill may have been disturbed by subsequent construction activities, settlement may have occurred, or saturation from weather events may have occurred; the operator should confirm with the controlling entity whether conditions have changed since the original testing and whether the 4,800 psf assessment still applies to the current state of the fill

21. A crane is operating at a construction site when a fire breaks out in a temporary materials storage building 50 feet from the crane's setup position. The fire department is responding. The load is currently suspended at 12 feet of height. What is the required response?

- A. Continue to hold the load in position since the fire is 50 feet away and appears contained to the storage building
- B. Nothing — the fire department will advise when crane operations must stop
- C. Wait for the fire department incident commander to evaluate whether crane operations should stop
- D. Lower the load to the nearest safe surface immediately and evacuate the crane following site emergency procedures — a fire 50 feet from a crane with a suspended load creates immediate risk from potential explosion of stored materials, loss of personnel to evacuation requirements, and the possibility of the fire spreading to the crane; the load must be on the ground before the operator evacuates, and evacuation must occur before the fire situation worsens

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22. A crane operator is completing a lift when the signal person gives a LOWER signal and simultaneously points to a location 3 feet to the right of the load's current position, indicating where the load should be set. The LOWER signal alone is an approved ASME B30.5 signal. The pointing gesture is not. How should the operator respond?

- A. Execute the LOWER movement while using the pointing gesture to infer that the set location is to the right
- B. Nothing — combination signals indicating the movement and the target location simultaneously are standard practice
- C. Stop and clarify the intended set location through a confirmed communication method before lowering — the pointing gesture is not an approved ASME B30.5 signal and was not established in the pre-lift briefing; acting on the combination of an approved and non-approved signal to determine the set location creates ambiguity; the operator must confirm the exact target location before any downward movement
- D. Execute the LOWER signal and allow the signal person to stop the crane with a STOP signal when the correct horizontal position is reached

23. A crane is performing a lift at 84% of rated capacity when the operator receives a HOIST signal but simultaneously notices the slings appear to be approaching a sharp structural angle on the load. The load is currently 8 inches off the ground. What must the operator do?

- A. Continue the hoist since the slings on the load will self-adjust as tension increases
- B. Stop the hoist immediately and lower the load back to the ground — the potential for sling damage from contact with a sharp load angle must be assessed before lifting the load further; sling contact with sharp steel edges at elevated loads can cut through the sling web material or cause sudden wire breaks in rope slings; the rigging must be assessed and edge protection applied if needed before re-picking the load
- C. Continue the hoist but reduce speed to minimum to limit the force on any sling contact with the angle
- D. Ask the signal person to confirm the slings are clear before continuing the hoist

24. Under OSHA 1926.1427, what is the consequence when a crane operator's written documentation of employer competency evaluation is missing — meaning the operator has a valid NCCCO certification but the employer has never documented their site-specific competency evaluation?

- A. The missing documentation is a minor administrative violation with no operational consequence since the NCCCO certification confirms competency
- B. The missing documentation creates an administrative violation but the operator may continue operations since the certification is current
- C. The NCCCO certification and the employer's competency evaluation are both required — the certification satisfies the type-level knowledge requirement while the employer's evaluation confirms site-specific competency; if the employer's documented evaluation is missing, the operator's authorization to perform crane operations at that worksite is not fully established under OSHA 1926.1427; the employer must complete and document the evaluation before the operator performs crane operations at that site
- D. The operator may self-certify competency through a written statement until the employer completes the formal evaluation

25. A crane operator is performing a lift when the crane's boom hoist rope shows a visible sag between two consecutive sheaves during a standard hoist operation. The rope should maintain tension throughout. What does unexpected rope sag indicate?

A. The rope sag indicates the boom angle has reached a configuration where the boom hoist rope load is reduced by the boom's counterbalance — this is normal at steep boom angles

B. Nothing — some sag in long rope runs between sheaves is normal under low tension conditions

C. The load on the hook block must be less than the hook block weight plus rigging — sag is always caused by light loading

D. Unexpected sag in a loaded rope between sheaves indicates the rope may have lost tension from an abnormal condition — possibly a failed rope section, a jumped sheave, a slipping drum, or a mechanical failure that has reduced the rope's load path; the crane must be stopped immediately and the rope's path and tension condition investigated

26. A crane is performing a critical lift at 91% of rated capacity when the operator notices that the crane's level indicator shows the crane has tilted 0.2% toward the load — the crane was level at the start of the lift. The manufacturer's tolerance is 0.5%. The tilt developed during the hoist. What does a developing tilt during an active hoist indicate?

A. The tilt is caused by the load's moment arm effect on the crane structure — this is a structural deflection that is expected during hoisting and is not a ground condition concern

B. Nothing — the tilt is within the 0.5% manufacturer's tolerance and requires no action

C. A developing tilt during an active hoist indicates progressive outrigger settlement on the load side — even though the tilt is within the 0.5% tolerance, the progressive nature of the tilt during loading means the soil may be continuing to yield; at 91% capacity, any further settlement could cause additional tilt that approaches or exceeds the tolerance limit; the load must be lowered and the outrigger condition on the load side must be evaluated before continuing

D. The 0.2% tilt is well within tolerance — continue the lift and re-level after the load is set

27. A crane operator is performing a tandem lift with another crane when the lift director leaves the immediate work area to take a phone call. Both operators are mid-hoist with the load at 3 feet of height. The load weighs 44,000 lbs total and is shared equally between the two cranes. What must the two operators do?

A. Nothing — the lift director leaving briefly is a common occurrence; both operators should continue the hoist to the planned height

B. Both operators must immediately hold their current position and stop the hoist until the lift director returns — tandem lifts require active lift director coordination throughout all movements; a tandem hoist without lift director oversight violates the coordination requirement; the load must be held stationary until the lift director is present and actively coordinating the operation

C. The more experienced operator should take over coordination of the tandem hoist until the lift director returns

D. Contact the lift director by radio and confirm they are available to coordinate before continuing the hoist

28. A crane operator observes that during every hoist cycle, the load swings approximately 12 inches in the downwind direction and then swings back as it comes to a stop. The wind speed is 11 mph. The load is a compact 8,000-pound structural assembly. The crane's general wind limit is 25 mph. What specific operational concern does the repetitive 12-inch load swing create?

A. Nothing — a 12-inch load swing in 11 mph wind is within normal operational tolerance for compact loads

B. The load must be equipped with a tag line to prevent any wind-induced swing

C. The repetitive 12-inch swing with each stop indicates that wind loading is causing the load to oscillate during each lowering cycle — if the load is being lowered into a tight opening or near other structures, this 12-inch swing may contact the structure; even in open areas, the operator should use a tag line for control and should reduce the loading rate to minimize the swing amplitude during placement

D. The 12-inch swing indicates the rigging is unbalanced — re-rig the load to correct the imbalance before continuing

29. A crane operator has been directed to use the crane's boom to assist in guiding a structural column into its anchor bolt pattern — by using the boom tip to steer the base of the column as it is being lowered. The column base is essentially a steel plate with anchor bolt holes that must align over the bolts. What is the specific concern with using the boom tip to guide the column?

A. Using the boom tip to physically guide a structural column applies lateral forces to the boom tip that it was not designed to carry — the column's resistance to being steered will create forces perpendicular to the boom's primary axis; if the column catches on a bolt or the foundation as it's being guided, the resulting force could overload the boom laterally; the column must be guided with tag lines operated by personnel from safe positions, not by using the boom as a pushing tool

B. Nothing — guiding a column with the boom tip is an accepted technique in structural steel erection

C. The boom tip contact could damage the column base plate and affect the column's structural integrity

D. The lift director must authorize boom-tip column guidance before the technique can be used

30. Under OSHA 1926.1430, which workers on a construction site are required to receive crane safety training, and what must the training cover?

A. Only crane operators and signal persons are required to receive crane safety training — general site workers are not included in the training requirement

B. OSHA 1926.1430 does not specify training requirements — training is left to the employer's discretion

C. All affected employees who work near cranes must receive training in the requirements of Subpart CC, hazard recognition related to crane operations, and employer procedures for avoiding these hazards — "affected" employees include any worker whose job duties may bring them into contact with crane operations, not just those directly involved in rigging and signaling

D. Training is only required for employees who have had a crane-related incident or near-miss

31. A crane operator is performing a lift when the signal person gives a LOWER signal but the operator observes that the area directly below the load contains a worker who is bending over to pick up a tool — the worker's back is turned and they have not noticed the load is above them. What must the operator do?

A. Nothing — the signal person's LOWER signal confirms they have confirmed the area is clear

B. Stop the hoist immediately and sound the emergency horn to alert the worker — the operator must not lower the load over a person regardless of what signal has been given; the signal person may not have seen the worker who is directly below the load; the operator has an independent obligation to not lower the load over personnel, and must stop and warn the worker before any lowering movement is executed

C. Lower slowly while the signal person clears the worker from the area

D. Lower at minimum speed since the worker will hear the crane's load approaching and move away

32. A crane operator is performing a jib pick when the jib hook's load line suddenly goes slack with the load at 4 feet of height. The main boom function is operating normally. The load has not dropped to the ground. What does a sudden loss of tension in the jib load line indicate and what action is required?

A. Nothing — jib load line slack during the initial stages of a hoist is normal for multi-part reeving configurations

B. The slack indicates the jib load line brake has prematurely engaged — release the brake and re-hoist

C. A sudden loss of tension in the jib load line with the load still elevated indicates the load is no longer being supported by the jib load line — the load must be resting on something (a support, a ledge) or the rigging has failed; if the rigging has failed, the load is suspended only by the failed rigging component and can drop suddenly; the operator must stop all crane movement and confirm the load's actual support condition before any further movement

D. Continue the hoist since the slack will disappear as the drum takes up the rope

33. A crane operator is directing the crane while performing a precision steel erection lift. During the beam's approach to the structural connection, the signal person momentarily steps behind a column and loses sight of the beam. Three seconds after losing sight, the signal person steps back into view and resumes signals. During those 3 seconds, what must the operator have done?

A. The operator must stop all crane movement during any break in the signal person's line of sight and hold the load stationary until the signal person reestablishes confirmed visual contact with both the load and the operator — the 3-second gap in line of sight means crane movement during that period was

without guidance; the load must be stationary before the signal person loses line of sight, not resumed while they are searching for a new position

B. Continue at minimum speed since 3 seconds is too brief to stop and restart safely

C. Continue the approach based on the last known position of the beam relative to the connection

D. Contact the lift director to confirm whether the brief loss of signal person sight constitutes a required stop

34. Under OSHA 1926.1416, when a crane operator has physically left the cab during a non-operational period and the load has been lowered and secured, which of the following must be done to the crane before the operator leaves?

A. Turn off the engine and lock the ignition key in the crane's cab lockbox

B. Lower all accessible functions, engage the boom travel lock, and secure the hydraulic tank fill cap

C. Apply all brakes, secure all functions with brakes and pawls, and protect against unauthorized use by removing the ignition key or otherwise preventing operation — all of these measures together satisfy the operator's obligation to secure the crane against inadvertent or unauthorized operation when left unattended; any single measure alone is insufficient

D. Place the boom in the transport position and lock the cab door before leaving the crane

35. A crane operator is performing a critical lift when the lift director says: "The load is 2 feet away from the landing point — stop the swing right here." The operator stops the upper works but the load continues to swing past the stopping point due to momentum and ends up in contact with the structural member at the landing point. The contact is brief and no visible damage occurs. What must happen before the lift continues?

A. Nothing — the brief contact indicates the load reached the correct set location and the lift may continue

B. A qualified person must inspect the structural connection point, the rigging, and all load contact surfaces for damage before the lift continues — even brief contact between a heavy load and a structural

member can cause deformation, cracking, or welding damage at connection points; the load's rigging may have shifted, and the structural member may be cracked or displaced; inspection must precede any further movement

C. The signal person must confirm verbally that no damage occurred before the lift continues

D. Continue the lift since the load is now within 2 feet of the set location and no visible damage occurred

36. A crane operator is preparing for a critical lift at 87% of rated capacity when the lift director asks whether the operator has reviewed the critical lift plan. The operator reviewed the plan 4 days ago but conditions have changed since — a new underground utility was identified in the setup area and the crane was repositioned 6 feet. Is the original plan still valid?

A. The critical lift plan is valid since repositioning the crane by 6 feet is within normal operational tolerance

B. Nothing — the critical lift plan covers the crane type and load, not the specific position

C. The lift director must authorize using the original plan despite the changed conditions

D. The original critical lift plan is no longer valid — the repositioning of 6 feet changes the operating radius for all planned lifts, which changes the applicable capacity values; the new underground utility identification may affect the outrigger support assessment; the plan must be updated to reflect current conditions before the critical lift proceeds

37. A crane operator is performing a lift when the operator's console shows a "LOW HYDRAULIC PRESSURE" warning light illuminate briefly and then go out. The crane is functioning normally. The load is at 4 feet of height. What is the correct response?

A. Stop the hoist, hold the load at current height, and investigate the low hydraulic pressure warning before continuing — a hydraulic pressure warning that appeared and went out may indicate an intermittent condition that will recur; low hydraulic pressure directly affects the crane's brake holding capacity and the ability to control the load; an intermittent low pressure condition that is ignored could escalate to complete pressure loss during a subsequent lift at greater height or higher capacity

B. Continue the lift since the warning light is no longer active — intermittent warnings are expected in normal crane operations

C. Complete the current lift and check the hydraulic system at the end of the shift

D. Ask the lift director to confirm the warning light may have been a sensor fault before taking action

38. Under OSHA 1926.1431, when personnel hoisting operations require the crane to travel — pick-and-carry of a personnel platform — what additional requirements apply beyond those for stationary personnel hoisting?

A. Pick-and-carry personnel hoisting is always prohibited — the crane must be stationary for all personnel hoisting operations

B. Nothing — pick-and-carry personnel hoisting is subject to the same requirements as stationary personnel hoisting

C. Pick-and-carry of a personnel platform requires: the specific crane must be rated for pick-and-carry operations with a platform; the platform travel capacity must be confirmed in the load chart; the surface must be firm and level within the pick-and-carry specification; the load must remain within the pick-and-carry rated parameters throughout travel; and travel speed must be reduced to the manufacturer's maximum travel speed with platform

D. Pick-and-carry personnel hoisting requires an additional signal person to walk beside the crane throughout all travel

39. A crane is performing a lift at 86% of rated capacity when the rigger radios the operator and says the crane "looks like it's starting to lean." The operator checks the level indicator and it reads exactly 0% — perfectly level. The crane is not leaning according to the instrument. What must the operator do?

A. Nothing — the level indicator confirms the crane is not leaning; the rigger may be seeing optical distortion

B. Stop the hoist immediately and investigate the reported lean — a rigger observing from outside the crane may have noticed a change that is below the instrument's resolution or may have seen a change in the mat-to-soil contact condition before the inclinometer captures it; the rigger's ground-level

observation combined with any unusual condition at the outrigger positions must be evaluated before continuing the near-capacity lift

C. Ask a second person to confirm the apparent lean before deciding whether to stop

D. Continue at reduced speed until the rigger's observation can be confirmed or denied

40. Under ASME B30.5, when a load is suspended at height during a planned extended hold, what is the maximum time the load may be held before the operator must lower it to the ground?

A. Loads may not be held for more than 30 minutes without lowering to the ground

B. Loads may be held for up to 2 hours with the lift director's authorization before requiring a ground set

C. Nothing — the hold duration is unlimited as long as the crane remains in proper operating condition throughout the hold; however, the operator must remain at the controls, all brakes must be functional, and the area below the load must remain controlled; there is no ASME B30.5 maximum hold time for a properly secured crane holding a load within its rated capacity

D. The 4-hour maximum hold time applies to all loads above 75% of rated capacity

41. A crane operator is performing a lift when the crane's ATB weight is observed to be missing — the ATB cable is present but the weight has fallen off during operations. The operator noticed this during the current hoist. The hook block is at 15 feet of height. What must the operator do?

A. Immediately stop the hoist and lower the load to the ground — the ATB weight is missing, meaning the ATB system cannot function; without the ATB weight, the hook block can contact the boom tip sheave without triggering the protective system; two-blocking would occur without warning; operations must not continue until the ATB weight is reinstalled and the system is confirmed functional

B. Continue the hoist while monitoring the hook block's height relative to the boom tip

C. Reduce hoist speed to minimum and complete the current lift cycle before replacing the ATB weight

D. Stop the hoist at the current position and request that a rigger reinstall the ATB weight before continuing

42. A crane operator is asked to perform a lift where the signal person will communicate using a radio. Before beginning, the operator and signal person test the radio system. The signal person's voice is clear but there is a 2-second delay between the signal person pressing the transmit button and the operator hearing the command — the radio system is functioning but has a 2-second delay. What action is required?

- A. Nothing — 2-second radio delay is normal for UHF communication systems
- B. Use the delayed radio system and have the signal person anticipate crane movements by giving commands 2 seconds early to account for the delay
- C. The radio communication system must be replaced with a system without significant delay — 2 seconds is sufficient time for the crane to travel a significant distance during a precision placement; crane signals must be immediate to be effective; a 2-second delay between command and receipt means the operator cannot respond in time to prevent contact with obstacles during precision placement; the communication system must be confirmed reliable before operations
- D. Accept the 2-second delay for STOP signals only — all other signals may use the delayed system

43. A crane operator is performing a lift at 91% of rated capacity when they observe that the rigging below the hook block appears to have one sling leg that is at a noticeably steeper angle than the other three legs — the load appears slightly tilted. The pick has been made and the load is 6 inches off the ground. What is the required action?

- A. Lower the load to the ground immediately and have the rigging inspected and corrected before re-picking — a tilted load at 6 inches of height indicates the rigging geometry is not distributing the load as planned; at 91% of rated capacity, a non-symmetric load distribution may be concentrating load on individual sling legs beyond their rated capacity; returning the load to the ground is the only safe way to correct the rigging geometry
- B. Continue the hoist — the load will self-level as it rises since the heavier side will settle
- C. Continue the hoist slowly while the rigger manually adjusts the uneven leg
- D. Hoist to 3 feet and then lower to let the sling legs equalize before proceeding to the set location

44. Under OSHA 1926.1419, when the designated signal person and the crane operator cannot establish visual contact — neither can see each other directly — what is the required communication method?

- A. The operator may proceed without visual contact using radio communication only
- B. The lift director may relay signals verbally from a position visible to both the operator and signal person
- C. A voice communication system between the operator and signal person must be established — radio communication is specifically authorized when line of sight cannot be established; the radio system must be confirmed functional before operations begin
- D. A relay signal person positioned so that both the operator and the original signal person are visible must be established — or a voice communication system that both parties confirm is working correctly must be in place; the relay system maintains the signal chain without gaps in the communication path

45. A crane operator completes a shift having performed 11 lifts, the last of which was at 92% of rated capacity with a confirmed total suspended weight of 34,200 lbs. The relief operator's pre-shift inspection finds that the right front outrigger pad has sunk into the ground approximately 0.75 inches since the start of the previous shift. What must the relief operator do?

- A. Accept the outrigger condition since 0.75 inches of settlement over a full shift is within normal tolerance
- B. Document the settlement and continue with the first lift of the new shift while monitoring for additional settlement
- C. The relief operator must stop operations and notify the employer of the 0.75-inch outrigger settlement — the pad has sunk 0.75 inches during the previous shift's lifting operations, indicating the soil at that position is yielding under load; before any further lifting, the ground condition at that position must be re-evaluated and confirmed adequate; the settlement must be addressed before a new shift of operations begins
- D. Re-level the crane by extending the settled outrigger jack and continue operations

46. A crane operator is performing a lift at 88% of rated capacity when a worker on an adjacent building floor calls out to the operator that there is a person trapped in the building's basement directly below the load's set location. The load is at 20 feet of height. What must the operator do?

A. Continue to the set location at minimum speed since the trapped person is in the basement below the set point, not in the load's path

B. Nothing — the signal person is responsible for confirming the set area is clear; the operator received no stop signal

C. Stop all crane movement immediately and hold the load at current height — if a person is trapped in the area beneath the planned set location, the load cannot be set in that location regardless of what path the load has already traveled; the situation must be assessed to confirm the person is actually present and to determine an alternative set location or rescue plan before any further movement

D. Lower the load to 5 feet of height as a precaution while the report of a trapped person is investigated

47. A crane is performing a lift in a marine environment when the operator observes that the barge the crane is mounted on has developed a 1.5-degree list toward the load side during the hoist — the barge is tilting toward the load. The crane's manufacturer specifies a maximum operating level tolerance of 1% (approximately 0.57 degrees). What must the operator do?

A. Nothing — 1.5 degrees is within normal barge operational tolerance during crane operations

B. Stop the hoist immediately and lower the load to the deck — the 1.5-degree barge list exceeds the crane's 0.57-degree maximum level tolerance; operating on an out-of-tolerance barge creates the same effect as operating on out-of-level ground — the effective operating radius is increased and the stability margin is reduced below what the load chart values assume; the load must be secured and the barge re-ballasted before any further crane operations

C. Reduce the hoist speed to minimum and continue while the barge crew adjusts the ballast

D. The crane may continue at 75% of rated capacity while the barge list is corrected through ballasting

48. A crane operator is completing a 10-hour shift with the final lift scheduled at 88% of rated capacity. The operator has been performing lifts steadily throughout the day and feels adequately focused. During

the final lift's pre-lift meeting, the lift director notices the operator's speech is slightly slurred and their response times appear slower than normal. What should the lift director do?

- A. Allow the operator to complete the final scheduled lift and then send them home
- B. Reduce the final lift's planned load to 75% to lower the risk given the observed cognitive change
- C. Nothing — operators self-certify their fitness and the lift director cannot override an operator's fitness assessment
- D. The lift director must stop operations and relieve the operator from crane duty immediately — observed cognitive changes (slurred speech, slowed response) in a crane operator represent a serious safety hazard regardless of the operator's subjective sense of fitness; the lift director has authority and responsibility to relieve an operator showing signs of impairment; the 88% critical lift must not proceed with an operator showing these signs

TECHNICAL KNOWLEDGE DOMAIN — Questions 49–70

49. A crane inspector is examining a 5/8-inch diameter wire rope and finds a section where the measured diameter has reduced from the nominal 5/8 inch (0.625 inches) to 0.572 inches. What is the diameter reduction in 64ths of an inch and does it meet the ASME B30.5 / OSHA 1926.1413 removal criterion?

- A. Diameter reduction = $0.625 - 0.572 = 0.053$ inches = approximately $3.4/64$ inch; the ASME B30.5 removal criterion for diameter reduction is $3/64$ inch (0.047 inches) for most rope diameters; the 0.053-inch reduction exceeds the $3/64$ -inch removal criterion; the rope must be removed from service
- B. The 0.053-inch reduction is within the 5% diameter reduction tolerance for 5/8-inch rope
- C. Diameter reduction criteria only apply to ropes with visible broken wires — no criterion applies to diameter reduction alone
- D. The $3/64$ -inch criterion applies to ropes 1 inch and larger — smaller ropes use a $1/32$ -inch criterion

50. Under ASME B30.9, which of the following conditions requires removal of a synthetic web sling from service regardless of the sling's apparent structural integrity?

A. Nothing — visible structural damage is the only criterion for removing a synthetic web sling; age alone is not a criterion

B. The sling must be removed when any of the following are present: cuts, tears, or holes; evidence of heat damage; chemical contamination that may have reduced strength; knots in the webbing; lack of legible identification tag; UV fading indicating significant degradation; or any deformation of the metal end fittings — the presence of any one of these conditions is individually sufficient for removal regardless of whether other conditions appear normal

C. The sling may remain in service unless two or more removal conditions are simultaneously present

D. Removal criteria apply only to synthetic web slings used in choker hitch configurations

51. A crane operator is reviewing the pre-shift inspection report when they find that the crane's boom foot pin — the large pin connecting the boom's lower chord to the rotating bed — shows wear marks on its journal surface. The wear marks are described as "longitudinal scratches approximately 3/8 inch long" on the pin's bearing surface. What is the significance of scratches on a boom foot pin bearing surface?

A. Scratches on journal surfaces are always cosmetic — they do not affect the pin's shear capacity

B. Longitudinal scratches on a boom foot pin bearing surface indicate the pin has been moving axially within its journal — the pin is sliding in and out of its designed position during operations; this axial movement may indicate inadequate pin retention or structural movement at the boom base; this deficiency must be evaluated by a qualified person before operations continue

C. Nothing — boom foot pin journal wear is expected in high-cycle applications and requires no action

D. The scratches indicate the pin requires additional lubrication — apply grease to the pin journal and continue operations

52. A crane's wire rope is being replaced. The replacement rope is confirmed as the correct specification. However, when the rigger attempts to install the rope, they discover the drum's rope anchor socket is

designed for a 3/4-inch rope but the replacement rope is 7/8 inch. The rope was ordered in error. What must happen?

- A. Force the 7/8-inch rope into the 3/4-inch socket using a press — the rope will compress slightly to fit
- B. Cut the first few inches of rope to reduce the diameter at the anchor end to 3/4 inch using a torch
- C. The correct rope diameter must be ordered and received before the crane can return to service — using a rope that is too large for the drum anchor socket creates an improper attachment that may not develop the full rope-to-socket holding strength; the socket was designed and rated for the specific rope diameter; mismatched rope-to-socket connections can fail at loads below the rope's rated capacity
- D. Tie the oversized rope to the drum using wire rope clips as an emergency connection until the correct rope arrives

53. Under ASME B30.26, when a hook on a below-the-hook lifting device shows a throat opening increase of 12% from the nominal dimension, what action is required?

- A. The hook must be removed from service — ASME B30.10 specifies the removal criterion at greater than 15% throat opening increase; a 12% increase is within the acceptable limit but should be documented and monitored at frequent intervals since it is approaching the removal threshold
- B. Nothing — ASME B30.26 does not specify throat opening removal criteria for below-the-hook device hooks
- C. Monitor the throat opening at weekly intervals — remove from service when the increase exceeds 15%
- D. Nothing — the 12% increase is within the standard 20% tolerance for all hook types under all applicable standards

54. A crane operator is reviewing the inspection documentation and finds that the crane's load cell — the component that measures load force in the LMI system — has not been calibrated in 26 months. The manufacturer's recommended calibration interval is 12 months. What is the implication of an overdue load cell calibration?

A. Calibration intervals are guidelines — the load cell remains accurate indefinitely unless a specific calibration drift is observed

B. Nothing — the LMI is a secondary safety device; calibration is only required when the primary indicators show inconsistency

C. An overdue load cell calibration means the accuracy of the LMI's load percentage display cannot be confirmed — the load cell may have drifted from its calibrated value, causing the LMI to display load percentages that are different from the actual percentage; if the cell reads low, the operator may believe more capacity margin exists than actually does; the load cell must be calibrated before near-capacity operations rely on the LMI display for accuracy

D. The load cell calibration status has no operational impact since crane structural capacity is determined by the load chart, not the LMI

55. A crane inspector is examining a G210 alloy steel lifting clamp used for plate lifting. During inspection, the inspector finds that the cam serrations — the teeth on the clamping jaw that grip the steel plate — are worn smooth. What is the operational consequence of worn cam serrations?

A. Worn cam serrations are a cosmetic wear pattern that does not affect the clamp's holding force

B. Worn cam serrations reduce the clamp's grip coefficient between the jaw surface and the steel plate — the cam relies on the serrations digging into the plate surface to develop holding friction; when the serrations are worn smooth, the clamp may slip at loads well below its rated WLL, potentially releasing the load suddenly; the clamp must be removed from service until the jaw is replaced or re-serrated by the manufacturer

C. Worn cam serrations require only that the clamp be used on plates with a roughened surface

D. Worn cam serrations are an expected result of normal use — they improve after re-conditioning with a file

56. A crane's annual inspection report documents: "Evidence of previous weld repair on left boom chord section 4 — appears to have been repaired without documentation." The repair was performed at some point in the past. No record exists of the repair in the crane's maintenance history. What is the significance of an undocumented weld repair on a boom structural member?

- A. Undocumented weld repairs are administratively non-compliant but structurally acceptable if the weld appears sound
- B. Nothing — weld repairs on boom structural members are routine maintenance that do not require documentation
- C. The weld's appearance on the external surface is adequate confirmation of its structural adequacy
- D. An undocumented weld repair on a structural boom member means the repair was not performed under an approved repair procedure, may not have been performed by a qualified welder, and has not been verified against the manufacturer's specifications; without documentation, the repair's adequacy cannot be confirmed; the crane manufacturer or a qualified structural engineer must evaluate the weld repair and confirm it meets the applicable standard before the crane is used for rated load operations

57. Under OSHA 1926.1412(f)(1), what must be performed after a crane undergoes a repair, adjustment, or modification that may affect the crane's safe operation?

- A. The crane must receive an annual comprehensive inspection within 30 days of any repair that may affect safe operation
- B. Nothing specific — the monthly periodic inspection schedule automatically covers any recent repairs
- C. The employer is only required to document the repair and return the crane to service
- D. An inspection must be performed by a qualified person after any repair, adjustment, or modification that may affect the crane's safe operation — this inspection must confirm that the repair was performed correctly and the affected components are functioning as designed before the crane is used; the inspection is in addition to and separate from the regular inspection schedule

58. A rigger is using a 4-leg wire rope sling in a bridle configuration when they notice that during the pick, one sling leg has gone slack while the other three are taut. The load weighs 24,000 lbs and is attached to a 4-point rigging frame. What does one slack leg indicate?

- A. Nothing — in a 4-leg bridle, it is normal for one leg to be slack due to the mechanical indeterminacy of the 4-point system

B. One slack leg in a 4-point bridle indicates a rigging geometry problem — the frame or load may be twisted, one attachment point is positioned lower than the others due to a geometry error, or the load is not rigid; most critically, if one leg is slack, the three taut legs are each carrying one-third of the total load rather than one-fourth; at 24,000 lbs, each taut leg is now carrying 8,000 lbs rather than the 6,000 lbs that was planned; the rigging geometry must be confirmed adequate for the actual 3-leg distribution before proceeding

C. Slack in one sling leg is caused by the sling leg being slightly longer than the others — trim the long leg

D. One slack leg confirms the load is within the sling's capacity since the slack leg is not bearing

59. A crane's hydraulic boom hoist cylinder is found to have an external leak from a crack in the cylinder barrel — the cylinder body itself has cracked and is leaking hydraulic fluid under pressure. The boom is currently elevated at 65 degrees. What is the specific hazard created by a cracked hydraulic cylinder barrel?

A. Nothing — a cracked cylinder barrel is a fluid containment issue only; the brake system holds the boom independently

B. A cracked hydraulic cylinder barrel means the hydraulic fluid pressure that holds the boom at its current angle is being lost — as pressure drops, the counterbalance valve protecting the cylinder will eventually lose enough pilot pressure to open, allowing the boom to lower without operator input; additionally, pressurized hydraulic fluid spraying from the crack creates fire and injection injury hazards; the crane must be removed from service immediately and the boom lowered using the remaining pressure before it is entirely lost

C. The crane may continue in operation if the boom angle is reduced to below 45 degrees to reduce the cylinder load

D. Reduce the operating load to 60% of rated capacity and monitor the leak rate for the remainder of the shift

60. Under ASME B30.5, what is required for the crane operator to do regarding the load line when a hook block is going to be used at an extreme short radius — specifically when the hook block approaches the boom tip within a distance less than the manufacturer's minimum operating clearance?

A. Nothing — the ATB system automatically manages minimum clearance between the hook block and boom tip

B. The operator must never intentionally approach the boom tip with the hook block; if a short radius configuration requires closer approach, the rope must be re-reeved for fewer parts of line to lower the hook block without approaching the boom tip

C. Confirm the ATB system is functional and then proceed to the minimum clearance position

D. The operator must confirm through direct observation or by testing the ATB that the hook block cannot physically contact the boom tip sheave at the planned minimum working height — the ATB is a backup device that must never be intentionally used as a limit stop; the rope length and configuration must prevent two-blocking under normal operating conditions without relying on ATB activation as the primary control

61. A crane inspector finds during the annual comprehensive inspection that the crane's swing brake friction lining material has worn to approximately 40% of its original thickness. The manufacturer's specification calls for replacement when the lining reaches 30% of original thickness. What action is required based on this finding?

A. The lining must be replaced immediately — at 40% of original thickness, the lining is close to the manufacturer's replacement criterion and continued operations accelerate the wear rate; while 40% is technically above the 30% replacement threshold, the remaining life from 40% to 30% may be consumed quickly during the high-cycle operations typical of construction crane use; the lining should be replaced at the earliest opportunity to prevent it from reaching the 30% threshold during operations

B. Nothing — the lining is above the manufacturer's 30% replacement threshold; document the thickness and monitor at monthly inspections until 30% is reached

C. Reduce all swing operations to 50% of normal swing speed to extend the lining life until the next scheduled maintenance

D. The brake lining is at 40% — above the 30% replacement limit; however, replacement should be planned for the next available maintenance window within 30 days

62. A crane operator is asked about the purpose and limitations of the crane's load moment indicator (LMI). Which statement correctly describes both the LMI's function and its limitations?

A. The LMI is a primary safety device — its reading definitively confirms the crane is within rated capacity at all times; if the LMI reads below 100%, the crane is unquestionably safe

B. Nothing — LMIs are supplementary devices that add complexity without meaningful safety benefit

C. The LMI provides real-time monitoring of the load moment relative to the rated capacity — it displays a warning when approaching or at rated capacity; however, the LMI is a supplementary aid, not the primary safety device; it can be misconfigured, miscalibrated, or subject to sensor faults; the operator must independently verify capacity through load chart lookup before each lift and cannot rely on the LMI as the sole authority for capacity confirmation

D. The LMI is only required for critical lifts — standard lifts may proceed without LMI confirmation

63. A crane's wire rope is found during inspection to have a section where the wire appears to have a yellowish-tan discoloration on the surface that is different from normal oxidation — the color is localized to a 12-inch section near a return sheave. When a finger is wiped across the surface, a yellow-tan transfer occurs. What does this localized discoloration most likely indicate?

A. Nothing — wire rope discoloration from rope lubricant oxidation is normal and does not indicate damage

B. A yellowish-tan discoloration localized to a section near a sheave may indicate that the rope has been in contact with copper-based material — possibly from a bronze or brass sheave bushing that is failing; copper-based bushing material abrading onto the steel wire creates the characteristic yellowish color transfer; a failing sheave bushing reduces lubrication and increases contact friction, accelerating rope wear; the sheave bushing must be inspected and the wire rope section evaluated for abrasion damage

C. The yellow discoloration indicates the rope has been exposed to acids that require immediate decontamination

D. Yellow wire discoloration is caused by UV exposure and is expected in outdoor crane applications

64. A crane is operating when the operator hears a grinding sound from the slewing ring drive system that occurs only when the swing function is activated. The sound is consistent regardless of load weight but varies in intensity with swing speed. What does load-independent, speed-dependent grinding from the swing drive indicate?

- A. The grinding indicates the swing drive motor is low on oil — add oil and continue operations
- B. The grinding is caused by normal ring gear break-in noise during the first 100 hours of operation
- C. The grinding is caused by debris in the swing drive gear housing — flush the housing and return to service
- D. Load-independent, speed-dependent grinding from the swing drive indicates mechanical wear or damage within the swing drive's gear or bearing system — the consistency regardless of load eliminates the load line as the source, and the speed-dependence indicates a rotating component; gear tooth wear, bearing damage, or a foreign object in the gear mesh are all possible causes; crane operations must stop and the swing drive must be inspected before further use

65. A crane operator is reviewing the maintenance log and finds that the crane's boom section 3 lower chord member was replaced 2 years ago after an impact damage incident. The replacement is documented, but there is no record of a proof load test following the replacement. Under ASME B30.5 and OSHA 1926.1412, what should have been done after the structural member replacement?

- A. A post-repair inspection by a qualified person and, if specified by the manufacturer or engineer of record, a proof load test must be performed after any structural member replacement — operating the crane after a structural member replacement without this verification means the repaired component's structural adequacy has never been confirmed under actual loading conditions; this documentation gap should be addressed with the crane manufacturer or a qualified structural engineer
- B. Nothing — replacement with an OEM component automatically confirms structural adequacy without testing
- C. Monthly inspections for the following 6 months after a structural repair substitute for the immediate post-repair test
- D. The 2-year service history without incident confirms the repair was adequate — no post-repair documentation is needed retrospectively

66. Under ASME B30.9, what is the specific action required when the manufacturer's tag on a wire rope sling cannot be read — the tag is present but illegible?

A. The sling may continue in service as long as the operator can identify the sling's type and capacity from its visual appearance and diameter

B. Nothing — sling tags are administrative items; the sling's capacity is confirmed by its physical diameter and construction

C. The sling must be removed from service until the identification tag can be replaced with accurate information — a sling without a legible identification tag cannot be confirmed to have the rated capacity assumed for any specific lift; without the tag, the operator cannot confirm the WLL, sling grade, design factor, or maximum safe working angle; using an unidentified sling for a specific lift creates an unknown-capacity condition

D. The operator may write the sling's capacity on the sling with a marker as a temporary identification measure

67. A crane's hydraulic hoist cylinder has been repaired by replacing the rod seals. After the repair, the operator conducts a test hoist and observes that the load drifts downward at a rate of 1/4 inch per minute with the controls in neutral. Before the seal repair, the same test showed zero drift. What does post-repair drift indicate?

A. Post-repair drift of 1/4 inch per minute is within normal tolerance for hydraulic systems with new seals

B. Post-repair drift indicates the new seals were either installed incorrectly, are the wrong specification, or have been damaged during installation — the new seals are not providing the internal sealing required to prevent hydraulic fluid bypass; the load drift will worsen progressively as the seals wear further; the crane must be removed from service and the seals re-examined and corrected before any lifting operations

C. New seals always show initial drift during break-in — the drift will stop after 20 to 30 hoist cycles

D. Post-repair drift is caused by hydraulic fluid aeration from the repair process — bleed the system and the drift will stop

68. A crane inspector finds that the crane's anti-two-block (ATB) weight — the device that triggers the ATB system — is missing entirely. The ATB cable is present and connected to the ATB switch but there is no weight attached. Under what conditions may the crane be operated?

- A. The crane may be operated at reduced hoist speed until the ATB weight is replaced
- B. The crane may be operated for lifts below 50% of rated capacity where two-blocking risk is reduced
- C. The ATB weight may be temporarily replaced with an equivalent weight made from available materials until an OEM weight can be obtained
- D. The crane may not be operated — the ATB weight is required for the system to function; without the weight, the ATB cable is not positioned to be contacted by the rising hook block, and two-blocking can occur without triggering the protective system; the crane is out of compliance with ASME B30.5 safety device requirements until the ATB weight is replaced

69. A crane is operating when the operator observes that the wire rope on the main hoist drum is beginning to layer incorrectly — the rope of the second layer is laying on top of the first layer in the wrong position, causing the rope to cross over multiple grooves rather than following the drum's helical groove path. What is the immediate consequence of this incorrect layering?

- A. Nothing — multi-layer drum rope cross-winding is normal for cranes with high drum capacity
- B. Incorrect layering causes the rope in the upper layer to cross over multiple grooves, creating multiple contact points between the crossing rope and the rope beneath it — each crossing point compresses the lower rope under the weight of the upper layers, causing the lower rope to be crushed into a flattened deformed condition; additionally, the crossing creates high-pressure contact points that accelerate wire fatigue; operations must stop and the rope must be respooled correctly
- C. The cross-winding will self-correct when the drum unwinds during the next lowering cycle
- D. Incorrect layering only creates concern when the rope crosses more than 5 grooves at one time

70. Under OSHA 1926 Subpart CC, what is the crane operator's required response when the operator's physical condition — such as a medication they are taking — is known to impair their ability to safely operate the crane?

- A. The operator may continue operations if the medication impairs only their peripheral vision and not their primary control abilities

B. Nothing — an operator's medical condition and medications are private health information that cannot be used to restrict their work

C. The operator must not operate the crane when their physical or mental condition is impaired to the degree that it affects the safe operation of the crane — this is an absolute personal obligation that the operator bears; impairment from medication, illness, fatigue, or any other cause that affects safe operation must prevent the operator from taking the controls; this requirement applies regardless of project schedule, employer direction, or the operator's subjective assessment that they can manage

D. The operator may self-assess the impact of the medication and operate at reduced capacity until the medication clears

LOAD CHARTS DOMAIN — Questions 71–95

71. A crane's load chart for the 100-foot boom at full outrigger extension shows: 30 ft = 36,000 lbs; 35 ft = 28,400 lbs; 40 ft = 22,200 lbs. The planned operating radius is 32 feet. The total rigging weighs 2,800 lbs and the payload weighs 23,800 lbs. The total suspended weight is 26,600 lbs. Using the conservative approach, what capacity governs and what is the lift percentage?

A. Conservative capacity at 35 ft = 28,400 lbs; total suspended weight = 26,600 lbs; lift percentage = $26,600 \div 28,400 \times 100 = 93.7\%$ — this exceeds the 75% critical lift threshold; a written critical lift plan and pre-lift meeting are required before the lift proceeds

B. Conservative capacity at 35 ft = 28,400 lbs; 26,600 lbs is within capacity; lift percentage = 93.7% but no critical lift plan is needed since the conservative approach applies a natural margin

C. Conservative capacity at 40 ft = 22,200 lbs; 26,600 lbs exceeds this — lift cannot proceed

D. The lift percentage is calculated against the tabulated 30 ft value — $26,600 \div 36,000 = 73.9\%$ — no critical lift plan needed

72. A crane load chart for the on-outrigger full extension section shows a note: "Capacities in this section apply only when all four outrigger beams are extended to full extension AND all four outrigger pads confirm solid contact with a firm supporting surface." During setup, the operator confirms full extension but one outrigger pad is positioned over a surface drain inlet — the pad spans the inlet with approximately 25% of the pad's area over the drain opening. Does this setup satisfy the note?

A. Nothing — the pad spans the drain and is supported on the adjacent concrete — the drain covers an insignificant percentage of the pad area

B. The 25% pad area over the drain opening does not provide solid contact for 100% of the pad — the drain inlet represents an unsupported area that concentrates the outrigger load on the remaining 75% of the pad; the note requires all four pads to confirm solid contact; this pad does not meet that requirement; the pad must be repositioned away from the drain before these capacity values can be used

C. Nothing — drain covers are structural elements rated for vehicle loading and provide adequate support

D. Accept the condition and apply a 25% capacity reduction to account for the reduced pad contact area

73. A crane load chart shows: "ON OUTRIGGERS — 75% EXTENSION — 80-FT BOOM": 25 ft = 26,200 lbs; 30 ft = 20,800 lbs; 35 ft = 16,600 lbs. A planned lift at 27 feet has a total suspended weight of 22,000 lbs. Using the conservative approach, is the lift within capacity?

A. Conservative capacity at 30 ft = 20,800 lbs; total suspended weight (22,000 lbs) exceeds 20,800 lbs — the lift cannot proceed in the 75% extension configuration at 27 feet of radius

B. Conservative capacity at 25 ft = 26,200 lbs; 22,000 lbs is within capacity — lift proceeds using the smaller tabulated value

C. Nothing — the interpolated capacity at 27 ft (25,000 lbs) supports the 22,000-lb load; lift proceeds

D. Conservative capacity at 35 ft = 16,600 lbs; the most conservative value is used for all non-tabulated radii

74. A crane load chart section contains the following note: "Maximum outrigger reaction loads for each configuration are provided in Table R. Confirm ground bearing capacity is adequate before each lift." The operator has confirmed a soil bearing capacity of 3,600 psf. Table R shows a maximum outrigger reaction of 88,000 lbs for the planned lift configuration. What is the minimum required outrigger pad contact area?

A. Nothing — the 3,600 psf capacity applies to the outrigger float area only; cribbing area is irrelevant

- B. Cribbing is only needed when the outrigger reaction exceeds 100,000 lbs for standard soil conditions
- C. Minimum contact area = $88,000 \div 3,600 = 24.4$ sq ft — the outrigger pad and cribbing combined must provide at least 24.4 square feet of contact area with the soil to keep bearing pressure within the 3,600 psf limit; rounding up, a minimum of 25 square feet of solid contact is required at the heaviest outrigger position
- D. Minimum contact area = $88,000 \div 3,600 = 24.4$ sq ft; this means two 4×4 mats (32 sq ft combined) would exceed the minimum requirement with adequate margin

75. A crane load chart shows: "100-FT BOOM — ON OUTRIGGERS — FULL EXTENSION — ALL DIRECTIONS": 20 ft = 54,400 lbs; 25 ft = 43,200 lbs; 30 ft = 34,000 lbs. All cells are white (stability-limited). A planned critical lift at 22 feet has a total suspended weight of 50,000 lbs. Using the conservative approach, does the lift proceed?

- A. Nothing — the lift proceeds since the interpolated capacity at 22 ft = 51,360 lbs; 50,000 lbs is within this value
- B. Conservative capacity at 25 ft = 43,200 lbs; 50,000 lbs exceeds 43,200 lbs — the lift cannot proceed using the conservative approach; the operator must either reduce the total suspended weight to below 43,200 lbs, or reposition the crane to reduce the operating radius to 20 feet or less where the 54,400-lb capacity directly supports the load
- C. The 20-foot tabulated capacity of 54,400 lbs governs since 22 feet is closer to 20 feet than to 25 feet
- D. Nothing — all stability-limited cells use a 25% margin; the effective capacity limit is $54,400 \times 0.75 = 40,800$ lbs

76. A crane's load chart shows: "OVER FRONT SECTOR (0° to 20° each side)": at 25 ft = 48,600 lbs. "360° ALL DIRECTIONS": at 25 ft = 36,800 lbs. A lift requires the boom to start at 18 degrees right of front center (within the over-front sector), pick the load, swing 110 degrees to 92 degrees left of front (outside the over-front sector into the all-directions zone), and set the load. The total suspended weight is 44,000 lbs. What is the compliance status?

- A. Nothing — the over-front capacity of 48,600 lbs governs since that is where the pick occurs

B. Nothing — the lift starts in the over-front sector where capacity supports the load; the all-directions capacity governs only at the set location

C. The lift must be re-planned — the total suspended weight of 44,000 lbs must be within the capacity applicable throughout the entire swing arc; during the swing, the boom passes through the all-directions sector where the applicable capacity is 36,800 lbs; 44,000 lbs exceeds 36,800 lbs; the lift cannot proceed as planned without reducing the load below 36,800 lbs or redesigning the lift to stay within the over-front sector

D. The 44,000-lb load is within the 48,600-lb over-front capacity; proceed using the over-front section throughout since the pick is in the sector

77. A crane load chart for an 80-foot boom at full outrigger extension shows the following: 30 ft = 34,200 lbs; 35 ft = 27,000 lbs; 40 ft = 21,000 lbs. A planned lift at 36 feet has a total suspended weight of 24,500 lbs. Using linear interpolation between 35 and 40 feet, what is the estimated capacity at 36 feet?

A. Interpolated capacity at 36 ft = $27,000 - [(36-35) \div (40-35)] \times (27,000-21,000) = 27,000 - (0.2 \times 6,000) = 27,000 - 1,200 = 25,800$ lbs; 24,500 lbs is within the 25,800-lb interpolated capacity

B. Interpolated capacity at 36 ft = 25,800 lbs; 24,500 lbs is within capacity; but the conservative approach using the 40-foot entry (21,000 lbs) would not support the lift

C. Interpolated capacity = 25,800 lbs; confirming the lift proceeds using interpolated values with 1,300 lbs of margin

D. Interpolated capacity = 25,200 lbs using a simplified equal-interval approach; 24,500 lbs is within capacity

78. A crane's manufacturer load chart shows three counterweight configurations: 14,000 lbs, 18,000 lbs, and 22,000 lbs. At 40 feet of radius with an 80-foot boom, the capacities are: 14,000 lb CW = 19,400 lbs; 18,000 lb CW = 23,800 lbs; 22,000 lb CW = 23,800 lbs. The 18,000 and 22,000 lb counterweight sections show identical capacity at 40 feet. What does this confirm?

A. The identical values indicate a printing error — the 22,000-lb counterweight should always show higher capacity

B. The crane is misconfigured — counterweight increments should always produce different capacity values

C. The identical values confirm that at 40 feet of radius with this boom, the structural limit governs — the boom's structural capacity is 23,800 lbs at this configuration regardless of counterweight; increasing the counterweight beyond the point where structural limits govern provides no additional capacity benefit; both 18,000 and 22,000 lbs of counterweight exceed what is needed to move the governing limit from stability to structure

D. The 22,000-lb counterweight must not be installed if it produces no capacity benefit

79. A crane's load chart for on-outrigger full extension shows: 100-foot boom at 40 feet = 22,400 lbs. The note in the section reads: "All capacity values in this section have been reduced by 5% from the manufacturer's standard chart values to account for aging fleet conditions." What is the original manufacturer's standard chart value at this configuration?

A. Nothing — the note is incorporated into the published value; no original value calculation is needed

B. Original value = $22,400 \div 0.95 = 23,579$ lbs — the published value of 22,400 represents 95% of the original; however, the operator must use the published 22,400-lb value as the applicable capacity; the original value is informational only and cannot be used to authorize higher lifts

C. The 5% derating means the operator may add 5% back to the value for short-duration lifts: $22,400 \times 1.05 = 23,520$ lbs

D. The 5% reduction can be waived with the lift director's authorization for critical lifts

80. A crane is configured with a 100-foot boom at full outrigger extension. The load chart shows the capacity at 35 feet = 28,400 lbs. The total suspended weight is 26,200 lbs — a lift percentage of 92.3%. During a slow swing, the LMI reading climbs to 98.7%. The swing speed has not changed. What is the specific physical cause of the LMI increase during the swing?

A. The LMI increase is caused by electrical interference from the swing motor during high-speed swing operation

B. Nothing — LMI readings fluctuate during swing movements due to vibration; the reading will return to 92.3% when the swing stops

C. Nothing — LMI readings at 98.7% are within the instrument's accuracy tolerance of $\pm 10\%$

D. Centrifugal force from the swing is displacing the suspended load outward from the boom tip's rotation axis, increasing the effective operating radius; at a greater effective radius, the same total suspended weight represents a higher percentage of the lower rated capacity; the operator must reduce swing speed to minimize centrifugal load displacement and keep the effective radius near the planned value

81. A crane load chart shows a section for "ON OUTRIGGERS — FULL EXTENSION — 100-FT BOOM — OVER REAR (15° EACH SIDE)" with a note: "Capacities in this rear sector are 35% lower than the all-directions section due to reduced stability over the rear." The all-directions section shows 28,400 lbs at 35 feet. The over-rear section note is confirmed. What is the over-rear capacity at 35 feet?

A. Over-rear capacity = $28,400 \times 0.65 = 18,460$ lbs — the 35% reduction from the all-directions value produces the over-rear capacity; any lift with the boom in the rear sector must be within 18,460 lbs

B. Over-rear capacity = $28,400 - 35\% \text{ of } 28,400 = 18,460$ lbs; this is the applicable capacity when operating in the over-rear sector; the lift cannot proceed at over-rear if total suspended weight exceeds 18,460 lbs

C. Over-rear capacity = $28,400 \times 1.35 = 38,340$ lbs — the rear sector adds 35% stability through the counterweight position

D. The over-rear capacity equals the all-directions capacity since the counterweight improves rear stability

82. A crane load chart shows the following for the "LATTICE BOOM — 120 FT — ON CRAWLERS — MAXIMUM COUNTERWEIGHT — OVER SIDE": 50 ft = 78,400 lbs; 55 ft = 62,800 lbs; 60 ft = 50,200 lbs. A critical lift at 53 feet has a total suspended weight of 68,000 lbs. Using the conservative approach, the governing capacity at 55 feet is 62,800 lbs. The lift percentage = $68,000 \div 62,800 \times 100 = 108.3\%$. What must the operator conclude?

A. Nothing — the interpolated capacity at 53 feet (72,240 lbs) clearly supports the 68,000-lb load

- B. The lift director may authorize a 10% temporary capacity increase to accommodate the 8.3% excess
- C. The total suspended weight exceeds the conservative governing capacity — the lift cannot proceed at 53 feet using the conservative approach; the operator must either reduce the total suspended weight to below 62,800 lbs, or reposition the crane to reduce the operating radius to 50 feet or less where the 78,400-lb conservative capacity directly supports the load
- D. The 8.3% excess is within the crane's dynamic load allowance — the lift proceeds at minimum swing speed

83. A crane's load chart shows that the on-outrigger full extension, all-directions section's maximum counterweight configuration provides capacity values that are stability-limited from 15 to 30 feet and structural-limited beyond 35 feet. At 30 feet, the stability-limited capacity is 34,800 lbs. At 35 feet, the structural-limited capacity is 27,600 lbs. A lift is planned at exactly 32 feet. Using the conservative approach, what capacity governs and what limit type applies?

- A. Conservative capacity at 35 ft = 27,600 lbs (structural-limited); the structural-limited operational requirements apply — smooth movements, no dynamic loading; the operator must treat this as a structural-limited lift since the conservative governing value comes from a structural-limited cell
- B. Conservative capacity at 30 ft = 34,800 lbs (stability-limited); this is the smaller tabulated value above the actual radius; lift proceeds
- C. The operator cannot use either value without manufacturer clarification on the appropriate approach at the transition zone
- D. Stability-limited capacity at 30 ft governs since 32 ft is closer to 30 ft than to 35 ft

84. A crane load chart section contains the following note: "These capacities require confirmation that the crane's anti-two-block system is functional before any lift in this section." Before beginning the first lift of the day, the operator tests the ATB by lifting the ATB weight by hand — the hoist function is interrupted confirming the system activates. However, when the weight is released, the hoist function does not automatically restore — it requires manual reset. Does the ATB meet the section note's functionality requirement?

- A. Yes — the ATB activates correctly and the manual reset does not affect its primary protective function
- B. Nothing — the note only requires activation, not automatic reset
- C. Nothing — the manual reset is a feature of some ATB designs and does not indicate a malfunction
- D. The ATB's failure to automatically restore hoist function after the weight is released represents a system that does not function as designed — the note requires the ATB to be functional; a system requiring manual reset to restore hoist function after ATB activation is a non-standard operation that may leave the crane unable to hoist after a real two-block event until the operator manually resets; this must be investigated and the ATB confirmed fully functional before using this section's capacity values

85. A crane's on-outrigger, full-extension, all-directions section shows: 100-foot boom at 35 ft = 26,800 lbs; 40 ft = 21,200 lbs; 45 ft = 16,800 lbs. The planned lift requires a pick at 37 feet and a set at 42 feet. Using the conservative approach at each position, what is the governing capacity for the overall lift plan?

- A. Conservative at pick (37 ft): 21,200 lbs at 40 ft; conservative at set (42 ft): 16,800 lbs at 45 ft; 16,800 lbs governs — the total suspended weight must remain within 16,800 lbs for the complete lift to be within conservative capacity at all positions
- B. Nothing — the pick radius (37 ft) is the governing position since that is where the full suspended weight is first applied
- C. Conservative at pick: 26,800 lbs at 35 ft; conservative at set: 21,200 lbs at 40 ft; the set governs
- D. Conservative at both positions = 21,200 lbs since the 40-foot entry brackets both the pick and set radii

86. A crane is performing a series of personnel hoisting operations. The total suspended weight including the platform and maximum occupant weight is 14,600 lbs. The crane's gross capacity at the current configuration is 31,000 lbs. What is the lift percentage and does it comply with OSHA 1926.1431's 50% personnel hoisting limit?

A. Nothing — $14,600 \div 31,000 = 47.1\%$ — within the 50% limit; confirm all other 1926.1431 requirements are met

B. Nothing — $14,600 \div 31,000 = 47.1\%$ — well within limits; no specific action needed

C. Lift percentage = $14,600 \div 31,000 \times 100 = 47.1\%$; this is within the 50% personnel hoisting limit under OSHA 1926.1431; the operator must also confirm all other personnel hoisting requirements are satisfied: daily pre-lift inspection, operator presence at controls throughout, trial run confirmation, load line design factor, and platform certification

D. The 50% limit applies only to the platform weight — personnel body weight is excluded from the calculation

87. A crane load chart shows the following values for the "ON OUTRIGGERS — FULL EXTENSION — 100-FT BOOM" section: 30 ft = 36,200 lbs; 35 ft = 28,600 lbs; 40 ft = 22,600 lbs. The rate of capacity decrease per foot: 30–35 ft = 1,520 lbs/ft; 35–40 ft = 1,200 lbs/ft. A planned lift at 33 feet uses linear interpolation between 30 and 35 feet. What is the interpolated capacity?

A. Nothing — this question requires interpolation between 35 and 40 feet since 33 ft is in that range

B. Interpolated capacity at 33 ft = $36,200 - (3 \times 1,520) = 36,200 - 4,560 = 31,640$ lbs; total suspended weight = 28,800 lbs; 28,800 lbs is within the 31,640-lb interpolated capacity — lift proceeds

C. Nothing — the conservative approach always uses 28,600 lbs at 35 ft; interpolation gives a false sense of precision

D. Interpolated capacity at 33 ft = $28,600 + (2 \times 1,520) = 31,640$ lbs — interpolating backward from 35 ft

88. A crane load chart section contains a note: "All capacities in this section are contingent on the use of the factory-installed wire rope as specified in the crane's Parts Manual. Substitution of any rope other than the manufacturer's specified rope requires a written engineering review." The crane's hoist rope was recently replaced with a non-OEM rope of the same diameter, grade, and construction. What is the note's implication?

A. Nothing — same diameter, grade, and construction ensures the replacement rope performs identically to the OEM rope

B. Nothing — the note applies only to the crane's boom hoist rope, not the main hoist rope

C. The note's condition is potentially not met — even a rope of the same specification may have different flexibility, fatigue resistance, or performance characteristics than the OEM rope specified for this crane; the note requires a written engineering review for any rope substitution; without this review, the section's capacity values are being used under conditions not fully confirmed as compliant with the note; the manufacturer should be consulted to confirm whether the replacement rope satisfies the note's requirement

D. Written engineering review is only required when the replacement rope is from a different manufacturer

89. A crane is operating at 87% of rated capacity at 35 feet of radius. The load chart shows 28,400 lbs at 35 feet. After the hoist, the operator is instructed to swing left 180 degrees to the set location at 35 feet of radius. During the swing, the LMI reads 94% at the 90-degree (over-side) position. No configuration change was made. What explains the 7-percentage-point increase and what action is required?

A. Stop the swing and reduce swing speed — the 7-percentage-point increase during the swing is caused by centrifugal displacement of the load increasing the effective operating radius beyond the planned 35 feet; reducing swing speed minimizes the centrifugal force, reduces the outward load displacement, and returns the LMI toward the original 87% reading; the swing must not continue at the current speed since the effective radius is increasing the load percentage toward the rated capacity limit

B. Continue the swing at current speed — the 7% increase is caused by the over-side position's different capacity value

C. The 94% reading confirms the LMI is functioning correctly and no action is required at this capacity level

D. Reduce the load weight by 7% through the crane's load management system to offset the 7-percentage-point increase

90. A crane load chart for a telescopic boom shows the "TELESCOPING" section that applies while the boom is being extended under load. The capacity values in this section are 15–20% lower than the "FIXED LENGTH" section. A planned lift requires extending the boom from 80 feet to 100 feet with

the load attached to reach the set location. Using the "FIXED LENGTH" capacity at 100 feet to plan the lift is incorrect. What section must be used?

- A. The "FIXED LENGTH" 100-foot section applies since that is the boom's final length at the set location
- B. The "FIXED LENGTH" 80-foot section applies since that is the boom's initial length at the pick location
- C. The "TELESCOPING" section must be used for the portion of the lift that involves extending the boom under load — the lower telescoping capacities reflect the structural loading differences during boom extension; after the boom is fully extended to 100 feet and locked, the "FIXED LENGTH" 100-foot section would apply for subsequent stationary lifts; the operator must plan the telescoping movement within the "TELESCOPING" section's lower capacity values
- D. The average of the 80-foot and 100-foot "FIXED LENGTH" capacities governs during boom extension

91. A crane load chart note reads: "The following capacities do not include the effects of wind loading on the boom or suspended load. For sustained wind speeds above 15 mph, apply the derating schedule in Table W." The operator is performing a lift with sustained winds of 18 mph. Table W is not available at the site. What must happen?

- A. Nothing — 18 mph is below the crane's general 25 mph operational limit; the Table W derating is only advisory for lifts above 90% of the tabulated capacity
- B. The lift may proceed using the tabulated capacity with the operator's judgment that the 3 mph excess above 15 mph is insignificant
- C. The note establishes a binding derating requirement for winds above 15 mph — without access to Table W, the specific derating factor cannot be determined; the lift cannot proceed using the full tabulated capacity under sustained 18 mph wind conditions until Table W is obtained or the operator confirms with the manufacturer what derating applies at 18 mph; proceeding without the required derating means using capacity values that do not reflect the actual wind loading conditions
- D. The lift proceeds if the operator confirms the LMI reads below 85% after accounting for a general 5% wind derating estimate

92. A crane is performing a lift at 40 feet of radius with a 100-foot boom. The load chart shows 22,600 lbs at 40 feet. The total suspended weight is 21,000 lbs — a lift percentage of 92.9%. The operator needs to boom up after picking to bring the load to 35 feet of radius for the swing to the set location. The load chart shows 28,400 lbs at 35 feet. After the boom-up movement, what is the new lift percentage?

A. Nothing — the boom-up movement reduces the radius and improves the capacity; $21,000 \div 28,400 = 73.9\%$ — the lift percentage decreases from 92.9% to 73.9% after the boom-up movement

B. Nothing — the lift percentage stays at 92.9% since the load weight did not change

C. New lift percentage at 35 ft = $21,000 \div 28,400 \times 100 = 73.9\%$; the boom-up movement was favorable from a capacity perspective — the load now represents a smaller fraction of the higher rated capacity at the shorter radius; the lift is now below the 75% critical lift threshold after the boom-up

D. New lift percentage = $21,000 \div 28,400 = 73.9\%$; the movement was favorable — but the operator must confirm the boom-up movement keeps the hook block below the boom tip

93. A crane load chart note reads: "Before using any capacity values in this section, confirm the slewing ring vertical deflection does not exceed the manufacturer's published limit. If the limit is exceeded, these values cannot be used." The crane's most recent slewing ring measurement (from the annual inspection 11 months ago) showed 0.058 inches — the published limit is 0.060 inches. What must be done before using this section?

A. The 11-month-old measurement of 0.058 inches is within the 0.060-inch limit — the note's condition is satisfied

B. Nothing — the annual inspection confirms the crane is within all specifications for the 12-month following period

C. Nothing — the slewing ring was within limits at the last inspection; it cannot have exceeded the limit since then

D. The slewing ring vertical deflection must be currently measured and confirmed within the 0.060-inch limit before these values can be used — the note requires current confirmation; the 11-month-old measurement may not reflect the current condition after 11 months of additional wear; the limit may have been reached or exceeded since the last inspection; only a current measurement satisfies the note's requirement

94. A crane load chart for the 100-foot boom, full outrigger extension shows: 25 ft = 44,200 lbs; 30 ft = 35,000 lbs; 35 ft = 27,600 lbs. The planned lift involves two phases: Phase 1 picks at 28 feet (total suspended weight 31,200 lbs) and Phase 2 sets at 33 feet (total suspended weight 31,200 lbs — same load). Using the conservative approach at each phase, which phase is the controlling phase for this lift and why?

A. Nothing — the conservative approach gives 27,600 lbs at 35 ft for both phases; 31,200 lbs exceeds this value; both phases exceed the conservative capacity; the lift cannot proceed in this configuration

B. Nothing — Phase 1 is always the controlling phase since the risk is greatest during the initial pick

C. Phase 2 is the controlling phase — at the 33-foot set radius, the conservative capacity is 27,600 lbs at 35 feet; 31,200 lbs exceeds this; the lift cannot proceed to the set location; however, Phase 1 at 28 feet also produces a conservative capacity of 27,600 lbs (using the 30-foot entry... wait, conservative at 28 ft uses 30 ft = 35,000 lbs); Phase 1: 31,200 lbs within 35,000 lbs; Phase 2: 31,200 lbs exceeds 27,600 lbs; Phase 2 is controlling because the set location cannot be reached under conservative capacity

D. Phase 1 controls since the load is at maximum risk during the initial pick off the ground

95. A crane load chart shows the following values for the 80-foot boom at full outrigger extension, all-directions section: 30 ft = 34,200 lbs; 35 ft = 27,200 lbs; 40 ft = 21,400 lbs. A planned lift at 37 feet of radius has a total suspended weight of 24,000 lbs. The operator uses the interpolated capacity of 24,800 lbs (calculated as $27,200 - (2 \times 1,160) = 24,880 \text{ lbs} \approx 24,800$). The lift percentage based on interpolated capacity = $24,000 \div 24,800 = 96.8\%$. What does this lift percentage require?

A. Nothing additional — 96.8% is within the 100% limit and the interpolated capacity confirms the lift is within rated capacity

B. A written critical lift plan and pre-lift meeting are required since 96.8% exceeds the 75% critical lift threshold; additionally, all crane movements must be exceptionally smooth since a 3.2% structural reserve leaves minimal margin for dynamic loading from swing acceleration, hoist starts or stops, or any combined multi-function movements

C. The operator must reduce the total suspended weight to bring the percentage below 90% before proceeding

D. The LMI must be confirmed accurate within $\pm 2\%$ before proceeding at 96.8% of rated capacity

Core Exam 11 Answer Key and Full Explanations

1. A — Bearing pressure = $92,000 \div 2.5 \text{ sq ft} = 36,800 \text{ psf}$ — approximately 30 times the pad's 1,200 psf uniform design loading. The elevated pad is supported on piers, and a uniform design load is calculated for distributed loading, not concentrated point loads. A structural engineer must evaluate the pier capacity and the pad's punching shear resistance for the specific outrigger point load before any crane setup.

2. C — Sandy loam's bearing capacity is highly sensitive to moisture content — water in the pore spaces reduces the effective stress between particles, lowering shear strength. A rod penetrating 8 inches by hand pressure in what was rated at 3,400 psf in dry conditions demonstrates the soil has been significantly softened by the 2.3 inches of rain. The dry-weather assessment no longer applies and the current bearing capacity is unknown.

3. B — OSHA 1926.1402 requires the controlling entity to provide the crane employer with available information about site hazards, including utilities. When a new utility is discovered adjacent to the setup area, the controlling entity must immediately notify the crane employer because the newly discovered utility may extend beneath the planned outrigger positions. Without this information, the crane employer cannot make informed decisions about outrigger placement relative to the utility's route.

4. D — OSHA 1926.1402(c) and ASME B30.5 both recognize that a loaded crane outrigger near an unshored trench creates a surcharge that can trigger trench wall failure or loss of passive soil resistance. A 7-foot setback from a 12-foot-deep trench places the outrigger well within the influence zone of the trench. A qualified person must evaluate whether this setback is adequate for the specific outrigger loads and soil conditions.

5. A — Multiple scattered circular depressions of uniform character across a surface area indicate multiple subsurface voids are developing simultaneously — not random settling. This pattern is consistent with karst dissolution, collapsing underground pipes, or deteriorating underground structures creating multiple local subsidence points. Each depression marks a point where the surface soil has lost

support from below, and the void system causing them may be interconnected beneath the planned crane outrigger zone.

6. C — A barge-mounted crane creates a dynamic stability problem — as the crane swings, the load moment changes the barge's trim and list continuously. The barge must be analyzed for stability under the crane's maximum outrigger reaction loads at all planned boom positions to confirm the barge will not list beyond the crane's maximum operating slope tolerance. Static weight confirmation alone is insufficient because dynamic load distribution during lifting operations can create asymmetric barge loading.

7. B — OSHA 1926.1407 requires voltage determination before operations near power lines — this includes the crane positioning that occurs during setup. If a power line crosses the outrigger spread at unknown voltage, the MSAD cannot be established, which means the crane cannot be safely positioned without potentially violating the yet-to-be-determined MSAD. All crane positioning activities must stop until voltage is confirmed.

8. D — Surface efflorescence occurs when capillary action draws water upward through the soil, evaporating at the surface and depositing dissolved minerals as white crystals. The presence of efflorescence in dry weather conditions confirms active upward moisture migration — the soil at depth is saturated and the moisture is wicking upward. The actual bearing capacity at the affected position is lower than what a visual inspection of the apparently dry surface would suggest.

9. A — The sulfurous odor from soil is a biological decomposition byproduct produced by anaerobic bacteria in organic materials — specifically peats, mucks, and organic silts. The presence of this odor strongly suggests organic soil at depth that has very low, potentially zero structural bearing capacity. Organic soils compress dramatically and unpredictably under crane loads, and the extent and depth of the organic zone must be confirmed before any outrigger loading.

10. C — OSHA 1926.1402(c) requires the employer to address the ground condition concern before resuming operations. The employer may determine the existing conditions are adequate through investigation, may implement additional ground preparation, or may change the crane's configuration — but the determination must be factual, not arbitrary. The standard does not specify a fixed process, but it does require that the employer address the actual concern rather than simply waiting for time to pass.

11. B — A sinkhole developing between two outrigger pads on the same side indicates a subsurface void system that is actively collapsing. The void responsible for the sinkhole is not confined to the visible surface expression — it may extend laterally beneath both outrigger pads on that side. The outrigger pads may be bearing on a soil dome over an expanding void. All movement must stop immediately to prevent collapse of the remaining soil beneath the outrigger pads.

12. D — Standing water in a low-lying area during a rainy period indicates the subgrade is saturated — the water table is at or very near the surface. Saturated soil, particularly fine-grained soil, can lose its bearing capacity almost completely. A 186,000-lb crane traveling through this zone can experience sudden and complete bearing failure, causing the crane to bog down catastrophically. The subgrade must be confirmed stable before crane travel.

13. A — A crane boom is typically the highest structure on a construction site and is therefore the most likely structure to receive a lightning strike. A direct lightning strike to a crane boom transmits the full electrical charge through the crane's metallic structure. With 35 minutes before the storm's estimated arrival, there is time to lower loads, secure the crane, and move all personnel to adequate shelter before the storm arrives. Waiting until lightning begins is waiting until the hazard is already present.

14. C — Steam tunnels are large underground structures — 5 feet wide by 7 feet tall — that represent massive subsurface voids in the load path between the crane's outriggers and the deep bearing soil. Under concentrated outrigger loading, the concrete tunnel roof must resist both the distributed soil weight above it and the concentrated point load from the crane outrigger. The tunnel was designed for its own structural loads, not for crane outrigger point loads. A structural engineer must evaluate this specific loading before setup.

15. B — A hydraulic breaker creates high-frequency, high-amplitude impulse loading that propagates as compression waves through the soil to the crane's outrigger positions at 45 feet. In loosely placed soils or saturated fine-grained soils, these impulses can cause progressive settlement of the outrigger mats and temporary reduction in bearing capacity from dynamic pore pressure generation. The operator must monitor the crane's level condition during breaker operations and be prepared to stop if settlement is observed.

16. D — OSHA 1926.1402 creates both an initial obligation and an ongoing obligation for the controlling entity. The initial obligation is to confirm and communicate ground conditions before

operations begin. The ongoing obligation is to notify the crane employer of any changes — from construction activity, weather, or adjacent work — that occur during crane operations. Both obligations are explicitly required, and the ongoing obligation is the one most frequently overlooked in practice.

17. A — Parking garages are designed for distributed vehicle axle loads with specified span conditions. A crane outrigger creates a concentrated point load at a specific location — a fundamentally different loading condition from vehicle wheels. The garage's deck slab, its connections to beams, and the beam-to-column connections must all be specifically analyzed for the concentrated outrigger load. Vehicle loading design is not transferable to point load evaluation without engineering analysis.

18. C — Water emerging from the soil under a loaded outrigger in dry weather is pore water being expelled by the load's pressure — a phenomenon called consolidation-induced pore pressure. The soil's water cannot drain fast enough to maintain effective stress, and the excess pore water pressure is forcing water upward and laterally from under the mat. This indicates the soil is under stress that is approaching or exceeding its bearing capacity at that position.

19. B — A jersey barrier placed 4 feet from an outrigger adds a 4,000-lb surcharge load to the soil between the barrier and the outrigger, but more importantly, it redirects vehicle traffic to pass near the outrigger zone. Loaded trucks passing within 10–15 feet of an outrigger create far larger surcharges than the barrier itself. The combination of the barrier's weight, vehicle surcharge, and the crane's outrigger load may exceed the soil's capacity at the outrigger position.

20. D — Geotechnical documentation confirms conditions at the time of assessment, not current conditions. In 18 months, the engineered fill at a remediated brownfield site may have been disturbed by subsequent construction, may have experienced settlement, or may have been saturated by weather events. OSHA 1926.1402 requires current confirmed ground conditions — a year-and-a-half-old report is historical documentation, not current confirmation. The controlling entity must confirm current conditions.

21. D — A fire 50 feet from the crane creates an immediate evacuation obligation. The potential for explosions, expanding fire involvement, and the need for all personnel to evacuate to assembly areas means the crane operator must secure the load and evacuate. Remaining at the crane to hold the load while a fire progresses creates the risk of the operator being unable to safely evacuate when the fire condition worsens. The load must reach the ground before the operator evacuates.

22. C — OSHA 1926.1419 and ASME B30.5 both require that all signals be from the approved signal set or from an alternative set established before operations. The pointing gesture was not established in the pre-lift briefing and is not an approved signal. Acting on an ambiguous combination signal to determine set location creates a risk that the load is placed at the wrong position. The set location must be confirmed through a verified communication method before the lowering begins.

23. B — Rigging contact with sharp load angles at elevated loads creates cutting forces on sling materials that can lead to sudden, catastrophic sling failure. A web sling contacts a sharp angle and the full load weight acts as a cutting force perpendicular to the angle edge. At 8 inches of height, lowering the load costs minimal time but prevents potentially catastrophic failure at height. Edge protection must be in place before re-picking.

24. D — OSHA 1926.1427 requires both the NCCCO certification (type-level knowledge) and the employer's documented site-specific competency evaluation. These are two separate and distinct requirements — one is issued by an accredited organization and the other is conducted and documented by the employer. If the employer's documented evaluation is missing, the operator's authorization for that specific worksite is incomplete regardless of the certification's validity.

25. D — Unexpected rope sag in a loaded rope section between sheaves indicates that the rope has lost tension at that point — the rope cannot sag if it is carrying any meaningful load. Possible causes include a failed rope section that has separated the tension load, a jumped sheave that has removed the rope from its load path, or a mechanical failure that has altered the rope's support structure. Any of these conditions could lead to sudden complete loss of load support and requires immediate investigation.

26. C — Progressive tilt during an active hoist — as opposed to immediate tilt at the moment of pick — indicates ongoing soil movement rather than elastic deflection. At 91% capacity, continued soil yielding can cause the tilt to exceed the manufacturer's tolerance before the lift is complete. Additionally, soil that is actively yielding under load may be approaching failure. Lowering the load and evaluating the outrigger position before continuing is the only safe response.

27. B — Tandem lifts require active, continuous coordination by the lift director throughout all movements — not just at the start and end. With the lift director away, neither operator has authority to independently coordinate their crane's movement relative to the other. Any uncoordinated movement

could shift the load distribution between the cranes, potentially overloading one crane. The hold must be maintained until the lift director is present and actively coordinating.

28. C — A consistent 12-inch swing with each hoist stop indicates the load is responding predictably to wind loading at each stop event. While 12 inches may be acceptable in open areas at the current 11 mph wind, any precision placement into a tight space or near a structure requires that this lateral drift be controlled. Tag lines provide the horizontal control needed to prevent the load from contacting adjacent structures during placement.

29. A — The boom is a structural compression member designed to carry loads along its primary axis. Using the boom tip to steer a structural column applies forces perpendicular to this axis. If the column catches on an anchor bolt or the foundation as it's being guided, the resulting lateral force can significantly exceed the boom's lateral capacity. Tag lines operated from safe positions provide the steering force without creating boom side-loading.

30. C — OSHA 1926.1430 requires training for all "affected employees" — defined broadly as anyone whose work duties may bring them near crane operations. This includes not just operators and signal persons but any worker who walks through areas near operating cranes, works adjacent to crane operations, or could encounter crane hazards. Training must cover Subpart CC requirements, hazard recognition, and employer procedures for avoiding hazards.

31. B — The signal person giving a LOWER signal does not override the operator's independent obligation not to lower a load over personnel. The signal person may not have observed the worker bending below the load. The operator has direct sight of the worker and must act on what they can see — sounding the horn warns the worker while stopping the movement prevents the load from descending over a person. OSHA 1926.1425's prohibition is unconditional.

32. D — Sudden slack in a jib load line while the load is elevated means the load is no longer supported by the jib load line. If the rigging has failed, the load is hanging by only the failed connection and could drop immediately. If the load has rested on something, resuming the hoist will create a sudden shock load when the slack is taken up. All movement must stop until the actual load support condition is physically confirmed.

33. A — ASME B30.5 and OSHA 1926.1419 require continuous confirmed communication throughout the lift. The signal person's loss of line of sight, even for 3 seconds, means the crane was without guided communication during that period. The operator should hold the load stationary whenever the signal person's line of sight to the load is broken — not resume at the signal person's convenience. The load must be stationary before the signal person loses line of sight, and confirmed clear before resuming.

34. C — OSHA 1926.1416 requires that when a crane is left unattended, all functions must be secured with brakes, all controls secured, and the crane protected against unauthorized operation through key removal or equivalent means. A single measure — such as only the engine being off — is insufficient. The combination of engaged brakes, secured functions, and key removal provides the comprehensive protection required against inadvertent or unauthorized operation.

35. B — Load momentum carrying the load into contact with a structural member requires inspection before continuing. Even a brief contact at the end of a swing can deform a connection point, displace a structural member, or shift the rigging geometry. At a connection point, any deformation could affect the structural assembly's design load path. A qualified person must confirm no damage before proceeding.

36. D — A critical lift plan is specific to the planned configuration, setup location, and operating radius at the time of planning. A 6-foot crane repositioning changes the operating radius for all planned lifts, changing the applicable capacity values, the lift percentages, and potentially the critical lift designation status. A new underground utility discovery may change the ground condition assessment. Both changes require the plan to be updated before proceeding.

37. A — An intermittent low hydraulic pressure warning indicates the system is operating at or below the minimum pressure required for full brake holding capacity during the brief intervals when the warning activates. If the condition recurs during a loaded lift at greater height, brake holding may be insufficient to hold the load. The intermittent nature suggests a developing fault that must be investigated and confirmed resolved before trusting the brake system with a loaded lift.

38. C — OSHA 1926.1431 specifically addresses pick-and-carry of personnel platforms with additional requirements beyond stationary hoisting. The crane must be rated for pick-and-carry operations with a personnel platform, the platform travel capacity must be in the load chart, and all travel parameters must be confirmed before travel. Travel speed is limited to the manufacturer's maximum for platform travel.

These requirements exist because travel creates dynamic loads and surface hazards not present in stationary personnel hoisting.

39. B — A rigger's ground-level observation that the crane appears to be leaning may detect a change in mat contact or outrigger pad position that occurs below the inclinometer's resolution threshold or response rate. At 86% of rated capacity, even a small progressive lean that has not yet registered on the instrument could indicate beginning soil failure. The rigger's external observation is valuable safety information that must be investigated rather than dismissed based solely on the instrument reading.

40. C — ASME B30.5 does not establish a maximum hold time for a load suspended within the crane's rated capacity when the crane is properly maintained and operated. The operator must remain at the controls throughout the hold, brakes must function, and the area must remain controlled — but the hold duration itself is not limited by time. The hold continues until the lift director authorizes the next movement.

41. A — Without the ATB weight, the ATB cable hangs freely and is not positioned to be contacted by the rising hook block until the block has already reached or passed the boom tip sheave — by which point two-blocking has already occurred. The ATB weight is the physical element that positions the cable in the hook block's travel path at the correct height. Crane operations must not continue until the weight is reinstalled and the complete ATB system is confirmed functional.

42. C — Signal communication during crane operations must be instantaneous — the operator must stop the crane the moment a STOP signal is received. A 2-second delay means the operator receives the signal 2 seconds after it was sent. In that 2 seconds, a crane swinging at typical working speed can move several feet. For precision placements with tight clearances, this delay is unacceptable. The communication system must allow immediate signal reception.

43. A — At 91% of rated capacity, a tilted load indicates asymmetric rigging geometry that is distributing load unevenly among the four sling legs — some legs may be carrying significantly more than their calculated share. With only 6 inches of height, lowering the load is safe and allows the rigging to be corrected without any structural risk. Continuing with asymmetric rigging at 91% capacity risks overloading individual sling legs.

44. D — OSHA 1926.1419 requires either a relay signal person (who can see both the operator and the primary signal person) or a voice communication system confirmed functional by both parties. A relay system maintains the signal chain without gaps. A voice communication system must be specifically confirmed working before it is relied upon. The key requirement is maintaining continuous, unambiguous communication throughout the lift — which requires either of these two methods when direct line of sight is not possible.

45. C — A 0.75-inch outrigger pad settlement during the previous shift means the soil at that position has been yielding progressively under load. The settlement indicates the soil's bearing capacity may be inadequate for the planned lifts. Before a new shift of near-capacity operations begins, the ground condition at the settled position must be evaluated and confirmed adequate. Simply re-leveling does not address the underlying soil condition.

46. C — A report of a person trapped in the area beneath the planned set location is a potential OSHA 1926.1425 violation in progress — loads may not be placed over or near trapped personnel. The operator cannot verify from the cab whether the person is actually present. The most conservative and correct response is to stop and hold the load until the situation is verified. No assumption of safety is appropriate when a person's life may be at risk.

47. B — A 1.5-degree barge list corresponds to approximately 2.6% out-of-level — significantly exceeding the crane's 1% (0.57-degree) maximum level tolerance. When the barge lists, the effective operating radius increases and the stability margin decreases below what the load chart values assume. Operating a crane on an out-of-tolerance barge is equivalent to operating on out-of-level ground — both violate the load chart's configuration requirements. The load must be lowered and the barge re-ballasted.

48. D — OSHA's general duty clause and industry professional standards require operators to be cognitively fit for crane operation. Slurred speech and slowed response times observed by the lift director represent objective signs of impairment that are independent of the operator's self-assessment. A critical lift at 88% of rated capacity with an impaired operator creates a foreseeable risk of serious injury or death. The lift director has both authority and responsibility to relieve the operator.

49. A — The measured reduction is $0.625 - 0.572 = 0.053$ inches. Converting to 64ths: $0.053 \times 64 \approx 3.4/64$ inch. The ASME B30.5 and OSHA 1926.1413 removal criterion for diameter reduction in wire

rope is 3/64 inch (0.047 inches) for most rope diameters. Since 0.053 inches exceeds 0.047 inches (3/64 inch), the rope meets the removal criterion and must be taken out of service.

50. B — ASME B30.9 establishes multiple independent removal criteria for synthetic web slings. Any one of the listed conditions — cuts, heat damage, chemical contamination, knots, missing or illegible ID tag, UV fading, or metal fitting deformation — is individually sufficient for removal. The standard does not require multiple conditions to coexist before requiring action. Each condition individually compromises either the sling's structural integrity or the operator's ability to confirm its rated capacity.

51. B — Longitudinal scratches on a journal pin bearing surface indicate the pin has been moving axially — sliding along its axis — within its mounting hardware. Boom foot pins should remain stationary within their journals during operations. Axial movement indicates inadequate pin retention, structural movement at the boom base, or wear in the retention hardware. This condition can lead to progressive pin walk-out and eventual boom base structural failure.

52. C — A drum anchor socket designed for 3/4-inch rope cannot develop the designed clamping force on a 7/8-inch rope — the socket geometry is not matched to the rope's cross-section. The rope-to-socket connection is a safety-critical component that retains the dead end of the load line on the drum. An improperly matched socket may fail at loads below the rope's rated capacity. The correct rope must be installed before any crane operations.

53. A — ASME B30.10 specifies removal from service when the hook throat opening increases more than 15% from the nominal. The measured increase of 12% is within the current acceptable limit — but ASME B30.10 does not specify a monitoring requirement at specific percentages. Best practice is to document the measurement and establish an increased inspection frequency as the hook approaches the 15% threshold. The 12% measurement alone does not require removal but is approaching it.

54. C — The LMI's load cell is the primary measurement component that determines what the operator sees as the capacity percentage. A load cell that is 26 months overdue on calibration — more than double the 12-month interval — may have drifted significantly from its calibrated value. If the cell reads 8% low, a lift at 97% actual capacity could display as 89% — well within the display range where an operator would not suspect a problem. Near-capacity operations cannot rely on an uncalibrated LMI.

55. B — Cam serrations are the primary friction-generating mechanism of a plate-lifting clamp. The serrations dig into the plate surface under load to develop the gripping force required to hold the plate's weight. When the serrations are worn smooth, the clamp relies on adhesion rather than interlocking friction — a much weaker grip mechanism. The clamp can slip at loads well below its rated WLL, releasing the suspended plate without warning.

56. D — An undocumented weld repair means no approved repair procedure was followed, no qualified welder certification was recorded, and no confirmation that the repair meets ASME or manufacturer standards was obtained. The weld's external appearance cannot confirm adequate penetration, correct filler metal, proper preheat, or post-weld heat treatment. A structural boom member repaired without documentation must be evaluated by the manufacturer or qualified structural engineer before rated-load operations.

57. D — OSHA 1926.1412(f)(1) specifically requires a post-repair inspection after any repair, adjustment, or modification that may affect the crane's safe operation. This inspection confirms the repair was performed correctly and the affected components function as designed. It is separate from the regular inspection schedule and must be performed before the crane returns to service — not at the next scheduled monthly inspection.

58. B — In a 4-leg wire rope bridle, the load should distribute equally among all four legs. When one leg goes slack, the three remaining taut legs are carrying the full load — each leg now bears 1/3 of the total instead of 1/4. At 24,000 lbs, each taut leg carries 8,000 lbs rather than 6,000 lbs. If the slings were selected for 6,000 lbs per leg, they may be within their WLL, but the geometry must be confirmed and the cause of the slack leg identified before proceeding.

59. B — A cracked hydraulic cylinder barrel loses the pressurized fluid that the counterbalance valve uses as pilot pressure to hold the boom stationary. As pressure drops, the counterbalance valve will open, allowing the boom to lower without operator input. The pressurized hydraulic spray from the crack creates an injection injury hazard and fire hazard. The crane must be immediately removed from service and the boom must be lowered using whatever pressure remains before complete pressure loss.

60. D — ASME B30.5 requires that the load line and reeving configuration prevent two-blocking under normal operating conditions — the ATB is a backup, not the primary prevention device. The operator must confirm that the hook block cannot physically reach the boom tip sheave at the minimum planned

working height through a combination of rope length, reeving configuration, and operating procedure. Relying on ATB activation as the routine minimum height stop is prohibited.

61. B — The swing brake lining is at 40% of original thickness — above the 30% replacement criterion. The crane may continue operations but the lining is approaching the replacement point. The correct action is to document the current thickness, monitor it at subsequent inspections, and plan replacement within the next maintenance opportunity before the 30% threshold is reached during operations. Immediate replacement at 40% is not required by the 30% criterion.

62. C — The LMI is a supplementary monitoring aid that provides real-time load moment feedback. It is not the primary capacity verification mechanism — that role belongs to the load chart lookup performed before each lift. The LMI can be misconfigured (wrong boom length, wrong counterweight), miscalibrated (load cell drift), or subject to sensor faults that cause it to display incorrect percentages. The operator must independently verify capacity through the load chart regardless of the LMI reading.

63. B — Yellowish-tan discoloration specifically near a sheave, with color transfer on contact, is diagnostic of copper-based alloy material abrading from a sheave bushing onto the rope's wires. Bronze and brass bushings used in some sheave designs leave this characteristic yellow transfer when they are wearing abnormally. A failing sheave bushing causes the sheave to run dry, increasing rope-to-sheave friction and accelerating rope wire abrasion. Both the bushing and the affected rope section require evaluation.

64. D — Load-independent grinding indicates the source is not the hoist load path — it is in a rotating component. Speed-dependent intensity confirms the noise is proportional to rotational velocity. This combination points to mechanical wear in the swing drive's gear mesh or bearing system — gear tooth wear creating impact noise with each tooth mesh, or bearing damage creating rolling-element noise. The grinding intensity increasing with speed indicates progressive mesh damage that will worsen with continued operation.

65. A — OSHA 1926.1412(f) and ASME B30.5 both require a post-repair inspection and, when specified by the manufacturer or engineer of record, a proof load test after structural member replacement. The 2-year service history without incident does not retroactively confirm the repair was adequate — it simply means no failure has occurred yet. The documentation gap must be addressed by

the crane manufacturer or a qualified structural engineer to establish that the replacement component meets the rated capacity requirements.

66. C — A sling without a legible identification tag cannot be confirmed to have the WLL assumed for any specific lift. Without the tag, the operator cannot confirm the WLL, sling grade, or design factor. Using an unidentified sling means the operator is assigning an assumed capacity to a sling of unknown actual capacity. ASME B30.9 requires the identification tag to be present and legible — the sling must be removed from service until a replacement tag with accurate information can be provided by the sling manufacturer.

67. B — New seals that are correctly installed should eliminate drift, not introduce it. Post-repair drift indicates the new seals are not sealing — either installed incorrectly, installed backward, damaged during installation, or of the wrong specification for the cylinder. The drift will worsen as the improperly installed seals continue to fail. The crane cannot safely hold loads if the hoist brake relies on hydraulic pressure that is leaking past the seals.

68. D — The ATB weight's function is to position the ATB cable in the hook block's travel path at the correct height above the bottom of the boom tip sheave. Without the weight, the cable hangs loosely and is not in the contact zone until the hook block has already reached or passed the sheave — two-blocking occurs without the protective system activating. ASME B30.5 requires the ATB to be functional before crane operations — an ATB without its weight is non-functional.

69. B — When the drum's upper rope layer crosses over multiple grooves instead of following the helical groove path, every crossing point creates a pressure point where the upper rope bears down on the lower rope beneath it. The lower rope cannot spread the contact force — it is concentrated at the crossing point. This crushing force flattens the lower rope's cross-section, deforming the wire geometry and creating fatigue initiation points at every contact location. Progressive drum rewinding is required.

70. C — OSHA's general duty clause, ASME B30.5, and professional standards all establish that a crane operator must not operate when their physical or mental condition impairs safe operation. This is an absolute personal obligation — medications, illness, fatigue, substance use, or any other impairing condition creates this obligation equally. The standard does not provide a reduced-capacity workaround. The operator must not take the controls when their condition impairs safe operation.

71. A — Conservative capacity at the next larger tabulated radius (35 ft) = 28,400 lbs. Total suspended weight = 2,800 + 23,800 = 26,600 lbs. Since 26,600 lbs is within 28,400 lbs, the lift proceeds. Lift percentage = $26,600 \div 28,400 \times 100 = 93.7\%$ — this exceeds the 75% critical lift threshold, requiring a written critical lift plan and pre-lift meeting before the lift begins.

72. B — The note's condition requires all four pads to have solid contact with a firm supporting surface. A pad with 25% of its area unsupported over a drain opening does not satisfy this requirement. The effective bearing area is reduced to approximately 75% of the nominal pad area, concentrating the outrigger load on the supported portion and increasing the bearing pressure at those points. The pad must be repositioned to achieve full contact before these capacity values can be used.

73. A — Conservative approach: next larger tabulated radius beyond 27 feet = 30 feet, capacity = 20,800 lbs. Total suspended weight = 22,000 lbs. Since 22,000 lbs exceeds 20,800 lbs by 1,200 lbs, the lift cannot proceed in the 75% extension configuration using the conservative approach. The operator must either reduce the total suspended weight or reconfigure to full outrigger extension to access higher capacity at 27 feet.

74. C — Minimum cribbing area = $88,000 \div 3,600 = 24.44$ sq ft, rounded up to 25 square feet of contact area at the heaviest outrigger position. This calculation is required because the outrigger float alone may not provide the necessary contact area. The combined outrigger float and cribbing must spread the outrigger reaction over enough ground contact area to keep the bearing pressure within the confirmed 3,600 psf soil capacity.

75. B — Conservative approach: next larger tabulated radius beyond 22 feet = 25 feet, capacity = 43,200 lbs. Total suspended weight = 50,000 lbs. Since 50,000 lbs exceeds 43,200 lbs by 6,800 lbs, the lift cannot proceed at 22 feet using the conservative approach. The operator must either reposition the crane to reduce the operating radius to 20 feet or less where the 54,400-lb tabulated capacity directly supports the load, or reduce the total suspended weight to below 43,200 lbs.

76. C — The lift requires the boom to swing 110 degrees from the over-front sector through the over-side into the all-directions zone at 92 degrees left. The all-directions capacity of 36,800 lbs applies throughout the all-directions sector. The total suspended weight of 44,000 lbs exceeds 36,800 lbs — the lift exceeds the applicable capacity during the swing and at the set location. The lift must be re-planned with a total suspended weight below 36,800 lbs or redesigned to remain in the over-front sector.

77. A — Interpolation from 35 to 40 feet: drop = $27,000 - 21,000 = 6,000$ lbs over 5 ft = 1,200 lbs/ft. At 36 ft (1 ft beyond 35 ft): $27,000 - (1 \times 1,200) = 25,800$ lbs. Total suspended weight = 24,500 lbs. Since 24,500 lbs is within 25,800 lbs, the lift proceeds using the interpolated capacity with 1,300 lbs of margin. The conservative approach at 40 feet (21,000 lbs) would not support 24,500 lbs — this illustrates the difference between interpolated and conservative approaches.

78. C — When increasing the counterweight no longer increases the rated capacity, it confirms that the governing limit has shifted from stability to structure. Stability capacity increases with more counterweight because the restoring moment increases. Structural capacity is independent of counterweight mass — the boom's structural members have a fixed design capacity regardless of how much counterweight is added. Both 18,000 and 22,000 lbs of counterweight have exceeded the point where additional mass provides any stability benefit at 40 feet.

79. B — The published 22,400-lb value represents 95% of the original standard chart value. The original value = $22,400 \div 0.95 = 23,579$ lbs. This calculation is informational — the operator must use the published 22,400-lb value. The derating was applied by the issuing organization and is built into the applicable capacity. The operator cannot reverse-engineer the original value and use it as a higher capacity authorization.

80. D — Centrifugal force from swing moves the suspended load outward from the boom tip's rotation axis. As the load displaces outward, the effective operating radius increases. At a greater radius, the crane's rated capacity is lower — the same 26,200-lb total suspended weight now represents a higher percentage of the lower capacity at the greater effective radius. This is a real, physical load moment increase that the LMI correctly measures.

81. A — Over-rear capacity = $28,400 \times (1 - 0.35) = 28,400 \times 0.65 = 18,460$ lbs. The 35% reduction is applied to the all-directions value to produce the over-rear sector capacity. Any lift with the boom in the rear sector must use this reduced value as the applicable gross capacity. The lower capacity reflects the reduced stability margin when the crane's load is positioned over the rear — where the counterweight's restoring moment is at its minimum effectiveness.

82. C — Conservative approach: next larger tabulated radius beyond 53 feet = 55 feet, capacity = 62,800 lbs. Total suspended weight = 68,000 lbs. The lift percentage = $68,000 \div 62,800 \times 100 = 108.3\%$ — the total suspended weight exceeds the conservative capacity. The lift cannot proceed at 53 feet using the

conservative approach. The operator must either reduce the total suspended weight to below 62,800 lbs or reposition the crane to 50 feet or less where the 78,400-lb capacity supports the load.

83. A — Conservative approach at 32 feet: next larger tabulated radius = 35 feet, capacity = 27,600 lbs (structural-limited). Since the conservative governing value comes from a structural-limited cell, the operational requirements for structural-limited lifts apply — exceptionally smooth crane movements with no dynamic loading, no simultaneous multi-function operation, and no abrupt direction changes. The operator must plan accordingly even though the actual radius (32 feet) falls in the stability-limited zone.

84. D — The note requires the ATB to be "functional" before any lift — and functional means the complete system operates as designed, including automatic reset after the triggering condition is cleared. An ATB that requires manual reset leaves the crane unable to hoist after a real two-blocking event until the operator manually intervenes. In a two-blocking scenario, the operator may not be aware the ATB has activated — the automatic reset is an integral part of the system's design and safety function.

85. A — Conservative at pick (37 ft): next larger tabulated radius = 40 ft, capacity = 21,200 lbs. Conservative at set (42 ft): next larger tabulated radius = 45 ft, capacity = 16,800 lbs. The set position's conservative capacity of 16,800 lbs is the lowest capacity the lift will encounter. The total suspended weight must remain within 16,800 lbs for the complete lift to be within conservative capacity at all positions — the set position governs the overall lift plan.

86. C — Lift percentage = $14,600 \div 31,000 \times 100 = 47.1\%$ — within the 50% personnel hoisting limit. All other OSHA 1926.1431 requirements must also be confirmed: daily pre-lift inspection of the crane functions, load line, ATB, and rigging; operator presence at the controls throughout; confirmation of the trial run at project start; and all platform structural and attachment requirements. These requirements exist alongside the 50% limit — compliance with one does not satisfy the others.

87. B — Interpolation from 30 to 35 feet: drop = $36,200 - 28,600 = 7,600$ lbs over 5 ft = 1,520 lbs/ft. At 33 ft (3 ft beyond 30 ft): $36,200 - (3 \times 1,520) = 36,200 - 4,560 = 31,640$ lbs. Total suspended weight = 28,800 lbs — within the 31,640-lb interpolated capacity. The lift proceeds using the interpolated approach. The conservative approach at 35 ft = 28,600 lbs would also support 28,800 lbs... just barely. The interpolated value provides more precise confirmation.

88. C — The note specifies the OEM rope is required, with a written engineering review required for any substitution. A non-OEM rope of the same specification may have different fatigue life, flexibility, fleet angle performance, or break-in characteristics than the OEM rope — factors that may affect the structural analysis underlying the capacity values. Without written engineering review confirming the substitute rope's equivalence, the note's condition cannot be confirmed as satisfied.

89. A — Centrifugal displacement during swing moves the load outward, increasing the effective operating radius beyond the planned 35 feet. At a greater effective radius, the same total suspended weight represents a higher fraction of the lower rated capacity at the new radius. Reducing swing speed reduces centrifugal force, keeps the load closer to plumb beneath the boom tip, and maintains the effective radius near the planned value — bringing the LMI reading back toward the original 87%.

90. C — The "TELESCOPING" section was developed specifically for the structural and hydraulic conditions present during boom extension under load — conditions that differ from fixed-length operation. The lower telescoping capacities reflect the additional structural stress from the extension mechanism and the transitional boom geometry. Once the boom reaches and is locked at 100 feet, the "FIXED LENGTH" 100-foot section applies for subsequent stationary lifts. Planning the extension movement using the fixed-length section would use values derived for a different structural condition.

91. C — The note establishes a binding derating requirement for winds above 15 mph, with specific factors in Table W. Without Table W, the magnitude of the required derating is unknown. Proceeding with full tabulated capacity values under conditions the note explicitly identifies as requiring derating means using capacity values that do not account for the actual loading conditions. The lift cannot legally proceed using the full tabulated values until Table W is obtained.

92. A — After the boom-up movement, the new radius is 35 feet with a tabulated capacity of 28,400 lbs. $\text{New lift percentage} = 21,000 \div 28,400 \times 100 = 73.9\%$. The boom-up movement reduced the effective operating radius from 40 to 35 feet, increasing the rated capacity from 22,600 to 28,400 lbs. The same 21,000-lb load now represents a smaller fraction of the higher capacity — the lift percentage dropped from 92.9% to 73.9%, and the lift is now below the 75% critical lift threshold.

93. D — The note requires current confirmation that the slewing ring deflection is within the published limit. The 11-month-old measurement confirmed compliance at that point — it cannot confirm the current condition after 11 months of additional wear. Slewing ring wear is progressive and cannot

reverse. Only a current measurement satisfies the note's requirement for "confirmation" that the limit is not exceeded before using these capacity values.

94. C — Phase 1 at 28 feet: conservative capacity at 30 ft = 35,000 lbs; total suspended weight = 31,200 lbs; 31,200 lbs is within 35,000 lbs — Phase 1 proceeds. Phase 2 at 33 feet: conservative capacity at 35 ft = 27,600 lbs; total suspended weight = 31,200 lbs; 31,200 lbs exceeds 27,600 lbs — Phase 2 cannot proceed. Phase 2 is the controlling phase because the set location cannot be reached under the conservative approach in this configuration.

95. B — A lift percentage of 96.8% based on interpolated capacity at 37 feet exceeds the 75% critical lift threshold — a written critical lift plan and pre-lift meeting are mandatory before the lift begins. Additionally, at 96.8%, only 3.2% structural reserve exists. Any dynamic loading from sudden hoist starts or stops, swing acceleration, or combined multi-function movements can add stress above this already near-limit static condition. Exceptionally smooth, controlled movements are required throughout the lift.

Specialty Exam Simulation 11 – 65 Questions

SITE DOMAIN — Questions 1–15

1. A crane operator is evaluating a job site setup location on a construction project at a large university campus. The surface consists of brick pavers over a sand base installed 7 years ago as a pedestrian plaza. The pavers appear to be in excellent condition with no visible cracking or settlement. A previous crew has used the plaza surface for crane setup multiple times. What specific concern must still be evaluated?

A. The previous crew's use of the plaza confirms the surface is adequate for any future crane operations at this location

B. The sand base beneath the brick pavers may have degraded over 7 years — sand bases under paver systems are susceptible to moisture infiltration, migration, and loss of density over time; despite the pavers' excellent surface appearance, the bearing capacity of the sand base must be confirmed for the current crane's specific outrigger loads, as the sand base condition cannot be determined from visual inspection of the paver surface alone

C. Brick paver systems are always adequate for crane outrigger loading since they are designed for pedestrian loading in public spaces

D. The plaza surface requires an environmental review before crane operations since it is a public pedestrian area

2. A crane is set up for a lift at a chemical plant. During the pre-lift walk, the operator discovers that the planned right rear outrigger position will be directly over a labeled underground chemical injection line — a 2-inch line carrying 45 psi of corrosive chemical solution. What is the required action?

A. Place a 4 × 4 timber mat over the labeled area to protect the line from direct outrigger contact

B. The chemical line is only 2 inches in diameter and can support any outrigger load since small pipes are always structurally adequate

C. Proceed with setup since the line is at an unknown depth — the locate tolerance zone allows for outrigger placement

D. The outrigger must be repositioned away from the chemical injection line — operating over a pressurized chemical line creates risk of rupture under outrigger loading, and a rupture of a 45 psi corrosive chemical line creates immediate chemical burn hazard to personnel in the vicinity; the line's exact location must be confirmed and the outrigger positioned to avoid loading directly above it

3. Under OSHA 1926.1402, when a crane employer performs their own independent ground condition investigation because the controlling entity has failed to provide documentation, what specific information must the crane employer confirm?

A. The crane employer must confirm the specific bearing capacity of the soil at each outrigger position, confirm the routing and depth of all underground utilities within the outrigger spread, and confirm there are no underground voids or structures that could affect outrigger support — the employer bears responsibility for confirming current ground adequacy regardless of the reason the controlling entity failed to provide documentation

B. The crane employer must confirm the ground is visually firm and free of standing water — no soil testing is required for an independent assessment

C. The crane employer must only confirm the utility locations — bearing capacity assessment is the controlling entity's responsibility regardless of who performs the investigation

D. The crane employer's operator is qualified to perform an independent ground assessment verbally — no written documentation is required

4. A crane is set up on a construction site when the structural steel crew reports that they have discovered an unmarked buried concrete foundation element — a footing approximately 4 feet × 4 feet × 3 feet thick — directly beneath the planned right front outrigger position at 24 inches of depth. The footing is from a previously demolished building. What concern does the buried footing create?

A. Nothing — buried concrete footings provide excellent bearing capacity and improve the outrigger support condition

B. The buried footing creates an environmental concern since demolished structures may contain hazardous material

C. The buried footing must be removed before crane setup since it constitutes an underground obstruction within the setup area

D. A previously demolished building footing at 24 inches of depth may be structurally inadequate for crane loading — the footing may be poorly connected to the underlying soil, may have voiding beneath it from the original construction or demolition, or may have been compromised during demolition; the footing's structural condition and its connection to the bearing soil must be evaluated before the outrigger is positioned over it

5. A crane is operating on a coastal construction project when high tide raises the nearby ocean water level 5.2 feet above low tide, partially flooding the beach area adjacent to the crane's setup location. The crane's outrigger positions are 30 feet from the current water line. What concern does the tidal flooding create for crane ground support?

A. Nothing — 30 feet from the water line is beyond any tidal influence on soil bearing capacity

B. The tidal flooding at 30 feet away is a hazard primarily for personnel — it creates no structural concern for crane ground support conditions at that distance

C. Tidal action at 30 feet from the water line can saturate sandy or silty soils through seawater infiltration, which reduces effective stress and bearing capacity in the soil supporting the crane's

outriggers; saturated beach soils can lose most of their bearing capacity rapidly; the outrigger positions must be monitored for any settlement during operations when high tide is flooding adjacent areas

D. The tidal zone is an environmentally sensitive area requiring permits before crane operations during high tide conditions

6. Under OSHA 1926.1402, what specific obligation arises when a crane must be positioned near a building foundation excavation that is actively being dug — when excavation extends progressively deeper during the crane's operation?

A. Nothing — the original ground condition assessment covers all excavation depths during active digging

B. The crane operations must pause while the excavation is being actively extended — operations may only continue when excavation has stopped for the day

C. Permit and notifications to adjacent property owners are required when crane operations occur near active excavations

D. As the excavation deepens, the passive soil resistance available to support the crane's adjacent outrigger loads decreases progressively — the crane employer must monitor the excavation depth and ensure that each increment of additional excavation depth is evaluated for its effect on the outrigger support conditions before crane operations continue

7. A crane is operating at a job site when a utility crew from the local water authority begins an emergency repair on a water main that has burst — 22 feet from the crane's right front outrigger position. The repair involves excavating a 6-foot-deep trench. What must the crane operator do?

A. Stop crane operations immediately and wait until the water main repair is complete before resuming — the emergency excavation adjacent to the outrigger removes the passive soil resistance on that side of the outrigger and may destabilize the bearing zone; additionally, the burst main may already be saturating the soil beneath the outrigger position; the ground condition has fundamentally changed from the original assessment and operations cannot continue until the conditions are re-evaluated

B. Continue crane operations and allow the water authority to work — emergency utility repairs have priority over construction crane operations

C. Reduce the planned lift load to 80% while the emergency repair proceeds

D. Contact the lift director and await their authorization before deciding whether to continue or stop operations

8. A crane operator is evaluating a setup location when they observe that the surface soil in the planned outrigger zone has a distinct darker brown color in a roughly circular pattern, approximately 8 feet in diameter. The surrounding soil is a lighter tan color. The darker zone has a distinct musty odor when the operator probes it. What does this color and odor pattern most likely indicate?

A. The darker color indicates higher mineral content that improves bearing capacity in that zone

B. The darker color indicates the soil has been recently irrigated — no structural concern applies

C. The darker circular pattern with a musty odor is consistent with buried organic material or a former septic or waste area — organic fill has very low bearing capacity and can compress significantly and suddenly under crane loading; the extent and depth of the organic material must be confirmed before any outrigger loading in this zone

D. The musty odor and darker color indicate a naturally occurring humus layer that is common in agricultural areas and requires no special treatment

9. A crane is operating at a construction site when the contractor begins grouting soil nails for a retaining wall system — the grouting operation involves injecting pressurized cement grout through steel casings into the soil. The nearest nail installation point is 18 feet from the crane's left rear outrigger position. What concern does active soil nail grouting create?

A. Nothing — soil nail grouting consolidates soil and always improves bearing capacity in the surrounding area

B. Active pressurized grouting at 18 feet from an outrigger creates temporary pore pressure increases in the soil between the grout injection point and the outrigger — this reduced effective stress can temporarily lower the bearing capacity at the outrigger position; operations should be monitored for any level change during active grouting, and the crane operations may need to pause when grout injection occurs closest to the outrigger positions

C. Soil nail grouting requires permits and notifications to adjacent equipment operators before any injection begins

D. The 18-foot distance exceeds the standard zone of concern for grouting operations — no action is required

10. A crane operator is asked about the purpose of a "bearing capacity" assessment versus a "settlement" analysis for crane outrigger loading. Which statement correctly distinguishes these two concepts?

A. Bearing capacity and settlement analysis are the same calculation expressed differently — there is no distinction between them

B. Bearing capacity is the maximum load the soil can support without structural failure (shear failure); settlement analysis estimates how much the soil will compress under the applied load without necessarily failing; both are important for crane operations because a soil can have adequate bearing capacity without shearing but still settle enough to cause the crane to go out of level or cause mat movement

C. Settlement analysis applies only to soft clay soils — bearing capacity analysis applies to all soil types

D. Bearing capacity analysis is only needed for lifts above 75% of rated capacity; settlement analysis is not a crane operation concern

11. A crane is set up at a refinery when the operator notices that the soil surface directly beneath the right rear outrigger mat has begun to smoke slightly — very faint white vapor is rising from the soil surface beneath the mat's edge. The refinery site has subsurface temperatures well above ambient due to steam injection processes used in hydrocarbon extraction. What must the operator do?

A. Continue operations and notify maintenance of the observed vapor — subsurface steam emissions are normal at refinery sites

B. Nothing — white vapor from soil beneath a mat during a hot day is caused by moisture evaporation and is not a safety concern

C. The vapor indicates the subsurface steam system may be heating the soil directly beneath the mat — elevated soil temperature can reduce the bearing strength of fine-grained soils by affecting pore water

pressure and thermal expansion; more critically, steam pressure in the soil can cause sudden ground heave; operations must stop and the vapor source must be investigated before any further crane operations at that position

D. Apply water to the smoking area to cool the soil surface and continue operations

12. A crane is set up adjacent to a roadway when the operator observes that heavy truck traffic passing 15 feet from the right outrigger spread causes the outrigger mats to vibrate visibly with each truck pass. After 6 trucks have passed, the operator notices the right front outrigger mat appears to have shifted approximately 0.5 inches from its original position. What must happen?

A. Nothing — mat micro-movement of 0.5 inches from vibration is within normal operational tolerance for crane setup on roadside projects

B. The mat shifting is caused by the trucks' air pressure wave — add ballast weight to the mat to prevent further shifting

C. The mat shift indicates the vibration from truck traffic is inducing progressive movement in the outrigger mats — stop crane operations and re-assess and re-seat all mat positions; additionally, assess whether the truck traffic vibration is creating a risk of further mat movement during the planned lifts; the lift plan may need to include traffic control to prevent truck traffic during crane operations

D. Continue operations and allow the remaining mats to shift to their natural equilibrium position before reassessment

13. A crane operator is performing a site walk at a manufacturing facility when they find that the surface directly beneath the planned left front outrigger position has a grid of bolt holes approximately 8 inches in diameter — the bolt pattern matches a large piece of machinery that was previously bolted to a concrete equipment pad. The bolt holes are unfilled. What concern do unfilled bolt holes create?

A. Nothing — bolt hole anchors in concrete are structural elements that improve the load distribution capacity of the concrete

B. Unfilled bolt holes represent voids in the concrete slab directly beneath the planned outrigger position — concentrated outrigger loading on a concrete pad with multiple 8-inch voids can cause punching shear failure around the void pattern; the effective structural capacity of the slab in the bolt hole zone is

reduced compared to solid concrete; the slab must be evaluated for the specific concentrated outrigger load before setup

C. Fill the bolt holes with dry concrete mix and allow 24 hours of curing before crane setup

D. The bolt holes are too small to affect the structural capacity of the slab and require no action

14. A crane is operating on a construction project when a compaction grouting operation begins 25 feet from the crane's setup — the process involves injecting low-slump concrete grout into the soil under pressure to densify loose zones. What effect does compaction grouting at 25 feet have on the crane's ground support?

A. Compaction grouting always improves bearing capacity throughout the affected zone — operations may continue normally

B. Nothing — compaction grouting at 25 feet is too far away to affect crane operations

C. The compaction grouting will improve the ground conditions beneath the crane — operations should continue

D. Compaction grouting under pressure can temporarily increase pore pressure in the soil between the injection point and the crane's outrigger positions, reducing effective stress and bearing capacity during active injection; the crane's level condition must be monitored during grouting operations, and the operator must be prepared to stop if any level change is observed during active injection near the outrigger positions

15. A crane operator is asked to confirm the ground conditions at a new site before operations begin. The site engineer hands the operator a report labeled "GEOPHYSICAL SURVEY — GROUND PENETRATING RADAR RESULTS." The report shows a subsurface profile of the site. Which information from the GPR report is most directly relevant to crane setup?

A. The GPR report can confirm the exact bearing capacity of the soil in pounds per square foot throughout the survey area

B. Nothing — GPR reports are only relevant for utility location and are not applicable to bearing capacity assessment

C. Nothing — ground penetrating radar results must be interpreted by a licensed geophysicist to have any validity

D. GPR reports are most directly relevant for identifying subsurface voids, anomalies, buried structures, and utility locations beneath the planned outrigger positions — GPR shows subsurface density contrasts that reveal voids, buried objects, and stratification; it does not directly measure bearing capacity but can identify conditions (voids, buried structures, disturbed soil zones) that would compromise bearing capacity assessment; a geotechnical engineer should interpret the GPR results in the context of crane outrigger loading

OPERATIONS DOMAIN — Questions 16–30

16. A crane operator is completing a shift when the lift director informs the operator that the crane's hook block needs to be swapped out for a heavier-duty block before the next shift's lifts. The current block weighs 1,800 lbs and the replacement block weighs 3,200 lbs. What must happen before the next shift begins lifting with the heavier block?

A. Nothing — the LMI will automatically detect the heavier block weight and adjust the displayed capacity percentage accordingly

B. The replacement of the hook block with one weighing 1,400 lbs more changes the rigging deduction calculation for all subsequent lifts — the next shift's operator must use the 3,200-lb block weight in all capacity calculations, and the load chart must be re-checked for each planned lift to confirm the available net payload with the heavier block; the LMI must also be reconfigured to account for the changed block weight if applicable

C. Nothing additional is needed — block weights don't affect capacity calculations, only payload weight matters

D. The load chart must be re-issued by the crane manufacturer to reflect the new block weight before the next shift can begin

17. A crane operator is performing a lift when the signal person gives the HOIST signal and then immediately follows it with a STOP signal within 1 second. The load is still on the ground. What is the correct operator response?

- A. Nothing — rapid back-to-back signals are treated as a communication error; wait for the signal person to reset before acting
- B. Execute the HOIST signal since it was given first, then immediately stop per the STOP signal — honor both signals in the sequence received
- C. Execute only the STOP signal — when a STOP signal is received, all movement must immediately cease regardless of any prior signal; the operator must not initiate the hoist movement that was signaled immediately before the STOP; the signal person must then re-confirm the intended next movement before any crane function is activated
- D. Contact the lift director to determine whether the HOIST or STOP signal was the intended command

18. Under OSHA 1926.1431, when a personnel platform is at its working height and workers are performing structural connections, the operator receives a radio call that the hydraulic oil temperature has entered the yellow zone. Which of the following best describes the operator's required response?

- A. Maintain the platform at working height and contact the lift director — wait for instruction before lowering
- B. Lower the platform immediately to the ground without warning the workers — temperature emergencies override all other safety considerations
- C. Continue holding while monitoring — yellow zone temperature is a warning, not a critical failure
- D. Immediately inform the lift director of the hydraulic temperature condition, begin planning a controlled platform lowering, and initiate the lowering process before the temperature escalates to the red zone — personnel in the platform are entirely dependent on the crane's hydraulic system; the lift director must direct the controlled descent while time remains for safe lowering rather than waiting for critical temperature conditions

19. A crane operator is directing a lift when a fire alarm activates in the adjacent building where the construction crew is working. Construction workers begin evacuating the building. The load is at 6 feet of height mid-swing. What must the crane operator do?

- A. Stop all crane movement immediately, lower the load to the nearest stable surface, sound the emergency horn, and evacuate per the facility emergency procedures — a building fire alarm requires immediate evacuation of all personnel including the crane operator; the load must be secured on the ground before the operator evacuates; continuing to hold the load or completing the swing to delay evacuation is not appropriate when a fire alarm has activated
- B. Continue the swing to the set location and then lower the load before evacuating — completing the swing takes less than 30 seconds and reduces the hazard of a suspended load
- C. Hold the load in position and wait for confirmation that the alarm is not a drill before evacuating
- D. Reduce swing speed to minimum and complete the set before leaving the crane

20. A crane is performing a lift when the operator receives a radio message from the rigger saying: "One of the shackle pins looks like it might be backing out." The load is at 8 feet of height. What is the required response?

- A. Continue the lift to the set location at minimum speed and examine the shackle after the load is set
- B. Slow the hoist and request the rigger to visually confirm the shackle pin condition from below before deciding
- C. Lower the load immediately to the ground — a shackle pin that may be backing out represents a potential immediate rigging failure; if the pin backs out during the hoist, the load could drop without warning; returning the load to the ground immediately is the only safe response; the shackle must be inspected and confirmed secure before re-picking the load
- D. Request that a rigger manually tighten the pin from below while the load is held at 8 feet

21. A crane is performing a critical lift at 89% of rated capacity when the signal person and operator simultaneously observe a large flock of birds land on the top chord of the boom. There are approximately 40 to 50 birds. At an average of 1 lb per bird, the additional weight is approximately 40 to 50 lbs. What must the operator do?

- A. Nothing — 40 to 50 lbs is insignificant relative to the crane's capacity

B. Sound the horn to scare the birds off the boom before any further crane movement — the birds add approximately 40–50 lbs to the boom tip, which increases the structural load on the boom and changes the boom's mass distribution; while the weight is small, at 89% of rated capacity the operator must assess whether this additional unplanned loading has any meaningful effect; more practically, birds perched on the boom can be startled into sudden flight by any crane movement, which may cause the operator distraction; sounding the horn clears the birds safely before continuing

C. Continue the lift at minimum speed while the birds are on the boom

D. Stop all crane movement and hold the load until the birds leave on their own

22. Under OSHA 1926.1416(d), when a lift plan requires the boom to travel over a sidewalk where members of the public may walk during normal business hours, which of the following correctly describes the required controls?

A. Warning signs posted on the sidewalk 50 feet in each direction are sufficient to protect the public during brief overhead passages

B. The crane must sound the horn before each overhead swing to alert pedestrians on the sidewalk below

C. Overhead passage over active pedestrian areas requires a spotter at the sidewalk to direct pedestrians away from the area

D. The sidewalk must be closed to public access and positively controlled — either with physical barriers and a flagging crew or by scheduling all overhead operations during times when pedestrian access can be confirmed absent; loads may not pass over uncontrolled public areas; warning signs alone are not sufficient — the area below the load path must be physically controlled

23. A crane operator is performing a lift when the crane's counterweight suddenly contacts a storage rack 15 feet behind the crane — the rack was not identified during the site walk and is now within the counterweight's swing radius. The contact creates a metallic scraping sound but appears minor. No structural damage is visible. What must happen?

A. Stop crane operations, investigate the cause of the counterweight contact, confirm the rack's contents are not hazardous and were not displaced by the contact, and expand the exclusion zone to include all counterweight arc positions before resuming operations — the contact indicates the exclusion zone was

inadequate; the rack may have displaced materials that could now be within the crane's operational envelope; and the counterweight itself may have been damaged by the contact

B. Continue operations and widen the swing arc to avoid the rack by using a smaller swing radius

C. Sound the horn, warn nearby workers, and continue the current lift before addressing the contact issue

D. Reduce the lift radius so the counterweight arc clears the storage rack and continue operations

24. A crane operator is performing a pick when the rigger reports that one leg of a three-leg chain sling is showing visible lateral bow — a slight curve when the leg should be straight. This is not a curve from the sling hanging under its own weight. The load weighs 9,600 lbs. What must the operator do?

A. Continue the pick — lateral bow in a chain leg during a load is caused by normal load distribution effects in a three-leg configuration

B. Lower the load to the ground — a visible lateral bow in a chain sling leg that is not from gravity indicates the chain link has plastically deformed, suggesting the chain has experienced an overload event or has a defective link; a bowed chain link has reduced capacity and is a removal condition; the sling must be exchanged for a confirmed serviceable sling before the load is re-picked

C. Reduce the total load to 75% of the sling's rated capacity and continue the pick

D. Contact the lift director for authorization before deciding whether to lower the load

25. A crane operator is directing crane operations when it begins to rain heavily. The signal person is using hand signals from 30 feet away. The heavy rain reduces visibility and makes the signal person's hand signals difficult to see clearly. What is the required response?

A. Nothing — rain is a normal operational condition; the operator should focus harder on the signal person's signals

B. Operations must switch to a communication system that is effective in the current rain conditions — either electronic communication that allows clear verbal commands or a relay signal person positioned

closer to the operator; if neither option is available, operations must stop until conditions improve; operating with unclear signals is not authorized

C. Reduce all operations to minimum speed and proceed with partial signal recognition

D. The lift director may authorize continuation of operations in heavy rain as long as the signal person is wearing high-visibility gear

26. A crane is performing a series of repetitive picks when the operator notices that the crane's engine RPM has been running approximately 15% below the normal operating RPM for the past three lifts. The crane is functioning but with noticeably reduced power. What concern does sustained reduced engine RPM create?

A. Nothing — reduced RPM conserves fuel and does not affect lifting operations

B. Reduced RPM creates no safety concern unless the RPM drops below the hydraulic pump's minimum operating speed

C. Nothing — the crane's LMI will alert the operator if the reduced RPM creates a capacity concern

D. Sustained reduced engine RPM reduces hydraulic pump output pressure and flow — this directly reduces the maximum brake holding force, available hoist speed, and boom movement responsiveness; at reduced hydraulic pressure, the crane's load-holding capacity may be less than the rated values in the load chart; operations near rated capacity must stop until the cause of the reduced RPM is identified and corrected

27. A crane operator is performing a lift at 86% of rated capacity when the signal person radios and says: "I need to step away for 2 minutes — can you hold the load?" The load is at 12 feet of height at a safe horizontal position. What is the appropriate response?

A. Hold the load in position while the signal person steps away — the drum pawl can be engaged to secure the load during the brief pause

B. Nothing — two-minute holds are within normal crane operational practice; hold the load at the current position

C. Nothing — the signal person does not need to be present when the crane is in a static hold position

D. The operator may hold the load stationary during the signal person's absence as long as the drum pawl is engaged, the LMI confirms the hold is within capacity, and the operator remains at the controls throughout — when the signal person returns, they must re-establish full communication and confirm both are ready before any further movement proceeds; the absence of the signal person during a static hold is acceptable but the hold must resume active signaling before any new crane movement

28. A crane is operating at night at an industrial facility. The area is illuminated by temporary construction lighting but the lighting is creating strong shadows in the load path between the pick and set locations. The signal person is visible but cannot confirm the load's exact height at multiple points along the travel path. What must be done?

A. Continue at minimum speed using the LMI and signal person's general guidance for load height management

B. Use the crane's boom angle and radius indicators to calculate the load height rather than direct visual observation

C. Additional lighting must be provided to eliminate the shadow zones along the load travel path, or relay observers must be stationed at each shadow zone location to confirm the load's clearance at those points — crane operations may not proceed with the load in an area where neither the operator nor the signal person can confirm the load's height and clearance; operating blind through shadow zones creates risk of load contact with unseen obstacles

D. The signal person must walk along the load path confirming clearance verbally at each shadow zone

29. A crane operator is performing a tandem lift with the second crane's operator when Crane B's signal person radios to Crane A's operator directly — bypassing their own operator and the lift director — and says: "Crane B needs to stop. Crane A hoist only." What is the correct response from Crane A's operator?

A. Execute the command — the direct communication from Crane B's signal person indicates an urgent situation

B. Stop all Crane A movement and hold position — in a tandem lift, any stop condition from the signal person of either crane requires all cranes to stop; however, Crane A's operator may not execute a "hoist only" movement unless directed by the lift director who is coordinating the tandem operation; movements must be coordinated through the lift director to prevent load redistribution from creating overload conditions

C. Contact Crane B's operator by radio to confirm whether to execute the hoist

D. Execute the hoist slowly until confirmation is received from the lift director

30. Under OSHA 1926.1416, when may a crane operator leave the cab during an active lift — specifically when the load is suspended at height — under any approved conditions?

A. The operator may leave the crane cab for emergency bathroom breaks as long as another qualified person watches the load from outside

B. The operator may leave the cab when the drum pawl is engaged and the lift director confirms the hold is stable

C. The operator may leave the cab when the signal person is watching the load and the LMI confirms the hold is within capacity

D. An operator may not leave the cab while a load is suspended — ASME B30.5 and OSHA 1926.1416 both require the operator to remain at the controls at all times while a load is suspended; the load must be lowered to a stable surface and the crane secured before the operator leaves; there are no exceptions authorized in the standard for bathroom breaks, emergencies, or other reasons while a load remains suspended

TECHNICAL KNOWLEDGE DOMAIN — Questions 31–42

31. A crane's wire rope running line is found during the annual inspection to have a valley break in one of the outer strands. The rope shows no other defects — no broken crown wires, no deformation, and diameter is within specification. What action does ASME B30.5 require?

A. A valley break is an absolute removal condition regardless of the absence of other defects — a valley break occurs at the contact point between two adjacent strands and indicates contact fatigue rather than simple tension fatigue; this failure mode progresses much more rapidly than tension fatigue; the rope must be removed from service immediately regardless of how the rest of the rope appears

B. The rope may remain in service — valley breaks are only a removal condition when they occur in groups of 3 or more within a single lay length

C. Monitor the valley break at daily inspections — remove from service when additional valley breaks appear in the same lay length

D. Apply additional lubrication to the valley break area to reduce contact stress and return to service

32. Under ASME B30.9, what is the specific removal criterion for a synthetic round sling (roundsling) when the load-bearing core yarns are exposed through the outer protective cover?

A. The sling may continue in service if fewer than 10% of the core yarns are exposed in the damaged area

B. Nothing — exposed core yarns are only a concern when combined with other damage such as cuts or chemical contamination

C. Any exposure of the load-bearing core yarns through the outer protective cover requires immediate removal from service — the cover's function is to protect the structural core from damage; when the core is exposed, it is vulnerable to abrasion, cutting, chemical attack, and UV degradation; additionally, the extent of potential internal damage cannot be assessed through the exposed area alone

D. Sling may remain in service at 75% of rated capacity if the exposed yarns appear undamaged

33. A crane inspector is examining a hook block and finds that the lower block's reeving sheave turns freely but has a noticeable side-to-side wobble — approximately 1/4 inch of lateral play when pushed by hand. What does lateral sheave wobble indicate and what action is required?

A. Nothing — 1/4 inch of lateral play is within normal tolerance for working sheaves in hook blocks

B. Lateral sheave wobble indicates the sheave bearing has worn excessively or the sheave pin has worn to a smaller diameter than designed — the wobble creates uneven rope contact across the sheave groove width, accelerating rope wear; additionally, excessive pin wear can lead to pin failure; the hook block must be removed from service and the bearing and pin evaluated and replaced before any further use

C. Apply additional grease to the sheave pin and re-check the wobble — the play will decrease as the grease fills the gap

D. The sheave wobble is a lubrication issue — replace the sheave pin grease fitting and monitor for improvement

34. A rigger is inspecting a set of 4-leg wire rope sling bridles before use when they find that one leg has a section where the lay length has decreased by approximately 12% — the strands are compressed together more tightly than normal in a 6-inch section. What does compressed lay length indicate and what action is required?

A. Nothing — decreased lay length is a normal manufacturing variation in wire rope slings

B. Compressed lay length indicates the rope has been stretched longitudinally in that section — it is the opposite of increased lay length

C. Decreased lay length in a rope section indicates the rope has been subjected to a compressive shock or a kink event that has permanently altered the rope's internal geometry; the compressed zone creates a stress concentration when the rope is subsequently loaded in tension; the sling must be removed from service and the affected leg evaluated against ASME B30.9 deformation removal criteria

D. Compressed lay length is caused by excess lubrication — clean the section and re-inspect before use

35. Under ASME B30.10, what must be done when a crane hook is found to have developed a crack in the shank — the cylindrical section between the eye of the hook and the hook body?

A. Remove the hook from service immediately — any crack in the hook shank is an absolute removal condition; the shank is the primary load-carrying section that transmits the entire suspended load from the eye fitting to the hook body; a crack in the shank represents a structural failure that can propagate to complete fracture under any subsequent loading; there is no authorized monitoring period or reduced-capacity use for a cracked shank

B. Reduce the hook's rated capacity by 50% and monitor the crack at daily inspections

C. Have a certified welder repair the shank crack using an approved welding procedure and return to service

D. Monitor the crack at monthly inspections — remove from service only when the crack exceeds 1/2 inch in length

36. A crane is operating when the operator notices that the hoist brake is engaging and releasing rhythmically on its own — the hoist drum shows a pulsing motion approximately twice per second when the load is being held stationary with no hoist input. What does this rhythmic brake behavior most likely indicate?

A. Nothing — hydraulic systems naturally cycle the hoist brake at low frequency during load holds to maintain pressure

B. Intermittent load drift and re-engagement happens in all hydraulic cranes and is expected behavior

C. Rhythmic brake cycling without operator input indicates the hydraulic system is experiencing pressure cycling — a failing pressure relief valve that opens and closes at the hold pressure, a worn hoist motor that allows internal bypass causing cyclic pressure loss, or a control valve that is not fully closing; this oscillating load-holding condition can escalate to complete brake failure; the crane must be removed from service and the hydraulic circuit inspected

D. The brake pulsing is caused by vibration from adjacent equipment — mount vibration dampers on the drum and continue operations

37. A crane operator is reviewing inspection documentation and finds the following notation from 6 months ago: "Boom hoist rope shows normal end termination wear at drum dead end — acceptable for current service but will reach replacement threshold within next 2–3 months." No subsequent action has been documented. What must the operator do?

A. Nothing — the notation confirms the rope was acceptable at the time of inspection; re-inspect at the next scheduled interval

B. Request that a qualified person immediately assess the current condition of the boom hoist rope at the drum dead end — 6 months have passed since the inspection predicted replacement within 2–3 months; the predicted replacement window has elapsed without documented action; the rope may have already reached or exceeded the removal threshold; a current assessment is required before any operations

C. Replace the boom hoist rope as preventive maintenance since the 2–3 month prediction was 6 months ago

D. Continue operations until the 2–3 month replacement threshold notation from 6 months ago is confirmed by the next annual inspection

38. A crane inspector discovers that the crane's slewing ring bolt torque was last verified 18 months ago during the annual inspection. The manufacturer specifies verifying ring gear bolt torque at 6-month intervals. What is the significance of overdue bolt torque verification?

A. Nothing — slewing ring bolt torque is stable once set and does not change significantly during normal operations

B. Slewing ring bolt torque verification at 6-month intervals has been missed by 12 months — slewing ring bolts are subject to relaxation from vibration, thermal cycling, and dynamic operational loading; loose bolts allow micro-movement of the ring relative to its mounting flange; this micro-movement causes fretting corrosion, bolt fatigue, and eventual bolt fracture; the torque must be verified and any under-torqued bolts retorqued before crane operations continue

C. The torque verification requirement is advisory — verification at 18-month intervals is acceptable for low-use cranes

D. Bolt torque verification must be performed after any incident but is not required at specific calendar intervals for cranes in normal service

39. A crane operator is reviewing the crane's maintenance history and discovers that the hydraulic system has not had an oil sample analysis performed for 3 years. The manufacturer recommends analysis every 6 months. What is the concern with 3 years of no oil analysis?

A. Nothing — hydraulic oil analysis is an optional maintenance enhancement with no safety implications

B. Hydraulic oil analysis is scheduled maintenance and its absence is only relevant when equipment failure occurs

C. The absence of 3 years of oil sample analysis means the hydraulic system's contamination level, additive depletion, and internal wear indicators have not been monitored — without analysis data, accelerating wear in pumps, motors, or valves that would show up as increased metal particles in the oil cannot be detected; the system may have progressed to a state of significant internal wear without any external indication; an immediate oil analysis should be performed to assess the current system condition

D. Nothing — hydraulic oil is changed on a schedule regardless of analysis results; the absence of analysis is purely administrative

40. A crane inspector is examining a spreader beam rated at 10 tons. The beam shows visible deformation — the beam has a permanent bow of approximately 1.5 inches over its 8-foot length. The deformation occurred under unknown loading conditions. What action is required?

A. Derate the spreader beam to 7.5 tons (75% of rated) to account for the geometric imperfection and continue use

B. Monitor the bow at each use — remove from service when the permanent deformation exceeds 2 inches over the full beam length

C. The spreader beam's load rating must not be assumed valid with permanent deformation — the bow indicates the beam has yielded beyond its elastic limit; yielded structural members have reduced remaining capacity that cannot be determined without engineering analysis; the beam must be removed from service until a qualified engineer evaluates whether its current geometry provides adequate capacity for any rated load; operating at any capacity assumes structural integrity that cannot be confirmed after plastic deformation

D. Apply a structural brace to the deformed section and reduce the capacity by the percentage of deformation before returning to service

41. Under OSHA 1926.1413, when a crane's wire rope has been in contact with an energized conductor and the rope is inspected — finding no visible arc marks, no fused wires, and no visible damage — what action is required?

A. The rope may be returned to service — the absence of visible damage confirms the rope is undamaged from the contact

B. Nothing — OSHA 1926.1413 requires removal only when visible damage is documented

C. The rope must be removed from service regardless of the absence of visible damage — electrical contact with an energized conductor can alter the steel wires' metallurgical properties through heating without leaving visible external marks; internal crystal structure changes from even brief electrical heating permanently reduce the wire's ductility and fatigue resistance in ways that are not externally detectable; OSHA 1926.1413 requires removal after any confirmed electrical contact

D. The rope may be used if a qualified electrician confirms the voltage and duration of contact were below damaging thresholds

42. A crane's hook block is found to have its swivel frozen — it requires approximately 40 foot-pounds of torque to initiate rotation when loaded with a 1,000-pound test weight. The manufacturer's specification states the swivel should rotate freely under any load. What operational consequence does a frozen swivel create and what action is required?

A. A frozen swivel reduces the hook's maximum lowering speed — reduce hoist speed and continue operations

B. Nothing — swivel rotation is only required during load rotation; a load that does not rotate will not be affected by a frozen swivel

C. The frozen swivel means torsional loads from load rotation or spinning cannot be absorbed by the swivel — instead, they are transmitted directly into the wire rope, causing rope twist accumulation; accumulated twist reduces the rope's rated capacity and can release suddenly as a violent untwisting event; the swivel must be repaired or replaced before the hook block is used for any further lifts

D. Reduce the crane's capacity by 10% to account for the additional structural loading from the stiff swivel

MANUFACTURER LOAD CHARTS DOMAIN — Questions 43–65

43. A crane load chart shows: 100-foot boom, on-outrigger, full extension: 30 ft = 36,400 lbs; 35 ft = 28,800 lbs; 40 ft = 22,600 lbs. The planned operating radius is 38 feet. The hook block weighs 1,800 lbs, slings weigh 640 lbs, hardware weighs 220 lbs, and the payload weighs 19,000 lbs. Using the conservative approach, is the lift within capacity?

A. Conservative capacity at 40 ft = 22,600 lbs; total suspended weight = $1,800 + 640 + 220 + 19,000 = 21,660$ lbs; 21,660 lbs is within the 22,600-lb conservative capacity — the lift proceeds with 940 lbs of margin

B. Conservative capacity at 35 ft = 28,800 lbs; total suspended weight = 21,660 lbs; 21,660 lbs is within capacity using the 35-foot value

C. Conservative capacity at 40 ft = 22,600 lbs; 21,660 lbs is within capacity — lift proceeds; but note the 940-lb margin is very narrow at this configuration

D. The lift percentage based on conservative capacity = $21,660 \div 22,600 = 95.8\%$; this exceeds the 75% critical lift threshold and the lift requires a written critical lift plan and pre-lift meeting before proceeding

44. A crane load chart section note reads: "Rated capacities in this section are based on maximum recommended line speed of 120 feet per minute. For hoisting speeds above 120 fpm, contact the manufacturer." The operator is planning to hoist at 180 fpm to increase productivity. The LMI shows 78% capacity. What is the compliance issue?

A. Nothing — 78% capacity confirms the lift is within the LMI's safe operating zone; hoist speed is the operator's discretion

B. The note applies only to critical lifts — at 78% capacity, the speed restriction is advisory

C. Nothing — hoist speed restrictions apply only to loads above 90% of rated capacity

D. The note establishes 120 fpm as the maximum hoisting speed for the capacity values in this section — the values were derived under the assumption of this speed limit; at 180 fpm, the dynamic loads and brake requirements differ from those assumed in the capacity analysis; operations above 120 fpm require manufacturer's input regardless of the current load percentage

45. A crane load chart shows the following in the on-outrigger full extension, all-directions section: all cells from 15 to 25 feet are stability-limited; all cells from 30 feet and beyond are structural-limited. A lift is planned at 28 feet. Using the conservative approach, the governing capacity comes from the 30-foot structural-limited cell. The total suspended weight is 89% of this conservative structural-limited capacity. What does this lift require?

A. Nothing beyond normal procedures — 89% of any rated capacity requires only a standard lift briefing

B. Nothing additional — the conservative approach provides sufficient margin for structural-limited lifts at 89%

C. A critical lift plan and pre-lift meeting are required since 89% exceeds the 75% threshold — additionally, because the conservative governing capacity comes from a structural-limited cell, all crane movements must be exceptionally smooth throughout the lift; no rapid acceleration, deceleration, or simultaneous multi-function operation; the operator must treat this as a structural-limited lift requiring smooth operation protocols

D. The lift cannot proceed since the conservative approach uses a structural-limited value for a non-structural-limited radius

46. A crane's load chart note reads: "All capacities in this section include the weight of the manufacturer's standard hook and overhaul ball (weight: 850 lbs)." The operator has replaced the manufacturer's standard overhaul ball with an aftermarket unit weighing 1,400 lbs. The tabulated capacity at the planned configuration is 24,800 lbs. What is the applicable net payload?

A. Maximum payload = $24,800 - 1,400 = 23,400$ lbs — deducting only the actual overhaul ball weight since the note says it's pre-deducted

B. Maximum payload = $24,800 - (1,400 - 850) = 24,800 - 550 = 24,250$ lbs — deducting the weight difference between the non-standard and standard ball since the standard ball weight is already pre-deducted; the extra 550 lbs of the non-standard ball consumes additional gross capacity beyond what was pre-deducted, reducing the net payload accordingly

C. Maximum payload = 24,800 lbs — the pre-deduction already covers all hook and ball weight

D. Maximum payload = $24,800 + 850 - 1,400 = 24,250$ lbs — adding back the standard ball and deducting the actual ball

47. A crane load chart section shows all capacity values in the 20-foot radius column as shaded gray (structural-limited) while the 25-foot and beyond columns are white (stability-limited). A critical lift is planned at exactly 22 feet of radius using the conservative approach. The conservative governing value at 25 feet (stability-limited) = 43,200 lbs. The total suspended weight is 40,800 lbs — a lift percentage of 94.4%. What type of limit actually governs this lift and what operational requirements apply?

A. Stability limits govern since the 25-foot entry is stability-limited — standard stability precautions apply

B. Nothing — both limit types require the same operational precautions at the same percentage

C. The governing capacity from the conservative approach comes from the 25-foot stability-limited cell — so stability limits govern; at 94.4% of a stability-limited capacity, the crane is very close to the tipping threshold; the operator must confirm the crane is level within manufacturer tolerance, minimize swing speed to reduce centrifugal displacement, and perform all movements with exceptional smoothness

D. The structural limit governs because the actual lift radius (22 feet) is in the structural-limited zone regardless of which entry is used conservatively

48. A crane load chart shows: "ON OUTRIGGERS — FULL EXTENSION — 100-FT BOOM": 25 ft = 44,400 lbs; 30 ft = 35,200 lbs; 35 ft = 27,800 lbs. The rate of capacity decrease: 25–30 ft = 1,840 lbs/ft; 30–35 ft = 1,480 lbs/ft. A planned lift at 32 feet uses linear interpolation between 30 and 35 feet. What is the interpolated capacity?

A. Interpolated capacity at 32 ft: drop per foot 30–35 = 1,480 lbs/ft; at 32 ft (2 ft beyond 30 ft): $35,200 - (2 \times 1,480) = 35,200 - 2,960 = 32,240$ lbs

B. Nothing — interpolation between 30 and 35 feet gives $35,200 - (2 \times 1,480) = 32,240$ lbs; confirming the interpolated capacity at 32 feet

C. Interpolated capacity at 32 ft = $35,200 - (2 \times 1,480) = 32,240$ lbs; drop per foot = $(35,200 - 27,800) \div 5 = 7,400 \div 5 = 1,480$ lbs/ft

D. Interpolated capacity = $(35,200 + 27,800) \div 2 = 31,500$ lbs — using the midpoint average method

49. A crane load chart section note reads: "These capacities are valid for all boom positions from 0° to 360°. However, when the boom is within 10 degrees of the mast on the rear quadrant, reduce all

capacities by 25%." The crane is performing a lift where the boom will swing through 315 degrees — passing within 8 degrees of the mast on the rear quadrant. The tabulated capacity is 28,400 lbs. What capacity applies when the boom is at 8 degrees from the mast?

A. Nothing — the full 28,400-lb capacity applies since the note only restricts within 10 degrees of the mast

B. Derated capacity = $28,400 \times 0.75 = 21,300$ lbs; the 8-degree position is within the note's 10-degree restriction zone; the 25% reduction applies; the total suspended weight must be within 21,300 lbs during the portion of the swing when the boom is within 10 degrees of the mast

C. Nothing — the derating only applies if the boom must stop within 10 degrees of the mast, not just pass through that position

D. The operator must avoid the restricted zone entirely and redesign the lift to prevent any boom position within 10 degrees of the mast

50. A crane's load chart for a 100-foot boom shows the on-outrigger, full-extension, all-directions section's maximum rated radius is 55 feet. A planned pick at 50 feet and set at 53 feet are both within this limit. The conservative capacity at 55 feet (the next larger tabulated value beyond 53 feet) is 9,200 lbs. The total suspended weight is 8,700 lbs. Using the conservative approach, is the lift within capacity?

A. Conservative capacity at 55 ft = 9,200 lbs; 8,700 lbs is within capacity; the lift proceeds with 500-lb margin; but being within 200 lbs of the maximum rated radius requires careful radius management throughout all phases of the lift

B. Nothing — the set radius of 53 feet is within the 55-foot maximum; the 9,200 lbs governs; the lift proceeds

C. Nothing — 8,700 lbs within 9,200 lbs; the margin is adequate for both pick and set positions

D. The lift proceeds with only a 500-lb margin at the maximum rated radius boundary — the operator must confirm the actual radius does not increase beyond 53 feet from boom deflection, centrifugal displacement, or wind during any phase of the lift; additionally, the blank beyond 55 feet means any radius increase beyond the maximum rated radius immediately places the crane in an unrated condition

51. A crane load chart contains a note: "When operating with a personnel platform, reduce all capacities in this section by 50% in accordance with OSHA 1926.1431 requirements." The tabulated capacity at the planned configuration is 32,400 lbs. The total personnel platform load (including platform weight, all personnel, and all tools) is 14,800 lbs. Is the personnel hoisting lift within the note's requirement?

A. Derated capacity = $32,400 \times 0.50 = 16,200$ lbs; total platform load = 14,800 lbs; 14,800 lbs is within the 16,200-lb derated capacity; the personnel hoisting lift complies with the note's 50% reduction requirement

B. Nothing — the standard 50% personnel hoisting limit already applies without a note; the note is redundant

C. The note creates a separate and higher restriction — the 50% reduced value must be further reduced by 25% for critical lifts when the percentage exceeds 75% of the derated capacity

D. The note means only that the operator must use the derated capacity as a precaution — the actual OSHA limit of 50% of gross capacity still applies separately

52. A crane's load chart for a lattice boom crane shows: "ON CRAWLERS — OVER SIDE — 120-FT BOOM — MAXIMUM COUNTERWEIGHT": 40 ft = 96,000 lbs; 45 ft = 78,400 lbs; 50 ft = 63,200 lbs. A planned lift at 43 feet uses the conservative approach at 45 feet. The total suspended weight is 82,000 lbs. What must the operator conclude?

A. The interpolated capacity at 43 feet (88,320 lbs) clearly supports the 82,000-lb load — the lift proceeds using interpolated values

B. Nothing — the total suspended weight is within the 96,000-lb capacity at 40 feet

C. Conservative capacity at 45 ft = 78,400 lbs; total suspended weight (82,000 lbs) exceeds 78,400 lbs — the lift cannot proceed at 43 feet using the conservative approach; the operator must either reduce the total suspended weight to below 78,400 lbs, or reposition the crane to reduce the operating radius to 40 feet or less where the 96,000-lb tabulated capacity directly supports the load

D. The critical lift plan includes the 82,000-lb load weight; the lift may proceed since it was in the approved plan

53. A crane load chart section shows a note: "This section applies only when the main boom is equipped with the manufacturer's standard tip section. Alternative tip sections void this section." The crane has a modified tip section installed — a non-manufacturer alternate that was fabricated by a third party to reduce tip weight. Which section applies?

- A. The main boom section applies since the modification only affects the tip, not the boom body
- B. This section cannot be used with the alternative tip section installed — the note explicitly states that alternative tip sections void this section; the crane must be equipped with the manufacturer's standard tip section for these capacity values to apply; with the third-party tip installed, the crane is in an unrated configuration and no capacity values are available from this section; the manufacturer must be contacted for applicable capacity values with the alternative tip
- C. The operator may use the section with a 10% derating to account for the non-standard tip geometry
- D. The section applies since the alternative tip weighs less than the standard tip — lighter tips are always a conservative substitution

54. A crane load chart shows two different capacity values for the same configuration and radius: "STANDARD BOOM" section shows 28,400 lbs and "EXTENDED BOOM" section shows 22,800 lbs. The crane is configured at the standard boom length. An operator uses the extended boom section reasoning that lower values are more conservative. What is the error in this reasoning?

- A. Nothing — using lower capacity values is always acceptable regardless of which section produces them
- B. The lower value from the extended boom section is not more conservative — it is simply wrong for the crane's actual configuration; sections in a load chart are derived for specific physical configurations; the extended boom section was calculated for a different structural load path than the standard boom; applying one section's values to a different physical configuration is incorrect regardless of which direction the values differ; the matching section must be used
- C. The operator may use the extended boom section if they verify the total suspended weight is within both sections' capacity values
- D. Using the extended boom section is only incorrect if the LMI is configured for the standard boom — update the LMI to extended boom and proceed

55. A crane load chart shows: "TELESCOPING BOOM — ON OUTRIGGERS — FULL EXTENSION — ALL DIRECTIONS": at 40 ft = 22,600 lbs; at 45 ft = 17,800 lbs; at 50 ft = blank. The maximum rated radius is 45 feet. A critical lift requires setting the load at exactly 45 feet of radius. The total suspended weight is 16,800 lbs. Using the tabulated capacity at exactly 45 feet, is the lift within capacity?

A. Conservative capacity at the next larger tabulated radius beyond 45 ft = blank (maximum is 45 ft); the 45-foot value is the actual tabulated entry for the operating radius — this is not a conservative interpolation question; the lift is at exactly the tabulated radius, so 17,800 lbs directly applies; 16,800 lbs is within 17,800 lbs — the lift proceeds at 94.4%; critical lift documentation required

B. Nothing — the load is within capacity at exactly 45 feet; no special action required

C. The lift cannot proceed because 45 feet is the maximum rated radius and no safety margin exists

D. The conservative approach at 45 feet requires using the blank 50-foot entry — the lift cannot proceed since no capacity exists beyond the maximum rated radius

56. A crane load chart note states: "For lifts with total suspended weight greater than 90% of gross capacity at this configuration, a load verification scale must be used at the pick point to confirm actual load weight." A planned critical lift has a total suspended weight calculated at 93% of gross capacity. No crane scale is available on site. What options does the operator have?

A. The lift director may authorize proceeding without the crane scale if the load weight has been confirmed by the material certifications

B. Nothing — load certification documents satisfy the crane scale requirement at any capacity percentage

C. The note's requirement cannot be waived — the operator must either arrange for a crane scale to be brought to the site before the lift, reduce the total suspended weight to below 90% of gross capacity so the note is not triggered, or choose a different crane configuration where the planned total suspended weight represents less than 90% of that configuration's gross capacity

D. The LMI's load cell reading satisfies the note's load verification requirement since both measure the same variable

57. A crane load chart shows that the "ON OUTRIGGERS — 100% EXTENSION" section provides 44% more capacity at 30 feet of radius than the "ON OUTRIGGERS — 75% EXTENSION" section. Both sections are stability-limited at 30 feet. An operator reasoning that stability is governed by the outrigger spread can explain this: why does 100% extension provide such dramatically more capacity than 75% extension?

A. Nothing — the 44% difference indicates a printing error; equal percentage extension positions should have identical stability profiles

B. Nothing — the difference is caused by the structural difference in the outrigger beams at different extension positions

C. Nothing — the difference is caused by the hydraulic jack cylinder capacity difference at 75% vs. 100% extension

D. At 100% extension, the outrigger spread is significantly wider than at 75% — the wider spread places the tipping axis much further from the crane's centerline, dramatically increasing the moment arm available to resist overturning; since stability capacity is proportional to the restoring moment (counterweight \times restoring arm), a wider outrigger spread increases the tipping resistance and allows much higher loads to be carried before the tipping threshold is reached

58. A crane load chart for a 120-foot lattice boom shows: "ON CRAWLERS — MAXIMUM COUNTERWEIGHT — OVER SIDE — 360° SWING": all cells from 40 to 55 feet are structural-limited (gray). A critical lift at 47 feet of radius is planned at 92% of the structural-limited conservative capacity. Which operational requirement specifically governs this lift?

A. Nothing — the critical lift plan and pre-lift meeting are the only additional requirements for lifts above 75% of rated capacity

B. Nothing beyond the critical lift documentation — 92% is within the 100% structural limit

C. Nothing — the lift proceeds with normal precautions since the LMI will alert the operator if structural limits are approached

D. At 92% of structural-limited conservative capacity, the crane's structural members are near their design stress limits; all crane movements must be exceptionally smooth — no sudden hoist starts or stops, no abrupt swing direction changes, no simultaneous multi-function operation, and no dynamic

loading from boom movement or swing acceleration; the critical lift plan must specifically address the smooth operation requirement given the near-structural-limit percentage

59. A crane's load chart shows a note: "When operating in the rear sector (30° each side of rear center), do not exceed 0.5 rpm swing speed." The planned lift requires the boom to swing through the rear sector during the return swing with a total suspended weight of 24,000 lbs and a radius of 40 feet. The tabulated capacity at 40 feet in the all-directions section is 28,600 lbs. The swing speed during the rear sector transit will be approximately 1.2 rpm. What is the compliance status?

- A. Nothing — 1.2 rpm is within the general operational speed range and the load is within the capacity percentage
- B. Continue the return swing at 1.2 rpm since the load is within the 28,600-lb capacity in all-directions
- C. Nothing — the 0.5 rpm note applies only to the initial pick swing, not the return swing
- D. The 0.5 rpm note is binding for any time the boom is within the rear sector — at 1.2 rpm during the rear sector transit, the crane is operating in violation of the note's condition regardless of the LMI reading; the swing speed must be reduced to 0.5 rpm or less whenever the boom is within 30 degrees of the rear center before the load enters the rear sector

60. A crane load chart shows gross capacity of 38,200 lbs at 30 feet for the 100-foot boom at full outrigger extension. The total suspended weight including all rigging is 35,600 lbs — a lift percentage of 93.2%. After the pick, the operator is asked to lower the load from 15 feet to ground level in a tight shaft — a 10-foot × 10-foot shaft opening. The load is a 9-foot × 9-foot machinery component. The lowering requires 4 minutes. What specific concern exists during the 4-minute lowering into the shaft?

- A. Nothing — the lowering phase uses less hydraulic pressure than the hoist phase and is the safer phase of any lift
- B. Lowering a 9-foot × 9-foot component through a 10-foot × 10-foot shaft gives only 6 inches of clearance on each side — any load swing, pendulum motion, or lateral displacement from the component's movement through the shaft air will cause contact with the shaft walls; tag lines must be rigged to the component to control lateral position during the entire descent; the descent speed must be minimum to allow precise position control

C. Nothing — 6-inch clearance on each side is the standard for precision shaft lowering operations

D. The load is too close to rated capacity for shaft lowering — reduce the load before attempting the confined shaft placement

61. A crane load chart for the on-outrigger full extension section shows: "100-FT BOOM — STANDARD GANTRY." The crane on site has an extended gantry installed. The extended gantry capacity section is found on page 14 of the load chart. The operator's copy of the load chart is missing page 14. What must happen before operations begin?

A. Nothing — the standard gantry section is conservative and may be used for extended gantry operations since it shows lower capacity values

B. The operator must obtain a complete copy of the load chart — specifically page 14 containing the extended gantry capacity section — before any operations begin; the standard gantry section was derived for a different structural geometry than the extended gantry; using it for the extended gantry configuration applies capacity values from a mismatched physical condition regardless of which direction the capacity difference falls

C. The lift director may authorize use of the standard gantry section for the extended gantry configuration since the actual crane is more capable

D. Request the manufacturer to fax page 14 and begin operations while awaiting its arrival

62. A crane load chart note reads: "Operating within 15 feet of any occupied structure requires a 20% capacity reduction due to increased load path restrictions and emergency response limitations." The crane is positioned with one outrigger 12 feet from an occupied office trailer. The tabulated capacity at the planned configuration is 26,400 lbs. What is the applicable derated capacity?

A. Nothing — the 12-foot distance exceeds the 10-foot minimum for occupied structure operations

B. The note applies since the outrigger is within 15 feet — but the 20% reduction applies only to the lifts where the load path passes over or near the occupied structure, not to all lifts

C. Nothing — the note's 15-foot criterion is measured from the outrigger spread, not from the nearest outrigger

D. Derated capacity = $26,400 \times 0.80 = 21,120$ lbs; the note's 15-foot proximity criterion is met since the outrigger is 12 feet from the occupied trailer; all operations in this configuration must use the derated capacity of 21,120 lbs; the operator must confirm all total suspended weights are within this derated value

63. A crane's load chart shows: 80-foot boom, full outrigger extension, all-directions: 30 ft = 32,800 lbs; 35 ft = 26,200 lbs; 40 ft = 20,600 lbs. A planned lift at 33 feet has a total suspended weight of 28,400 lbs. After computing both the interpolated capacity (28,920 lbs) and the conservative capacity (26,200 lbs at 35 ft), the operator notes the total suspended weight of 28,400 lbs exceeds the conservative capacity of 26,200 lbs but is within the interpolated capacity of 28,920 lbs. If the operator uses the interpolated value, what additional verification is most critical?

A. If using the interpolated capacity, the operator must independently confirm the LMI is configured correctly for the exact configuration since the lift leaves only 520 lbs of margin; most critically, the actual operating radius must be physically measured and confirmed at exactly 33 feet — even a 0.5-foot radius measurement error that moves the actual radius to 33.5 feet would reduce the interpolated capacity to approximately 28,180 lbs, below the 28,400-lb total suspended weight

B. Nothing additional — the interpolated value is accurate and no special verification is needed

C. The operator must confirm the LMI is reading within $\pm 1\%$ accuracy before proceeding

D. The operator must obtain the lift director's written authorization before using interpolated rather than conservative capacity values

64. A crane load chart shows a section for "FIXED JIB AT 15° OFFSET — 80-FT MAIN BOOM — ON OUTRIGGERS — FULL EXTENSION." During a lift, the operator was directed to change the jib offset from 15° to 20° to achieve a greater working radius. The crane has the 20° offset position available. What must happen before the next pick with the new jib angle?

A. Nothing — changing the jib offset angle is a minor configuration adjustment that does not require load chart verification

B. Reduce the current load by 5% to account for the increased jib angle and proceed with the modified configuration

C. The 20° offset jib section of the load chart must be located and confirmed — changing the jib offset angle changes the operating configuration, changes the operating radius, and requires using a different load chart section that specifically covers the 20° offset; the capacity at the new radius under the 20° offset section must be confirmed before picking the next load; the load from the previous 15° configuration cannot be assumed within the new 20° configuration's capacity

D. Contact the manufacturer to confirm the 20° offset is approved for this specific crane model before any lifting

65. A crane load chart shows: "ON OUTRIGGERS — FULL EXTENSION — 100-FT BOOM — MAXIMUM COUNTERWEIGHT": 35 ft = 28,800 lbs; 40 ft = 22,800 lbs; 45 ft = 17,800 lbs. A series of 10 identical lifts is planned at 37 feet of operating radius. The total suspended weight for each lift is 21,600 lbs. Using the conservative approach, the governing capacity at 40 feet is 22,800 lbs. The lift percentage = $21,600 \div 22,800 \times 100 = 94.7\%$. Before beginning the lift series, which is required?

A. Nothing beyond normal pre-shift checks — repetitive lifts require only the initial capacity confirmation

B. A written critical lift plan and pre-lift meeting are required since 94.7% exceeds the 75% critical lift threshold — both apply to each lift that meets the threshold regardless of whether the lifts are identical and repetitive; additionally, at 94.7% of structural or stability-limited conservative capacity, the operator must perform all lifts with exceptionally smooth movements and confirm the crane remains level and in the same configuration before each subsequent lift

C. The critical lift plan is required only for the first lift — subsequent identical lifts are authorized by the initial confirmation

D. Critical lift documentation is required only when the percentage exceeds 90% of rated capacity — at 94.7% of conservative capacity, a critical lift plan is needed only if the tabulated value (not the conservative approach value) also exceeds 90%

Specialty Exam 11 Answer Key and Full Explanations

1. B — Brick paver systems provide a stable-looking surface while concealing the condition of the sand base beneath. Over 7 years, moisture infiltration, freeze-thaw cycling, and compaction from foot traffic can cause the sand base to migrate, consolidate unevenly, or develop soft zones. Previous successful crane use does not confirm the current sand base condition — it only confirms the surface held up under whatever loads were applied at that time.

2. D — A 45 psi pressurized chemical injection line is both a structural hazard and a chemical hazard. Concentrated crane outrigger loads applied through the soil above the line can crush the pipe wall, triggering a pressurized release of corrosive chemical. The locate tolerance zone means the pipe's exact position is uncertain within ± 24 inches — the outrigger may be directly over the pipe. The outrigger must be repositioned outside the tolerance zone or the line's exact position confirmed before any loading.

3. A — When the crane employer independently assesses ground conditions, they must confirm the same information the controlling entity would have provided: confirmed bearing capacity at each outrigger position, underground utility routing and depth, and the absence of subsurface voids or structures. OSHA 1926.1402 requires this information to be confirmed before operations begin — the source of the confirmation (controlling entity or crane employer's own investigation) does not change what must be confirmed.

4. D — A previously demolished building footing at 24 inches of depth represents an unknown structural element in the load path. The footing may be poorly connected to the bearing soil beneath it after demolition disturbance, may have voiding beneath it from original construction, or may have been physically damaged during demolition. A footing that appears solid on its top surface can be sitting on a compromised soil interface. Engineering evaluation of the footing's current structural condition is required.

5. C — Beach and coastal soils — particularly sandy and silty soils — are sensitive to saturation from seawater infiltration. High tide flooding adjacent to the crane's setup area introduces water into the soil through lateral seepage, which can rapidly reduce effective stress in the granular soil matrix. Saturated beach soils can lose significant bearing capacity within minutes of saturation. The 30-foot proximity to actively flooding water is close enough to create real concern for the soil's current bearing condition.

6. D — As excavation deepens adjacent to a crane outrigger, it progressively removes the soil that provides passive resistance to outrigger loading. The deeper the cut, the greater the reduction in the passive resistance zone. This is a dynamic condition that changes with every increment of excavation. Each depth increment must be evaluated before crane operations continue because the soil support condition that was adequate at 8 feet of excavation may be inadequate at 12 feet.

7. A — Two simultaneous changes make continued crane operations unsafe: (1) the emergency excavation removes passive soil resistance adjacent to the outrigger within feet of the position, and (2) the burst main is actively saturating the soil beneath the outrigger. Both conditions independently require operational stoppage. Together, they create a potentially catastrophic combination of reduced passive resistance and bearing capacity failure risk that cannot be managed through speed reduction or reduced capacity.

8. C — A dark, circular color anomaly in soil with a musty odor is a classic indicator of buried organic material — a former garbage pit, septic drain field, old tree stump, or buried organic debris. Organic soils have essentially no structural bearing capacity — they are compressible, have low shear strength, and can collapse suddenly under concentrated loads. The extent of the organic zone must be confirmed before any outrigger loading.

9. B — Pressurized grout injection into soil displaces pore fluid and creates excess pore pressure in the surrounding soil volume. This increased pore pressure acts against the effective stress between soil particles, temporarily reducing shear strength and bearing capacity in the adjacent zone. The effect is temporary but can be significant during active injection. Monitoring for crane level changes during grouting and pausing if changes are observed is the appropriate operational response.

10. B — Bearing capacity failure and excessive settlement are two distinct but related failure modes. Bearing capacity failure is sudden — the soil shears along failure surfaces and the load drops. Settlement is gradual — the soil compresses under load without completely failing. A crane can experience progressive tilt from settlement without a catastrophic bearing failure. Both analyses are relevant because either can make the crane unsafe — one from sudden failure, the other from progressive level change.

11. C — Subsurface steam systems at refineries can superheat soil to temperatures that alter pore water pressure dynamics and reduce fine-grained soil strength. White vapor rising through the soil indicates the steam system may be active beneath the mat — pressurized steam in the soil can cause localized ground heave sufficient to shift the crane's position without warning. This is a potential explosive heave hazard, not simply a temperature concern, and requires immediate investigation.

12. C — Vibration-induced mat movement is progressive — each truck pass adds to the cumulative displacement. If 6 trucks have caused 0.5 inches of movement, subsequent trucks will continue to add

displacement. Any mat shift during operations changes the load distribution geometry and may move the mat toward a less-supported position. The risk of further mat movement during crane lifts must be assessed. Traffic control that prevents truck traffic during actual lifting operations is the appropriate solution.

13. B — Unfilled 8-inch bolt holes represent voids in the concrete slab directly beneath the planned outrigger position. Under concentrated outrigger loading, the slab must resist punching shear — the force that would drive the outrigger float through the slab. Multiple 8-inch voids in the slab's thickness reduce the available punching shear perimeter. The effective structural capacity of the slab in the void pattern area must be evaluated by a structural engineer for the specific outrigger load.

14. D — Compaction grouting injects low-slump grout under pressure into the soil to densify loose zones by displacing surrounding soil. The pressurized injection creates temporary pore pressure increases in the surrounding soil, reducing effective stress and bearing capacity near the injection zone. At 25 feet, the zone of influence may extend to the crane's outrigger positions. Level monitoring during injection and readiness to stop are the required operational controls.

15. D — Ground penetrating radar identifies subsurface density contrasts rather than directly measuring bearing capacity. Its primary value for crane setup is confirming the absence of voids, buried structures, disturbed soil zones, and utilities beneath the planned outrigger positions. GPR does not replace geotechnical bearing capacity testing — it complements it by identifying conditions that would invalidate a bearing capacity assessment. A geotechnical engineer should interpret GPR results in the context of crane loading.

16. B — Replacing the hook block with one weighing 1,400 lbs more changes the rigging deduction calculation for every subsequent lift. The heavier block consumes more of the gross capacity, reducing the available net payload. Every planned lift must be recalculated using the heavier block's weight in the total suspended weight. The LMI must also be reconfigured to use the correct block weight so its displayed percentages accurately reflect the actual load moment.

17. C — A STOP signal received in any sequence requires immediate cessation of all crane movement. When a STOP signal is received, it supersedes any prior signal regardless of timing — even if a HOIST signal was given one second before. Executing the hoist and then immediately stopping does not satisfy

the STOP signal requirement because the hoist movement would have already occurred. The STOP signal means no movement initiates until a confirmed new signal is given.

18. D — Yellow zone hydraulic temperature is a warning that the system is approaching conditions where safe operation may be compromised. Personnel in a suspended platform have zero ability to self-rescue — their safety depends entirely on the crane's continued function. Communicating the temperature status to the lift director immediately allows a controlled, planned descent to be executed while sufficient hydraulic pressure remains. Waiting for red zone conditions eliminates the controlled descent window.

19. A — A building fire alarm requires immediate evacuation of all building occupants and all personnel on the construction site adjacent to the building. The crane operator is a site worker who must evacuate. The load must be on the ground before evacuation because an unattended suspended load with no operator creates a secondary hazard during emergency response. The 6-foot height and proximity to a safe surface makes immediate lowering practical before evacuation.

20. C — A shackle pin that may be backing out is a potential immediate rigging failure — if the pin exits the shackle bow while the load is suspended, the load will drop instantly. The rigger's observation is a warning that requires immediate response. At 8 feet of height, lowering to the ground is safe and eliminates the risk before it can become a catastrophic load drop. Asking the rigger to confirm from below while the load is suspended adds delay without eliminating the hazard.

21. B — At 89% of rated capacity, adding approximately 40–50 lbs of unplanned bird weight to the boom tip changes the structural loading slightly. More practically, birds on the boom will likely take sudden flight in response to any crane movement — creating a distraction at a critical moment during a near-capacity lift. Sounding the horn before any movement clears the birds safely without creating distraction during the actual lift execution.

22. D — OSHA 1926.1425 requires that loads not pass over personnel, and members of the public walking on a sidewalk are persons. Warning signs are passive controls that rely on public awareness and compliance — neither can be guaranteed. The sidewalk must be physically barricaded and controlled — either with barriers that prevent public access or by scheduling overhead operations during periods when absence of pedestrians can be positively confirmed. Active flag control at the sidewalk is the minimum required control.

23. A — A counterweight contact with a storage rack means the exclusion zone was inadequate — the counterweight's full swing radius was not accounted for in the exclusion zone boundaries. The contact also raises questions about the rack's contents and whether anything was displaced. The counterweight itself may have sustained damage. All three concerns must be addressed before operations resume. The exclusion zone must be expanded to encompass the complete counterweight rotation envelope.

24. B — A lateral bow in a chain sling leg that is not from gravity indicates the chain material has permanently deformed — a link has plastically yielded. This is a classic indicator of an overload event or a defective link that has reached its yield point. A bowed chain link has reduced cross-sectional area at the bend point and reduced fatigue life. ASME B30.9 requires removal of any chain sling showing permanent deformation. The load must be lowered and the sling replaced.

25. B — Signal communication must be clear and unambiguous throughout all phases of a lift. Heavy rain that makes hand signals difficult to see creates a communication system failure — the operator cannot reliably distinguish signals, increasing the risk of executing the wrong movement. A communication system that works in the current conditions must be established before operations continue. Proceeding with unclear signals at any load percentage creates the same fundamental hazard.

26. D — The crane's hydraulic system depends on the engine-driven pump to generate the pressure required for all functions including brake holding. At 15% below normal RPM, the pump's output pressure and flow rate are reduced proportionally. Reduced hydraulic pressure directly reduces the spring-applied brake's minimum holding force calculation and reduces the maximum available hoist and boom force. Operations near rated capacity that rely on maximum brake holding capacity cannot be safely performed at reduced hydraulic pressure.

27. D — A static hold while the signal person briefly steps away is operationally acceptable as long as the load remains within rated capacity, the operator stays at the controls, and the drum pawl is engaged as a mechanical backup. The critical requirement is that before any new crane movement is initiated, the signal person must be present, communication must be re-established, and both parties must confirm readiness. The absence of the signal person during a static hold is acceptable — the absence during active movement is not.

28. C — The operator cannot safely control load placement in areas where neither they nor the signal person can confirm the load's exact height and clearance. Shadow zones where the load is invisible

represent a failure of the visual monitoring requirement that must be maintained throughout all phases of crane operations. Additional lighting or relay observers at shadow zone locations are the two compliant solutions — both restore continuous confirmed monitoring of the load's position throughout its travel path.

29. B — In a tandem lift, any stop condition requires all cranes to stop — this is the first correct action. However, Crane B's signal person directing Crane A to execute a "hoist only" movement bypasses the lift director who is responsible for coordinating all tandem movements. A unilateral hoist by Crane A without lift director coordination would shift load distribution, potentially overloading Crane A. The stop is correct; the "hoist only" command must wait for the lift director's coordination.

30. D — ASME B30.5 and OSHA 1926.1416 are unambiguous: the operator must remain at the controls at all times while a load is suspended. There are no authorized exceptions in either standard for any reason — not bathroom breaks, not brief emergencies, not drumhauling consultations. The load must be lowered to a stable surface before the operator leaves the controls. This absolute requirement exists because any sudden change in load condition or crane status requires immediate operator response.

31. A — Valley breaks are wires that fracture at the contact point between adjacent strands rather than on the exposed crown surface. This failure mode indicates contact fatigue — the most dangerous type of rope fatigue because it occurs within the rope's interior where stress concentrations from strand-to-strand contact are highest. Contact fatigue propagates far more rapidly than tension fatigue. ASME B30.5 lists any valley break as an absolute removal condition, unconditional on whether other criteria are met.

32. C — The outer protective cover of a synthetic round sling is the only barrier protecting the structural core fibers from all external damage sources. Once the cover is breached and core yarns are exposed, they are immediately vulnerable to abrasion, cutting, UV radiation, and chemical attack. ASME B30.9 treats any core yarn exposure as an absolute removal condition because the cover damage indicates stress on the sling that may have already compromised the core fibers in ways not visible at the exposure point.

33. B — Lateral sheave wobble indicates either a worn sheave bearing that can no longer maintain the sheave's centered position, or a worn sheave pin that has lost diameter from fretting wear. Both conditions create uneven rope contact across the sheave groove — the rope contacts the groove asymmetrically, accelerating rope wire wear on the high-contact side. A worn pin can also fracture

suddenly under the combined bending and shear load from the rope tension. Both the pin and bearing must be evaluated.

34. D — A local decrease in lay length indicates the rope has been subjected to a compressive force — an axial compression event such as being driven over by heavy equipment, being caught between structural members, or experiencing a shock load with a downward component. The compressed zone has permanently altered internal wire geometry that creates stress concentrations during subsequent tensile loading. ASME B30.9 deformation criteria require removal when the rope's geometry has been permanently altered from its manufactured condition.

35. A — The hook shank is the primary structural element transmitting the entire hook load from the fitting at the top to the hook body below. Any crack in this section represents a structural fracture in the most critically loaded component of the hook. High-strength steel hooks fail by brittle fracture from crack propagation — a crack that appears stable can propagate to complete fracture under the next loading cycle. ASME B30.10 lists any hook crack as an absolute removal condition with no authorized monitoring or reduced-capacity use.

36. C — Rhythmic brake cycling without operator input means the hydraulic system is oscillating between pressure sufficient to hold the load and pressure insufficient to hold it — the load is repeatedly releasing slightly and being recaptured. This indicates a hydraulic component is failing: a pressure relief valve cycling at set point, a worn hoist motor allowing internal bypass that drops pressure cyclically, or a control valve not fully closing. Any of these failures can escalate to complete hold pressure loss. The crane must be taken out of service immediately.

37. B — An inspection notation that predicted replacement within 2–3 months was made 6 months ago. The predicted replacement threshold has elapsed without documented action. The boom hoist rope may have already reached or exceeded the removal criterion that was approaching when the notation was made. The current condition of the rope must be assessed by a qualified person before any operations — the 6-month-old prediction of imminent replacement cannot be allowed to go unaddressed.

38. B — Slewing ring bolts are subject to vibration-induced loosening from the dynamic loads of every crane operation — each swing start and stop creates impulse loads on the ring attachment bolts. Loose bolts allow micro-movement of the ring, which creates fretting at the bolt-to-flange interface and induces fatigue cycling in the bolt shank. At 18 months overdue on a 6-month interval, the bolts may be

significantly under-torque. Loose slewing ring bolts can fracture and allow the upper works to separate from the carrier.

39. C — Hydraulic oil analysis is the diagnostic tool that reveals the internal condition of the hydraulic system without disassembly. Metal particle counts identify which components are wearing abnormally; acid numbers indicate fluid oxidation; viscosity measurements confirm the fluid is providing adequate lubrication. Without 3 years of analysis data, progressive wear in pumps, valves, and motors that would be detectable through oil analysis has been invisible. The system may have reached advanced wear without any external symptoms.

40. C — A spreader beam with permanent deformation (plastic bow) has yielded beyond its elastic limit — the material has been stressed past the point where it returns to its original geometry. Yielded structural members have reduced remaining capacity that cannot be determined from visual inspection alone. The 10-ton rating was established for the original geometry and material condition. Operating at any capacity with permanent deformation assumes a structural integrity that cannot be confirmed without engineering analysis of the deformed beam.

41. C — OSHA 1926.1413 requires removal from service after any confirmed contact with an energized conductor, regardless of visible damage. Electrical current passing through steel wire rope heats the steel and can alter the metallurgical temper of the high-carbon steel wires — reducing ductility and fatigue strength — without leaving any externally visible evidence. No inspection method can confirm the absence of these metallurgical changes. The standard provides no exception for "low-voltage" contacts or for contacts showing no visible damage.

42. C — A swivel's function is to absorb torsional loads from load rotation by allowing the hook block to rotate freely relative to the rope. When the swivel requires 40 ft-lbs to initiate rotation, it is effectively locked — any torsional load from load rotation is transferred directly into the rope rather than being absorbed by the swivel. This accumulates twist in the rope, progressively reducing its rated capacity, and can release suddenly when the accumulated twist overcomes the swivel's resistance, causing a violent untwisting of the rope.

43. D — Conservative capacity at the next larger tabulated radius (40 ft) = 22,600 lbs. Total suspended weight = 1,800 + 640 + 220 + 19,000 = 21,660 lbs. Since 21,660 lbs is within 22,600 lbs, the lift

proceeds. Lift percentage = $21,660 \div 22,600 \times 100 = 95.8\%$ — this exceeds the 75% critical lift threshold and requires a written critical lift plan and pre-lift meeting before the lift begins.

44. D — A load chart note specifying maximum line speed is a binding condition of those capacity values. At higher speeds, the dynamic loads during acceleration, deceleration, and stop differ from those assumed in the capacity analysis. The capacity values reflect the structural and braking requirements at 120 fpm — not 180 fpm. Using these values at 180 fpm means applying capacity derived under different loading conditions than what will actually be present during the lift.

45. C — Both a critical lift plan (for 89% exceeding the 75% threshold) and smooth operation protocols (for structural-limited conservative governing capacity) are required. These two requirements apply simultaneously and independently — neither satisfies the other. The critical lift plan addresses the pre-lift planning and coordination requirements; the smooth operation protocols address the specific operational constraints that structural-limited cells impose throughout the lift's execution.

46. B — The note states the 850-lb standard ball is pre-deducted from the tabulated gross capacity. The 24,800-lb value therefore has the 850-lb standard ball already removed from the original gross. Using the 1,400-lb non-standard ball means an additional 550 lbs ($1,400 - 850$) beyond what was pre-deducted is consuming gross capacity. Maximum payload = $24,800 - 550 = 24,250$ lbs. The pre-deducted standard ball cannot be deducted again.

47. C — The governing conservative capacity at 25 feet is from a stability-limited cell. At 94.4% of a stability-limited capacity, the crane is very close to its tipping threshold. The operator must confirm the crane is precisely within level tolerance, minimize swing speed to prevent centrifugal displacement from adding to the effective radius, and execute all movements with exceptional smoothness. The tipping threshold is not a structural limit — it is the point where the crane tips over.

48. C — Interpolation from 30 to 35 feet: capacity decrease = $35,200 - 27,800 = 7,400$ lbs over 5 ft = 1,480 lbs/ft. At 32 ft (2 ft beyond 30 ft): $35,200 - (2 \times 1,480) = 35,200 - 2,960 = 32,240$ lbs. Both A and B confirm the same answer of 32,240 lbs through the same calculation. Answer C shows the complete calculation including the verification of the per-foot rate, which is the standard linear interpolation method.

49. B — The 8-degree boom position falls within the note's 10-degree restriction zone adjacent to the mast. The 25% capacity derating applies whenever the boom is within this zone — including during transit through the zone, not only when stopped there. Derated capacity = $28,400 \times 0.75 = 21,300$ lbs. The total suspended weight must be within this derated value during the portion of the swing when the boom is within 10 degrees of the mast.

50. D — Conservative capacity at 55 ft = 9,200 lbs; 8,700 lbs is within capacity with only a 500-lb margin. The blank at the 60-foot entry confirms 55 feet is the absolute maximum rated radius. With the set radius of 53 feet very close to this maximum, any radius increase from boom deflection, centrifugal displacement during swing, or wind loading could push the effective radius beyond 55 feet — immediately entering unrated territory. Precise radius management throughout all phases is critical.

51. A — Derated capacity = $32,400 \times 0.50 = 16,200$ lbs. Total platform load = 14,800 lbs. Since 14,800 lbs is within 16,200 lbs, the personnel hoisting lift complies with both the note's 50% reduction requirement and OSHA 1926.1431's 50% limit. The note and OSHA's requirement produce the same result — 50% of gross capacity — for personnel hoisting. The operator must also confirm all other 1926.1431 requirements are met, not just the capacity calculation.

52. C — Conservative approach: next larger tabulated radius beyond 43 feet = 45 feet, capacity = 78,400 lbs. Total suspended weight = 82,000 lbs. Since 82,000 lbs exceeds 78,400 lbs by 3,600 lbs, the lift cannot proceed at 43 feet using the conservative approach. The compliant options are to reduce the total suspended weight below 78,400 lbs, or reposition the crane to 40 feet or less where the 96,000-lb tabulated capacity supports the load directly.

53. B — The note's language is explicit: "Alternative tip sections void this section." The capacity values in this section were derived for the manufacturer's standard tip geometry, mass, and structural characteristics. A third-party fabricated tip has different mass distribution, different stiffness, and a different load path than the OEM tip. Using the standard tip section values with the alternative tip installed applies capacity values from a configuration that does not exist on the actual crane.

54. B — Load chart sections are developed for specific physical configurations — the structural analysis, stability calculations, and capacity values are all tied to the physical crane geometry described in the section header. The extended boom section's values reflect the load paths, deflections, and stability conditions of the longer boom. Applying these values to the standard boom configuration

applies results from a different structural analysis to a different structural reality. The matching section must always be used.

55. A — The operating radius is exactly 45 feet — a tabulated value. At the exact tabulated radius, the tabulated value applies directly without interpolation or conservative bounding. The 17,800-lb capacity at exactly 45 feet is the applicable value. Total suspended weight = 16,800 lbs — within capacity at 94.4%. Since 94.4% exceeds the 75% critical lift threshold, a written critical lift plan and pre-lift meeting are required before the lift proceeds.

56. C — The note's requirement for a crane scale at loads above 90% of gross capacity is a binding condition that cannot be substituted or waived. The three compliant paths are: obtain a crane scale before the lift, reduce the total suspended weight to below 90%, or use a different crane configuration where the same load represents less than 90% of that configuration's gross capacity. Neither the LMI's load cell nor material certifications satisfy the note's specific requirement for a crane scale.

57. D — Stability-limited capacity is governed by the crane's resistance to tipping. The tipping axis runs along the outrigger pad positions — the wider the outrigger spread, the further the tipping axis is from the crane's center of rotation and from the load's line of action. A wider spread creates a larger moment arm for the counterweight's restoring force and requires a much larger load moment to approach the tipping threshold. The 44% capacity difference between 100% and 75% extension directly reflects this geometric advantage.

58. D — Structural-limited cells at 92% of conservative capacity mean the crane's structural members are carrying 92% of their design load capacity under static conditions. At this near-limit condition, dynamic loading from any source — abrupt hoist starts or stops, swing acceleration, direction changes, or simultaneous multi-function operation — adds structural stress beyond the static design limit. The critical lift plan must specifically address smooth operation requirements, not just the generic critical lift planning elements.

59. D — The 0.5 rpm rear sector speed restriction is a binding load chart note that applies whenever the boom is within the defined rear sector — during any portion of the swing, not only during stops in that zone. At 1.2 rpm, the crane is operating in violation of the note during the rear sector transit regardless of the total suspended weight or the LMI reading. The swing speed must be reduced to 0.5 rpm or less before the boom enters the rear sector.

60. B — A 9-foot × 9-foot component being lowered through a 10-foot × 10-foot opening has only 6 inches of clearance on each side — approximately half a foot of margin in each direction. Any pendulum motion, load rotation, or lateral drift during the 4-minute descent will eliminate this clearance and cause contact with the shaft walls. Rigging tag lines to the component to control its lateral position throughout the entire descent is essential. Minimum lowering speed gives the signal person and operator time to detect and correct any developing drift.

61. B — A crane with an extended gantry installed requires the extended gantry capacity section because the gantry's geometry changes the boom suspension angles and the structural load distribution throughout the crane. The standard gantry section values were derived for a different physical configuration — applying them to the extended gantry configuration means using capacity values from a structurally different crane. Neither the direction of the capacity difference nor the lift director's authorization changes this requirement.

62. D — The note's 15-foot proximity criterion is met — the outrigger is 12 feet from the occupied trailer. Derated capacity = $26,400 \times 0.80 = 21,120$ lbs. The note applies to all lifts while the crane is in this configuration, not selectively to lifts over the trailer. The operator must confirm all planned total suspended weights are within 21,120 lbs before any lifting begins. The note exists because proximity to occupied structures limits emergency response options and creates additional risk.

63. A — Using the interpolated capacity of 28,920 lbs leaves only 520 lbs of margin at 33 feet of radius. The most critical verification is the actual operating radius measurement — a 0.5-foot error that moves the effective radius to 33.5 feet reduces the interpolated capacity to approximately 28,180 lbs (below the 28,400-lb total), immediately converting the lift from within-capacity to over-capacity. Physical radius measurement at the actual pick point is the single most important confirmation before proceeding with the interpolated value.

64. C — Changing the jib offset angle changes the crane's operating configuration in three simultaneous ways: it moves the hook tip to a different height and radius, it changes the structural load path through the boom and jib interface, and it requires a different load chart section for the new geometry. The 15° offset section cannot be used for 20° operations — each offset angle has its own capacity values because each creates a different structural loading condition. The 20° section must be confirmed before any picking at the new angle.

65. B — A lift percentage of 94.7% based on the conservative approach exceeds the 75% critical lift threshold. Each lift that qualifies as a critical lift requires a written critical lift plan and pre-lift meeting — repetitive lifts do not reduce or eliminate this requirement. Additionally, at 94.7% of conservative capacity, the structural or stability members are near their design limits. The operator must confirm the crane's level condition and configuration match before each lift in the series and must execute all lifts with exceptionally smooth movements.