SIMULATION SET 12

SITE DOMAIN — Questions 1–21

1. A crane operator is evaluating a setup location at a transit authority maintenance facility. The floor surface consists of 10-inch-thick reinforced concrete slabs resting on precast concrete T-beam supports spanning 30 feet. The slab was designed for 400 psf maintenance vehicle loading. The planned outrigger reaction load is 96,000 lbs with a 2.5 sq ft outrigger float. What bearing pressure does this create and what is required before setup?

A. Bearing pressure = 38,400 psf — within the T-beam design loading capacity for industrial maintenance facilities

B. The T-beam support system always distributes point loads adequately for any maintenance facility crane operation

C. Place maximum available timber mats over the T-beam support locations and proceed with the lift at 75% capacity

D. Bearing pressure = 96,000 ÷ 2.5 = 38,400 psf — approximately 96 times the 400 psf design loading; a structural engineer must evaluate the T-beam structure for the specific outrigger point loads, including punching shear and T-beam span loading, before any crane setup on this elevated floor system

2. A crane is set up for a lift when the operator discovers that the surface beneath the right front outrigger mat is showing efflorescence directly adjacent to a construction joint in the concrete slab — white mineral deposits are visible along the joint line and extending to the mat edge. What does this combination of a construction joint and efflorescence indicate?

A. Construction joints with efflorescence are reinforced locations that improve bearing capacity

B. The efflorescence at the construction joint indicates water is actively migrating through the joint — construction joints are inherent weak points in concrete; water migrating through the joint under the loaded mat suggests the concrete below the joint may be experiencing pressure, which can indicate the joint is opening or that water under pressure is softening the subbase below the slab; the joint condition and subbase integrity must be evaluated before outrigger loading

C. Efflorescence is always a cosmetic condition — no structural concern applies regardless of location

D. The construction joint must be sealed with hydraulic cement before crane setup to prevent continued water migration

3. Under OSHA 1926.1402, who bears responsibility for identifying and communicating the location and condition of underground utilities in the crane's setup area?

A. The crane operator bears responsibility for utility identification since they are physically present at the setup location

B. The utility companies bear sole responsibility since they installed the utilities and maintain the records

C. The controlling entity bears the primary responsibility for identifying and communicating the locations and conditions of all known underground utilities within the crane's working area before crane operations begin — if the controlling entity does not have this information, they must obtain it before the crane employer can safely begin setup

D. Utility identification is a shared 50/50 responsibility between the controlling entity and the crane employer

4. A crane operator is performing a site walk and finds that a previously-level concrete pad now has a visible concave depression approximately 8 feet in diameter and 1.5 inches deep at the center. The pad surface has no cracks. The pad was level during the previous shift. What does a concave depression with no cracking in a concrete pad most likely indicate?

A. A concave depression without cracking in a previously-level concrete pad indicates the soil or subbase beneath has settled or been removed — this is classic evidence of subbase erosion, piping, or void development beneath the slab; the slab is spanning a void and bearing only on its perimeter; placing an outrigger on a slab spanning a void can cause sudden punching shear failure; the subbase condition must be confirmed before any crane loading

B. The depression is caused by normal concrete creep over time — no concern applies

C. The depression indicates the pad has been uniformly loaded and has consolidated normally

D. Concrete pad depressions are caused by thermal contraction and indicate the pad is cooling down

5. A crane is set up at a construction site when the site foreman directs a concrete pump truck to park parallel to the crane's left outrigger spread — the pump truck's main frame runs 6 feet from the left front outrigger mat. The pump truck weighs 68,000 lbs when loaded. What specific concern must be raised?

A. The pump truck creates a noise and vibration concern that requires increased communication protocols

B. Nothing — standard construction equipment parking near crane outriggers is normal and creates no bearing concern

C. The pump truck must maintain a minimum 25-foot clearance from all crane outriggers under OSHA 1926 Subpart CC

D. The loaded pump truck's weight creates a surcharge on the soil between the truck and the outrigger mat — this surcharge adds lateral earth pressure to the soil bearing zone, and the truck's wheels also apply point loads to the ground that may affect the soil supporting the adjacent outrigger; the combined effect of the crane's outrigger load and the pump truck surcharge must be within the soil's bearing capacity before the truck parks at this location

6. Under OSHA 1926.1408(b), before crane operations begin near any power line, which of the following must be specifically established?

A. The crane's boom height at maximum reach must be measured and confirmed before any power line proximity assessment

B. Whether the power line can be de-energized and grounded, and if not, the voltage of the line and the applicable minimum safe approach distance that will be maintained throughout all crane operations — these determinations must be documented and communicated to all relevant personnel before any crane movement begins in the power line's vicinity

C. A written permit must be obtained from the power line owner before any work within 50 feet of an energized conductor

D. The crane operator's power line safety training must be verified and current before any operations near energized conductors

7. A crane is set up on a site when the operator notices that the planned outrigger zone is directly adjacent to a historic fill area — an area where the site survey shows fill was placed 60 years ago to level a hillside for the original building construction. No fill compaction records exist. What specific concern does 60-year-old unrecorded fill create?

A. Sixty-year-old fill is fully consolidated and equivalent to native soil for crane operations

B. The fill's age of 60 years eliminates all compaction concerns — time consolidation replaces engineered compaction

C. Sixty-year-old unrecorded fill may contain unknown materials — organic waste, demolition debris, or inadequately compacted soils — with highly variable bearing capacity; the absence of compaction records means no documented bearing capacity exists for this fill; bearing capacity must be confirmed through current testing before any crane outrigger loading in the historic fill zone

D. Apply a 50% capacity reduction for operations over unrecorded historic fill and proceed without testing

8. A crane is being set up adjacent to an active retaining wall when the operator notices that the soil behind the retaining wall (the retained side — where the crane is positioned) shows tension cracks running parallel to the wall at approximately 3 feet behind the wall crest. What do these tension cracks indicate?

A. Tension cracks forming 3 feet behind the retaining wall crest indicate the soil mass is beginning to separate from the stable zone — this is an early sign of slope or wall failure developing; placing an outrigger in the cracked zone would add surcharge to an already-stressed soil mass and could accelerate wall failure; crane operations must stop and the wall condition must be evaluated by a qualified engineer before any setup in this area

B. Tension cracks behind retaining walls are caused by normal seasonal moisture changes and are cosmetic

C. The tension cracks indicate the retaining wall is performing correctly — the soil is consolidating as designed

D. Cracks forming 3 feet from the wall crest indicate the wall's drainage system is working properly

9. A crane is operating at a job site when a significant thunder and lightning storm begins. Lightning is striking within 3 miles of the site. The load is currently suspended at 14 feet of height. What is the required response?

A. Nothing — lightning within 3 miles is the standard warning distance; crane operations may continue until lightning is within 1 mile

B. Continue the lift at minimum speed to complete the current cycle before addressing the lightning hazard

C. Reduce all operations to critical lifts only and establish radio silence to minimize electromagnetic interference

D. Lower the load to the nearest safe surface immediately, secure the crane, and move all personnel to adequate shelter — lightning within 3 miles is within the range at which crane operations should cease;

a crane boom is an excellent conductor that provides a low-resistance path to ground for lightning; both the operator and all personnel in the work area are at risk from a direct or induced lightning strike on the crane

10. Under OSHA 1926.1402, when a crane employer performs operations at multiple sites during the same project, what ground condition confirmation is required at each new location?

A. A single ground condition confirmation performed at the start of the project is sufficient for all locations within the same project scope

B. Ground conditions must be confirmed adequate at each new location before crane operations begin — conditions vary across a project site; soils, underground utilities, and subsurface conditions that were adequate at one location may be entirely different at another location on the same project; the crane employer must ensure adequate conditions specifically at each setup position

C. Ground condition confirmation is only required at the first setup location — subsequent locations on the same site are covered by the initial assessment

D. The controlling entity's single initial site assessment covers all locations within the project boundary

11. A crane operator is performing a site walk at an active refinery when they observe that the planned right outrigger spread area contains a section of ground that has been recently excavated and backfilled — the backfill is visibly disturbed and the surface shows the characteristic mounded profile of recently placed material. The foreman cannot provide compaction test results. What must happen before setup?

A. Nothing — backfill placed by a refinery contractor meets all bearing capacity requirements

B. The backfill area is acceptable since it was placed by a contractor familiar with refinery operations

C. The recently disturbed backfill zone must be tested or evaluated by a qualified geotechnical professional before crane outrigger loading — recently placed backfill without compaction verification has unknown and potentially very low bearing capacity; the mounded appearance confirms the fill has not been compacted and may not support the crane's outrigger loads; waiting 24 hours for settlement is not a substitute for compaction verification

D. Apply two 4×4 timber mats and proceed with the lift at 80% capacity since the backfill appears to be well-placed

12. A crane is being operated on a construction site when the site superintendent informs the operator that a dewatering pump that was keeping the water table below the site's foundation excavation has

failed. The pump has been off for 4 hours and water is rising in the excavation 25 feet from the crane's setup position. What specific concern does the rising water table create?

A. The rising water table from the failed dewatering system is saturating the soil beneath the crane from the excavation side — as the water table rises, the effective stress in the soil between the excavation and the crane's outriggers decreases, reducing the bearing capacity at the adjacent outrigger positions; operations must stop until the dewatering system is restored and the soil conditions are re-evaluated

B. The rising water in the excavation only affects the excavation itself — soil bearing capacity is not affected at 25 feet

C. The dewatering failure is a project management issue — crane operations continue normally

D. The operator should move the crane immediately rather than stopping operations

13. A crane is set up at a historic construction site where the site investigation report notes "potential for buried masonry rubble from 18th-century construction" at depths between 3 and 10 feet throughout the site. What specific concern does buried historic masonry rubble create for crane outrigger support?

A. Historic masonry rubble provides excellent bearing capacity and is the preferred subsurface material for crane setup

B. Nothing — masonry rubble is structurally stable and will not move under crane loading

C. Historic masonry rubble was placed without structural intent — its arrangement creates variable void spaces between the stone or brick pieces; under concentrated crane outrigger loading, the rubble pieces can shift, voids can collapse, and the entire rubble mass can reorganize under load; the bearing capacity of rubble fill is highly variable and unpredictable; geotechnical investigation is required before crane outrigger loading in this zone

D. Buried masonry rubble at 3 to 10 feet of depth is below the zone of influence for surface crane outrigger loads

14. A crane is set up on a job site when the operator observes that a delivery truck has just dumped a load of wet concrete — approximately 10 cubic yards — directly adjacent to the right rear outrigger position. The concrete is flowing along the surface and pooling 2 feet from the mat edge. What concern does the wet concrete pooling near the mat create?

A. Nothing — concrete flows along the surface and does not affect the bearing conditions beneath the outrigger mat

B. Wet concrete pooling adjacent to the outrigger mat creates a surcharge loading on the adjacent soil and introduces water into the soil at the mat boundary — as the water in the concrete mix migrates into the soil, it can temporarily saturate the soil at the mat edge; additionally, the concrete mass itself adds surcharge pressure to the bearing zone; the concrete must be redirected away from the mat area before operations continue

C. The concrete will harden and improve the bearing conditions near the outrigger

D. Continue operations and redirect the concrete flow after the current lift is complete

15. A crane operator is asked to set up at a pier that was originally designed for 300 psf cargo loading and has been in service for 45 years. The maximum outrigger reaction load for the planned lift is 74,000 lbs and the outrigger floats are 24 inches × 24 inches (4 sq ft). What must be confirmed?

A. Nothing — cargo piers are designed for heavy loads and 45 years of service confirms structural adequacy

B. The 45-year service history without incident confirms the pier can handle any crane operation

C. Bearing pressure = 74,000 ÷ 4 = 18,500 psf — approximately 62 times the 300 psf cargo design loading; the pier structure must be evaluated by a structural engineer for the crane's concentrated point loads before any operations; 45 years of service under cargo loads does not confirm capacity for concentrated point loads that exceed the design loading by 62 times

D. Contact the port authority for written authorization before any crane operations on the pier

16. Under OSHA 1926.1402(b), when the controlling entity provides the crane employer with documented ground conditions, but those conditions change due to a weather event between the documentation date and the planned crane operation, what is the controlling entity's obligation?

A. The controlling entity must update the crane employer with current ground condition information — weather events such as significant rainfall, flooding, or freeze-thaw can fundamentally change bearing capacity from what was documented; the crane employer cannot safely plan outrigger positions based on conditions that no longer exist; the controlling entity must communicate the changed conditions so the crane employer can reassess whether setup can proceed safely

B. The controlling entity's initial documentation satisfies their obligation for the life of the project regardless of subsequent weather events

C. Weather-related ground changes are the crane operator's responsibility to assess independently at each shift start

D. The crane employer bears sole responsibility for weather-related ground condition changes once the initial documentation has been provided

17. A crane is operating when the ground crew reports a new development: during the current shift, a utility contractor working 40 feet from the crane's setup position has hit and broken a 6-inch storm drain pipe at 4 feet of depth. Stormwater is flowing from the broken pipe into the soil. What must the crane operator do?

A. Continue operations and monitor for any visible surface water reaching the outrigger positions

B. Reduce the current lift load to 75% and continue while the broken pipe is addressed

C. Sound the crane's horn to warn all personnel of the utility damage and continue operations

D. Stop all crane operations — a broken stormwater pipe actively discharging water into the soil at 40 feet from the outriggers can rapidly saturate the soil in the bearing zone through lateral seepage; what begins as a relatively distant problem can reach the outrigger bearing zone within minutes; operations must stop until the pipe is repaired and ground conditions are confirmed adequate

18. A crane operator discovers during the pre-operation site walk that the planned setup area has been used as a material staging zone — loose concrete block, CMU, and steel reinforcing bars have been stacked in piles ranging from 3 to 6 feet high across the outrigger zone for approximately 2 months. The materials have recently been cleared. What concern does this recently-cleared staging area present?

A. Nothing — clearing the staging area restores the original ground conditions immediately

B. Two months of sustained heavy material staging can cause differential settlement and consolidation beneath the formerly-loaded areas — the soil that carried the staging materials may have settled differently than the surrounding unstaged soil; additionally, any water infiltration during staging may have created wet zones; the bearing capacity in the formerly-staged area should be confirmed rather than assumed equivalent to the surrounding unloaded soil

C. The cleared staging area has been pre-loaded and is therefore more compacted and has better bearing capacity than unstaged areas

D. The staging materials were below the typical surcharge threshold — no bearing concern applies

19. A crane is set up at a job site and the operator is ready to begin the first lift. The signal person informs the operator that the crane has been idle for 14 days since the last use. What must be confirmed before beginning the first lift?

A. The crane's manufacturer certification must be re-verified after any idle period exceeding 7 days

B. An annual inspection must be performed if the crane has been idle for more than 10 days

C. A pre-shift inspection must be performed before the first lift — the 14-day idle period means the crane must be inspected with particular attention to fluid levels, hydraulic condition, ATB function, brake function, and rope condition; conditions that develop during extended idle periods include hydraulic fluid settling, corrosion at exposed metal surfaces, and vermin-related damage; the pre-shift inspection is not reduced or eliminated by extended idle periods but is made more important by them

D. A special return-to-service inspection by the crane manufacturer is required after any idle period exceeding 10 days

20. A crane is set up at a job site when a water tanker truck sprays the access road adjacent to the setup area for dust suppression. The tanker applies water heavily and runoff from the road flows toward the crane's outrigger positions. What is the required response?

A. Stop all crane operations and prevent the water from reaching the outrigger bearing zone — road water runoff can saturate and rapidly soften the supporting soil, eliminating the bearing capacity the original assessment was based on; the source must be stopped and ground conditions re-evaluated before operations can resume

B. Sound the horn to warn nearby workers and continue lifting while monitoring for pad sinking

C. Continue operations since road dust suppression water is treated water that has no bearing capacity effect

D. Reduce the planned lift to 80% rated capacity while the water runoff is present

21. A crane operator is performing a site walk when they find that the planned right outrigger zone has a section of surface that has been painted with reflective lane marking paint — the kind used on roadway surfaces. The paint covers approximately 30% of the planned mat contact area. What specific concern does this road marking paint create?

A. Road marking paint is a durable industrial coating that improves surface friction for crane mats

B. The paint covers only 30% of the mat contact area and is within normal surface variation tolerance

C. Road marking paint creates a reduced friction interface between the mat and the underlying surface — the painted surface has lower friction coefficient than unpainted concrete or asphalt; under the crane's horizontal force component from the outrigger, the mat may slide on the painted surface more easily than on unpainted surface; the mat must be confirmed stable against lateral sliding before operations begin

D. Road paint is superficial and has no effect on the structural bearing capacity of the surface

OPERATIONS DOMAIN — Questions 22–48

22. A crane operator is completing a shift when the incoming relief operator asks the outgoing operator about an unusual noise the outgoing operator noticed during the last hoist of the shift. The outgoing operator says: "I heard a slight clicking sound from the drum area during the 11th lift but it didn't repeat during the 12th lift." Is the outgoing operator required to document and communicate this observation?

A. Nothing — a sound that does not repeat is self-resolved and requires no documentation or communication

B. Yes — the unusual sound must be documented in the crane's maintenance log and verbally communicated to the relief operator before the crane is operated again; a sound that occurred once and did not repeat may indicate a developing mechanical condition; the incoming operator cannot make an informed inspection decision without this information; conditions that appear self-resolved can recur with greater severity during subsequent operations

C. The sound only requires documentation if it occurs during a critical lift

D. The outgoing operator may choose whether to document based on their professional judgment about the sound's significance

23. A crane is performing a critical lift at 88% of rated capacity when the lift director asks the operator to "pick up the pace" on the hoist to meet a schedule deadline. The current hoist speed is already at the manufacturer's maximum recommended speed for the planned configuration. What must the operator do?

A. Increase hoist speed incrementally above the manufacturer's recommendation while monitoring the LMI for any significant change

B. Contact the manufacturer by phone to request a temporary speed exception for the scheduled lift

C. Maintain the current hoist speed — the manufacturer's maximum recommended speed for a specific configuration is the upper operating limit for that configuration; exceeding it creates dynamic loads that were not accounted for in the load chart capacity analysis; the operator must inform the lift director that the maximum speed is already being used and cannot be exceeded regardless of schedule requirements

D. Increase speed by 10% with the lift director's verbal authorization and document the exception post-lift

24. A crane operator is performing a lift at 82% of rated capacity when the load line jumps off one of the intermediate sheaves on the hook block — the rope is now resting on the sheave flange rather than in the groove. The load is at 6 feet of height. What is the required response?

A. Lower the load to the ground immediately — a jumped sheave means the rope is running on the sheave flange rather than in the designed groove; the rope is experiencing uneven contact stress and wear, and may disengage completely from the sheave if the flange is worn or if the load swings; continuing any crane movement with the rope misrouted risks sudden load drop; the rope must be re-reeved through the sheave before any further lifting

B. Continue the lift at minimum speed since the rope is still in contact with the sheave

C. The sheave can be re-centered with a light hoist-up movement to seat the rope back in the groove

D. Continue the lift and have the rigger re-seat the rope after the load is set

25. Under OSHA 1926.1416(e), what specific requirement applies to the load chart's condition when it is in the crane's cab?

A. The load chart must be laminated or in a protective cover to prevent weather damage

B. Nothing specific — load charts may be in any condition as long as they are present in the cab

C. The load chart must be reviewed and signed by the operator at the start of each shift to confirm familiarity

D. The load chart must be in a legible condition — damaged, missing sections, or illegible charts do not satisfy the requirement; the operator must be able to read all applicable sections, including notes and tables, to verify capacity before each lift; a torn, faded, or stained chart that cannot be fully read must be replaced before operations begin

26. A crane operator is performing a lift when the signal person leaves the established signal position to confer with the lift director about the set location. The signal person is gone for approximately 90 seconds. During those 90 seconds, the load is stationary at 10 feet of height. What must happen before any crane movement resumes?

A. Nothing — 90-second holds are within normal crane operational practice; the operator may resume when the signal person returns

B. The signal person must return to a position where they can see both the load and the operator, re-establish eye contact and confirmed communication, and then give a clear signal before any crane movement begins — the 90-second absence ended active signal communication; resuming movement without re-establishing confirmed communication is not authorized regardless of how brief the absence was

C. The operator may slowly swing the load toward the set location while awaiting the signal person's return

D. The lift director may give verbal authorization for the operator to continue the movement

27. A crane operator is preparing for a lift when the rigger attaches the slings and then exits the work area. Before the signal person gives the HOIST signal, the operator observes through the cab window that one sling leg appears to be sitting on a sharp protrusion on the load's surface — a steel weld seam approximately 1/4 inch high running across the sling contact area. What must the operator do?

A. Nothing — slings are rated to handle minor surface irregularities such as weld seams

B. Alert the signal person about the sling condition and wait for a HOIST signal confirming the rigging is safe

C. Proceed with the hoist at minimum speed since the weld seam is less than 1/2 inch high

D. Nothing — the signal person is responsible for rigging inspection; proceed when the HOIST signal is given

28. Under OSHA 1926.1431, what is the specific requirement for the operator regarding their physical presence during all phases of a personnel hoisting operation?

A. The operator must remain in the cab but may use crew-authorized absences during extended holds when the platform is within 5 feet of a landing

B. Nothing — the operator's presence requirement is satisfied by maintaining radio contact when away from the cab

C. Nothing — drum pawl engagement satisfies the operator presence requirement for brief holds

D. The operator must remain at the crane controls and in control of all crane functions throughout all phases of personnel hoisting — from the initial pick, throughout all movement and holds, and until the platform and personnel have been safely landed; there are no authorized absences from the controls while personnel are suspended; this absolute requirement exists because any change in crane or platform condition requires immediate operator response

29. A crane operator is performing a lift at 86% of rated capacity. During a slow swing, the load begins to oscillate in a 2-foot arc perpendicular to the swing direction. The oscillation is increasing with each swing cycle. What is the operational significance of increasing oscillation amplitude and what must the operator do?

A. Nothing — 2-foot oscillation during swing is within normal operational parameters for all standard lifts

B. Nothing — the operator should complete the swing to the set location and the oscillation will self-dampen on landing

C. Reduce swing speed only — the oscillation amplitude will reduce as speed decreases

D. Stop the swing immediately — increasing oscillation amplitude means energy is being added to the pendulum system rather than being removed; this can result from the swing frequency coincidentally matching the load's natural pendulum frequency (resonance); as amplitude increases, the risk of the load contacting adjacent structures or the load line becoming entangled increases; the swing must stop and the oscillation must be allowed to decay before any further movement

30. A crane operator is operating when they observe that the crane's boom is deflecting visibly more under the current load than it did under the same load earlier in the shift. No configuration change has been made and the temperature has not changed significantly. What does progressive increased boom deflection at the same load indicate?

A. Nothing — boom deflection naturally increases throughout a shift as the boom warms from solar exposure

B. Increased boom deflection at the same load compared to earlier identical lifts may indicate progressive structural degradation — a failing chord member, a cracked or missing lacing, or a structural connection that has loosened; the boom should not deflect more for the same load unless something in its structural system has changed; the crane must stop operations and the boom must be inspected for structural damage

C. Increased boom deflection is caused by hydraulic system temperature increase during the shift

D. The increased deflection is within the LMI's measurement tolerance and does not represent an actual change

31. A crane is performing a lift when the operator's radio receives a distorted message from the signal person that cannot be fully understood. The distortion was consistent throughout the message — the operator heard garbled sound throughout with no recognizable commands. What is the correct response?

A. Continue the current movement and ask the signal person to repeat the message at the next pause

B. Execute what the operator believes the garbled message may have intended based on the lift's sequence

C. Stop all crane movement immediately — a fully garbled radio message is not a valid signal; acting on an incompletely understood radio transmission is equivalent to acting on no signal at all; all crane movement must stop until the communication problem is resolved and a clear, fully understood command is confirmed received; this applies regardless of what the operator believes the intended command might have been

D. Contact the lift director to request authorization to continue without clear communication

32. Under OSHA 1926.1419, when a signal person is directing a crane through a radio communication system and the radio suddenly fails mid-command during an active hoist, what is the operator's immediate required response?

A. Stop the hoist immediately and hold the load at current height — the radio failure represents a complete loss of the communication system during an active command; the operator cannot confirm whether the incomplete command was a directional order, a stop, or an emergency; all movement must stop and hold until communication is restored and a complete, clear command is confirmed

B. Continue the hoist at minimum speed until the signal person can establish alternative communication

C. The operator may complete the hoist since the beginning of the command was sufficient to establish intent

D. Use the LMI reading to make an independent judgment about whether continuing the hoist is safe

33. A crane operator is completing a shift having performed 14 lifts at capacities ranging from 77% to 92%. The last lift was completed at 92% with a confirmed total suspended weight of 36,800 lbs. As the operator leaves the cab to hand off to the relief, they observe that all four outrigger pads appear to be at their original positions with no visible settlement. The relief operator asks: "Can I start with the same configuration for the next lift?" What is the correct response?

A. The configuration has been used for 14 lifts successfully — the relief operator may proceed without additional confirmation

B. The configuration capacity was confirmed for previous lifts — the current configuration is valid until a parameter changes

C. Nothing — the visual confirmation of no settlement confirms all conditions remain adequate for the next shift

D. Before the next lift, the relief operator must independently verify their own pre-shift inspection and confirm the crane configuration, level condition, and ground conditions before each lift in their shift — the outgoing operator's successful lifts confirm historical performance but do not substitute for the incoming operator's independent pre-shift confirmation; the incoming operator bears responsibility for their own shift's operational safety

34. A crane is performing a lift at night when the operator notices that the artificial lighting illuminating the set location is creating a "halo effect" — the strong direct lighting is making it difficult for the operator to see the shadowed area where the load must be precisely set. The signal person confirms they can see the load but the operator cannot confirm the set location's clearances independently. What must happen?

A. Nothing — the signal person's confirmed visual of the load is sufficient for precision placement

B. Additional lighting or repositioned lighting must be provided so the operator can also confirm the set area's clearances — both the operator and the signal person need to be able to perform their independent safety functions; the operator cannot confirm the set area is clear or that the load is safely positioned when the lighting prevents their independent visual verification; the signal person's view alone is insufficient

C. Continue the placement at minimum speed relying entirely on the signal person's guidance

D. The lift director may authorize single-party visual confirmation for precision nighttime placements

35. Under ASME B30.5, when a crane is directed to perform a lift that requires simultaneous boom-down and swing movements, what specific risk must the operator assess before executing both functions together?

A. Nothing — simultaneous multi-function operation is always authorized under ASME B30.5

B. The operator must confirm the lift director has approved simultaneous multi-function movement in writing

C. The operator must verify the combined effect of the simultaneous movements will not increase the effective operating radius beyond a position where the total suspended weight exceeds the rated capacity — boom-down increases the radius while swing centrifugal forces also increase the effective radius; the two effects together can create a greater effective radius than either alone; the capacity at the resulting combined effective radius must be confirmed before executing the simultaneous movement

D. Simultaneous boom-down and swing movements are always prohibited during critical lifts regardless of their combined radius effect

36. A crane operator is performing a precision placement when the operator observes that the load has tilted approximately 10 degrees from horizontal during the hoist — one end of the load is noticeably higher than the other. The load is a structural beam that was leveled during rigging. The tilt developed during the hoist. What must the operator do?

A. Lower the load to the ground immediately — an unexpected load tilt that develops during hoist indicates either a rigging failure (a sling slipping, a lug pulling, or hardware disengaging) or a significant CG offset that was not detected during rigging; at 10 degrees of tilt, the rigging's load distribution has deviated significantly from planned; the load must be returned to the ground and the rigging evaluated before re-hoisting

B. Continue the hoist at minimum speed and allow the beam to seek its natural hanging angle

C. Apply a HOIST signal to the higher end of the load to add tension to that sling leg

D. Swing the crane to shift the load's CG position before continuing the hoist

37. Under OSHA 1926.1427, a crane operator's NCCCO TLL (telescopic boom crane, swing cab) certification expired 3 months ago during an ongoing project. The operator has been continuously employed on this project since before the expiration. Does the continuous employment provide any exception to the certification requirement?

A. Continuous employment on the same project creates a 6-month exception period for NCCCO certification renewals

B. Nothing — continuous employment provides no exception; the operator's certification expired 3 months ago and they must stop performing certified crane operations until recertification is obtained; OSHA 1926.1427 requires current valid certification and provides no grace period or employment exception; the operator is not authorized to operate the crane until they hold a current, valid certification

C. Continuous employment on the same project is recognized as a qualification equivalent to certification for experienced operators

D. The operator may continue operating if the employer documents their continuous competency through a performance review

38. A crane operator is performing a lift at 90% of rated capacity when the lift director receives a phone call and steps 50 feet away from the lift area to take the call. The operator and signal person continue the lift in the lift director's temporary absence. The load is at 20 feet of height. Is it appropriate to continue without the lift director present?

A. Nothing — lift directors are administrative coordinators who are not required to be physically present during every moment of an active lift

B. For a critical lift at 90% of rated capacity, the lift director's presence at the lift area is a required element of the critical lift plan — stepping away during an active critical lift eliminates the coordinating function at the moment the coordination is most critical; the crane must hold the load stationary until the lift director returns to the lift area and re-establishes active coordination

C. Continue the lift since the signal person is present and is qualified to direct the lift

D. The operator may complete the current hoist cycle and hold the load while the lift director finishes the call

39. A crane operator is asked to perform a lift that will require swinging the load over a building's occupied office space on the second floor. The floor-to-ceiling height in the office is 9 feet and the windows are opaque — the office occupants cannot see outside. The bottom of the load will be at 22 feet above the office floor level when it passes over. What must happen before this lift?

A. Nothing — the load is 13 feet above the occupied floor level and the occupants cannot see the load anyway

B. The operator may proceed if the building owner provides written acknowledgment of the overhead crane operation

C. The swing over the occupied office space requires the office to be evacuated and confirmed empty before the load passes over it — OSHA 1926.1425 prohibits loads from passing over personnel; office occupants are personnel regardless of their elevation below the load or their inability to see the load through opaque windows; the building must be evacuated in the load's path and confirmed clear before any overhead swing

D. A spotter must be positioned in the office to confirm no one approaches the window area during the overhead swing

40. A crane operator is completing a shift when the relief operator notices that the crane's main hoist drum has an unusual wear pattern — a section approximately 8 inches wide on the left side of the drum has noticeably deeper groove wear than the rest of the drum. The outgoing operator says: "I've been noticing that for the last two weeks but it hasn't caused any problems." What must happen?

A. The concentrated groove wear on one section of the drum must be documented, reported to the employer, and evaluated by a qualified inspector before the next shift's operations begin — accelerated groove wear concentrated in one area indicates the rope is consistently tracking toward that area of the drum, which can cause the rope to cross-wind, crush on subsequent layers, and eventually overflow the drum flange; the two-week observation history means the condition has been developing and must be formally assessed before further operations

B. Nothing — if the condition hasn't caused problems in two weeks, it is within normal wear parameters

C. The outgoing operator should have reported it sooner — the relief operator may document it and continue

D. Replace the drum at the next scheduled maintenance interval since replacement is the only solution

41. A crane is performing a lift at 88% of rated capacity when the operator receives confirmation that the load weighs 4,600 lbs more than the original estimate — the total suspended weight is now at 96% of rated capacity. The load is currently at 8 feet of height after the initial pick. What must the operator do?

A. Nothing — 96% is still below 100% of rated capacity and the lift may continue with adjusted documentation

B. Continue at minimum speed with the signal person confirming clearances since the lift is within rated capacity

C. Nothing — the load is already off the ground and the risk of lowering is equal to continuing

D. Stop the hoist at current height and assess the situation — 96% is within rated capacity but the original plan was confirmed at 88%; additionally, if this was planned as a critical lift at 88%, the pre-lift plan is no longer valid at 96%; the current configuration, radius, and ground conditions must all be confirmed adequate for the revised 96% loading before any further movement; the lift director must be informed of the change and all affected parameters re-confirmed

42. A crane operator is performing a lift when the boom tip suddenly emits a loud metallic "bang" — like the sound of a large bolt striking the boom structure — while the load is at 6 feet of height during a slow hoist. No visible movement occurred in the boom structure. What must the operator do?

A. Continue the lift at minimum speed and investigate the source of the sound after the load is set

B. Stop the hoist immediately, lower the load to the ground, and have the boom tip and load line inspected before any further lifting — an unexplained metallic impact sound from the boom tip during an active hoist indicates a sudden structural event at or near the boom tip; possible causes include a rope jumping a sheave, a boom tip fitting failing, or a structural connection breaking; the consequences of a failed component at the boom tip include sudden load drop; the inspection must precede any further lifting

C. The bang was likely caused by thermal expansion of the boom — continue the lift

D. Contact the lift director for authorization before stopping operations for an unexplained sound

43. Under OSHA 1926.1424, what specific elements must the exclusion zone established before crane operations protect against?

A. Nothing — exclusion zones only protect against the crane's load dropping during operations

B. The exclusion zone must protect against equipment contacting the load — ropes touching the load from outside are excluded from the zone requirements

C. The exclusion zone must protect personnel from being struck by the rotating upper works including the counterweight, being struck or crushed by the load or load line, being struck by the boom if it falls, and being caught in any pinch points created by the crane's movements — all of these hazard zones must be barricaded from unauthorized personnel entry; the zone is comprehensive, not limited to the load path alone

D. Exclusion zones are only required when the crane's counterweight extends beyond the crane's original footprint area

44. A crane operator is asked by the lift director to perform a "test pick" — hoisting the load 6 inches off the ground, holding for 2 minutes, and then confirming all parameters before proceeding with the full lift. The planned lift is at 91% of rated capacity. During the 2-minute hold, the crane's level indicator shifts 0.15% toward the load side. What does this indicate and what must happen?

A. The 0.15% level shift during the 2-minute test hold indicates the soil beneath one or more outriggers is settling under the load — the soil is compressing under the outrigger loads at the planned capacity; even though the shift is within the manufacturer's tolerance, the progressive nature of the tilt during a short static hold indicates the soil may continue to consolidate under the planned 91% lift; the load must be lowered and the outrigger conditions evaluated before proceeding

B. Continue the lift since the 0.15% shift is within the manufacturer's stated tolerance

C. Boom up to reduce the operating radius before continuing the lift to reduce the outrigger loads

D. The test hold confirms the setup is adequate — a small level shift confirms the mats have seated properly

45. A crane is performing a lift when a large bird — estimated at 15 pounds — strikes the upper boom section and becomes caught in the upper chord lacing. The impact was significant and the bird appears dead. The crane is at 87% of rated capacity. What must happen?

A. Nothing — a 15-pound bird impact on the boom is within the crane's structural design tolerances

B. Continue the current lift since a bird strike does not affect the crane's structural capacity

C. The bird strike and the additional weight of the bird in the lacing are minor concerns — finish the lift

D. Stop crane movement and hold the load — the bird strike may have damaged the boom chord, lacing, or connections at the impact point; the impact force from a 15-pound bird at flying velocity can exceed 1,000 pounds for a fraction of a second, which may have cracked or displaced structural members; the crane must hold the load stationary while the boom impact location is inspected for damage before any further movement

46. A crane operator is asked to perform a lift where the load must pass within 2 feet of a running gas-powered generator that is fueling construction lighting. The generator is operating and its exhaust is directed horizontally toward the load path. What concern must be addressed?

A. Nothing — the 2-foot clearance from an operating generator is within standard crane operation proximity

B. The generator must be shut down before the load passes within the proximity limit — the risk of the load contacting the generator's exhaust or fuel system during a close-pass lift, combined with the generator being a potential ignition source for any fuel or fume release, creates a combined fire and collision hazard; the generator must be secured before the load passes within 2 feet

C. Reduce the swing speed to minimum when passing within 5 feet of the operating generator

D. The signal person must stand between the generator and the load path to prevent contact

47. A crane is performing a lift when the operator observes that the load is rotating slowly — approximately one revolution every 60 seconds. The load is an 18,000-pound steel fabrication in a 4-leg wire rope bridle. The rotation is consistent and continuous. What action is required?

A. Nothing — slow continuous rotation is a normal characteristic of large steel fabrications in multi-leg wire rope bridles

B. Continue the lift and plan to rotate the load to the correct orientation using the swing function at the set location

C. Stop the hoist and use a tag line to arrest the rotation before continuing — continuous rotation during hoist can progressively twist the wire rope legs, concentrating load on the twisted portion and reducing the effective WLL of each leg; rotation can also unscrew shackle pins under the rotational load; the rotation must be stopped and arrested before the load rises further or any swing movement begins

D. Apply the swing brake in the rotation direction to apply a counter-rotation force through the crane structure

48. Under OSHA 1926.1416, what must the operator confirm regarding the crane's rated capacity before beginning each lift, and how does this interact with the pre-existing LMI configuration?

A. The operator must confirm the crane's rated capacity through load chart verification before each lift, independent of what the LMI displays — the LMI is a supplementary monitoring tool that may be misconfigured, miscalibrated, or malfunctioning; the rated capacity is confirmed through the load chart, not through the LMI; if the LMI's displayed configuration does not match the actual crane configuration, the LMI's readings do not represent the actual capacity percentage and cannot be relied upon as the primary capacity confirmation

B. The LMI reading before each lift satisfies the rated capacity confirmation requirement

C. The operator's previous shift experience with the same configuration satisfies the confirmation requirement

D. Nothing — the rated capacity is permanently established and does not require per-lift verification

TECHNICAL KNOWLEDGE DOMAIN — Questions 49–70

49. A crane's wire rope is being inspected when the inspector notices that the rope's outer wire strands have a uniform bright, polished appearance on one side — as if they have been worn smooth on the contact side against a single surface — running the full length of a 24-inch section. What does this single-sided polishing pattern across a 24-inch section indicate?

A. Single-sided polishing across a 24-inch rope section indicates the rope has been in sustained contact with a fixed surface at a consistent angle — a drum groove wall, a sheave flange, or a structural edge —

throughout that section's travel; the contact has removed metal from the wire surfaces, reducing the wire cross-section at the contact points; both the rope section and the contact surface must be investigated and evaluated for damage; the rope section must be assessed against diameter reduction removal criteria

B. Single-sided polishing is normal for regularly used crane ropes and indicates the rope is properly seated

C. The polishing indicates the rope was recently lubricated with an abrasive-free lubricant — no concern applies

D. Single-sided polishing occurs from rope-to-drum contact during normal operations and is expected

50. Under ASME B30.9, what is the minimum design factor for alloy steel chain slings (Grade 80) used in standard rigging applications?

A. 5 to 1 — the same as wire rope slings to ensure consistent safety margins across sling types

B. 4 to 1 — the minimum design factor for Grade 80 alloy steel chain slings under ASME B30.9; the design factor means the sling's minimum breaking force is at least four times its Working Load Limit; this factor is specifically lower than wire rope's 5 to 1 design factor, reflecting the different failure modes and predictability of alloy chain

C. 3 to 1 — a reduced factor reflecting Grade 80 chain's higher base strength compared to regular steel chain

D. 6 to 1 — a higher design factor applied to all chain products to account for sudden link failure modes

51. A crane operator is reviewing the inspection report and finds the notation: "Hoist motor hydraulic supply hose — outer braid visible at one contact point — 50% cover wear." What does 50% outer cover wear at a contact point indicate and what is the required action?

A. Nothing — 50% cover wear is within the acceptable wear range for hydraulic hoses in active service

B. The hoist motor supply hose is a high-pressure hydraulic line carrying hundreds to thousands of psi — with 50% cover wear at a contact point, the outer protective braid is exposed and being abraded; continued abrasion will reach the high-pressure inner tube; hose failure at this location would release hot pressurized hydraulic fluid at high velocity, creating injection injury and fire hazards; the hose must be replaced or the contact point protected before any further crane operations

C. Monitor the hose at daily inspections until the cover is fully abraded

D. The 50% wear threshold applies only to return lines — supply hoses may continue at any wear level

52. A crane inspector is performing the annual inspection and finds a crack in the base of a boom foot pin lug — the structural element that connects the boom's lower chord to the rotating bed. The crack is approximately 1/2 inch long and appears to have been developing for some time based on the oxidation at the crack face. What action is required?

A. The crane must be removed from service immediately — a crack in the boom foot pin lug is a structural failure in a primary load-carrying connection; the boom foot pin lug transfers all boom loads from the boom's lower chord to the rotating bed; fracture of this connection would result in sudden boom separation from the crane; no monitoring or reduced-capacity operation is authorized for a cracked structural connection element

B. Reduce crane capacity to 75% and monitor the crack at monthly intervals

C. Have the crack welded and perform a proof load test before returning to service

D. The crack is at the base of the lug which is a non-critical location — monitor at monthly inspections

53. A crane's load line is being replaced. As the old rope is removed, the inspector finds that the rope's core is visible at one location — the outer strands have opened sufficiently to expose the fiber core beneath. No broken wires are visible in the outer strands. What does visible core exposure without broken outer wires indicate?

A. Nothing — fiber core visibility without broken wires indicates the core is intact and the rope is serviceable

B. Continue inspecting for broken wires and make the removal decision based on wire break count only

C. The rope must be removed from service — a crushed or collapsed fiber core that allows outer strands to spread to the point of core visibility indicates the rope's internal support structure has failed; the fiber core normally prevents strand-to-strand contact and maintains the rope's designed geometry; when the core collapses, the strands rest on each other, creating accelerated inter-strand wear and uneven load distribution; the capacity of a rope with a collapsed core cannot be relied upon

D. Visible fiber core through outer strands is acceptable if the core fibers are intact and not broken

54. A crane's hook block is being inspected when the inspector discovers that the hook has a visible twist of 8 degrees from its original plane. ASME B30.10 specifies removal at 10 degrees. What does the twist indicate about the hook's service history and what action should be taken?

A. Nothing — 8 degrees is below the 10-degree removal threshold; continue in service without further action

B. The 8-degree twist indicates the hook has been subjected to torsional loading from a lateral pull, angular rigging, or load rotation — the hook is approaching the removal threshold; document the measurement and perform more frequent inspections since the hook is within 20% of the removal criterion; at the next inspection, if the twist has increased, remove immediately

C. The 8-degree twist is within the removal threshold but indicates the hook has experienced off-axis loading — document the measurement, assess whether the hooks service conditions continue to create torsional loading, and confirm the hook is otherwise within all other removal criteria; since it is approaching the 10-degree removal threshold, inspections should be increased in frequency

D. The hook must be removed from service since it is within 25% of the removal threshold

55. A rigger is preparing to use a synthetic round sling with a rated WLL of 4.5 tons in a choker hitch. The load's attachment point has a 1/2-inch radius edge — essentially a sharp corner. What is the specific concern with using a round sling in a choker hitch on a sharp-edged load attachment point?

A. Nothing — round slings are specifically designed to handle sharp corners due to their padded construction

B. Round slings in choker hitch on sharp-cornered attachment points require only an edge protection sleeve on the attachment point

C. The combination of a choker hitch and a sharp load attachment creates two simultaneous risks — the choker hitch tightens progressively as the load is lifted, pressing the sling's load-bearing fibers against the sharp edge with increasing force; the sharp edge can cut through the round sling's outer cover and into the load-bearing core fibers; the choker action ensures the cutting force increases with load; edge protection must be used between the sharp edge and the sling before any lifting

D. Round slings may be used on sharp corners in all hitch types without edge protection since the round cover distributes the edge load

56. Under ASME B30.5, when must a crane's wire rope be specifically inspected after being exposed to shock loading — such as when a load falls several feet before being arrested by the brake?

A. After the shift during which the shock loading occurred — end-of-shift inspection is sufficient

B. The rope must be inspected at the next scheduled monthly inspection

C. Nothing — shock loads within the rope's rated breaking strength do not require special inspection

D. The rope must be inspected by a qualified person before any further use — the shock loading occurs when the brake arrests a falling load, creating dynamic forces that can be many times the static load weight; these forces can cause internal wire damage, strand rearrangement, and geometric deformation that are not visible externally; ASME B30.5 requires this post-incident inspection before the rope is put back into service regardless of its visual appearance

57. A crane operator is reviewing inspection documentation and finds that the crane's ATB system was tested 8 months ago and noted as functional. The crane has been in continuous daily service since. Is an 8-month-old ATB test record sufficient for today's operations?

A. Yes — the 8-month-old test confirms the ATB was functional; re-testing is only required after an ATB activation event

B. Nothing — ATB systems are mechanical devices with extended service life; annual testing is sufficient

C. ATB systems must be specifically tested during the pre-shift inspection of any crane that requires ATB protection as a condition of operation — an 8-month-old test result does not confirm today's ATB function; ATB cables can be damaged, ATB weights can be lost or damaged, and switch contacts can corrode between inspections; the ATB must be confirmed functional before operations begin each day; testing by lifting the ATB weight by hand to confirm hoist function interruption must be performed today

D. The ATB test from 8 months ago is valid for 12 months from the test date — no re-test is required

58. A crane is operating when the inspector notes that the two sheaves in the lower block of the hook block assembly are rotating freely but at significantly different speeds during a hoist — one sheave turns at approximately twice the RPM of the other. What does different rotational speed between sheaves on the same hook block indicate?

A. Nothing — sheave speed differences are normal due to differences in groove wear creating different effective diameters

B. The different rotational speeds indicate the rope is not loading the two sheaves equally — if the rope is passing around the sheaves and one is turning faster, the rope is likely contacting the sheaves unevenly due to a misaligned sheave pin, a damaged sheave groove, or the rope having crossed between sheaves; unequal sheave loading creates uneven rope wear and can cause the rope to jump one of the sheaves; the hook block must be inspected and the cause of the speed difference identified

C. Different sheave speeds confirm the hook block is properly reeved — this is expected in multi-part reeving

D. The speed difference is caused by the hook block rotating slightly — correct by stabilizing the hook block with a tag line

59. A crane inspector examines the slewing ring's vertical deflection during the annual inspection. The measurement shows 0.052 inches. The manufacturer's maximum specification is 0.060 inches. The previous year's measurement was 0.038 inches. What does the increase from 0.038 to 0.052 inches over one year indicate?

A. Nothing — the measurement is within the manufacturer's specification and no concern applies

B. Nothing — slewing ring wear progresses at a predictable rate and the current measurement provides no special information

C. The increase of 0.014 inches over one year is significant — at this rate of wear, the slewing ring will reach the 0.060-inch specification limit within approximately one additional year; the wear rate indicates the slewing ring is experiencing accelerated wear; operations should continue with heightened monitoring at more frequent intervals than annual, and the wear rate should be confirmed by a mid-year measurement to detect any further acceleration before the limit is reached

D. The slewing ring must be replaced since it has exceeded 80% of the maximum allowable deflection

60. A crane operator is asked about the function and limitation of the crane's rated capacity indicator (RCI). Which statement accurately describes both?

A. The RCI confirms the crane is operating safely within rated capacity — when the RCI reads below 100%, all crane operations are confirmed safe at current and higher loads

B. The RCI is the required primary safety device for all crane capacity confirmation — it supersedes load chart verification during actual lifting operations

C. Nothing — RCIs are optional accessories with no defined function under ASME B30.5

D. The RCI provides real-time feedback on the crane's load moment as a percentage of rated capacity for the current configuration; however, the RCI is a supplementary device that can be misconfigured, miscalibrated, or affected by sensor errors; it does not substitute for pre-lift load chart verification; when the RCI configuration does not match the actual crane configuration, its readings are meaningless regardless of what percentage they display

61. A crane is operating when the inspector observes that the main hoist drum's rope spools inconsistently — on every sixth revolution of the drum, the rope jumps slightly before settling back into

the groove. The jump creates a brief visible displacement of the rope at the drum surface. What does a rhythmic rope jump every sixth drum revolution indicate?

A. Nothing — minor rope displacement during winding is expected on drums with multiple layers of rope

B. The rhythmic rope displacement synchronous with drum revolution indicates the drum has either a localized deformed groove, a damaged groove edge, or an out-of-round condition at one point on the drum circumference — the rope rides over this anomaly on every revolution; the repeated rope jump creates a fatigue point in the rope at the location that contacts the drum anomaly on each revolution; the drum must be inspected and the cause of the rhythmic displacement identified

C. The rhythmic jump is caused by fleet angle changes as the rope traverses the drum — it is a normal phenomenon

D. A rhythmic drum jump indicates the anti-creep device is engaging and releasing — verify the device is set correctly

62. Under ASME B30.9, what is the required action when a wire rope sling is found to have a section where three wires in the same strand have broken within a 2-inch section near the middle of the sling — not at an end fitting?

A. Nothing — three broken wires in the same strand at mid-sling does not meet the 10-wire-per-lay-length removal criterion for slings

B. The sling must be removed from service — ASME B30.9 specifies removal when 10 or more broken wires are found in one rope lay length, but also when 5 or more broken wires are found in one strand in one lay length; with 3 broken wires in the same strand in 2 inches (well within one lay length for most rope diameters), the count is approaching the 5-in-one-strand threshold; additionally, concentration of breaks in the same strand indicates strand fatigue that can progress rapidly; the sling should be removed pending evaluation against the applicable standard's removal criteria

C. The sling must be removed from service — ASME B30.9 specifies removal when 3 or more broken wires occur in one strand within one lay length for wire rope slings

D. Monitor the sling and remove when the three-wire cluster increases to five within the next three uses

63. A crane's annual inspection reveals that the boom chord's cross-sectional area has been reduced by an estimated 7% at one location due to surface corrosion and pitting. The crane manufacturer's maximum allowable section loss for boom chord members is 5%. What is the status of this crane?

A. Nothing — a 7% section loss is within normal aging tolerance for outdoor crane booms

B. Continue operations with a 7% capacity reduction to offset the section loss

C. The crane must be removed from service until the manufacturer or a qualified structural engineer evaluates the chord — the 7% section loss exceeds the manufacturer's 5% maximum, meaning the chord's structural capacity is below the manufacturer's minimum standard; operating with a chord that has exceeded the maximum allowable section loss means the boom's rated capacity is not valid for the degraded structural condition; the crane cannot be used until the chord is evaluated and either confirmed acceptable with a revised capacity or replaced

D. The 7% section loss is within the 10% tolerance that ASME B30.5 allows for all structural members

64. A rigger is preparing a four-leg wire rope sling bridle for a 36,000-pound load. The slings will be at 45 degrees from horizontal and each leg has a vertical hitch WLL of 12,000 lbs. What is the tension on each leg and is the configuration within the rated WLL?

A. Tension per leg = (36,000 ÷ 4) × (1 ÷ sin 45°) = 9,000 × 1.414 = 12,726 lbs — this exceeds the 12,000-lb WLL; the configuration cannot be used as planned; the sling angle must be increased or higher-capacity slings must be selected

B. Tension per leg = 36,000 ÷ 4 = 9,000 lbs regardless of angle — the four legs share the load equally; the configuration is within the 12,000-lb WLL

C. Tension per leg = (36,000 ÷ 4) × cos 45° = 9,000 × 0.707 = 6,363 lbs — well within the 12,000-lb WLL

D. Tension per leg = 36,000 ÷ (4 × sin 45°) = 36,000 ÷ 2.828 = 12,726 lbs — each leg carries 12,726 lbs; the slings may be used since the excess is within the design factor

65. A crane's load line passes over a sheave whose groove shows a visible flat spot approximately 2 inches in length at the groove bottom. The sheave is on the main hook block and has been in service for 3 years. What action is required?

A. Apply additional lubrication to the flat spot area to reduce rope wear at that contact point

B. Monitor the flat spot at monthly inspections — replace the sheave when the flat spot exceeds 4 inches

C. Continue in service since the 2-inch flat spot is within the service tolerance for high-use sheaves

D. The sheave must be replaced and the rope section that has been running over the flat spot must be inspected for fatigue damage — a flat spot on a sheave creates an impact load on the rope every time the flat zone contacts the moving rope; this periodic impact causes accelerated fatigue cracking in the wires at the contact point; the longer the flat spot has existed, the more fatigue has accumulated in the corresponding rope section; both must be replaced or evaluated before further operations

66. A crane operator is reviewing the maintenance record and discovers that the crane's last hydraulic system flush and fluid replacement was performed 4 years ago. The manufacturer's recommended interval is every 2 years or 1,000 operating hours. The crane has accumulated 820 hours since the last fluid change. What is the maintenance status?

A. Nothing — 820 hours is within the 1,000-hour limit; the calendar interval is secondary to the hour interval

B. The hydraulic fluid change is 2 years overdue based on the calendar interval — even though the 1,000-hour limit has not been reached, the 2-year calendar interval represents the manufacturer's maximum service life for the fluid regardless of hours; degraded hydraulic fluid has reduced viscosity, depleted additives, and increased contamination that accelerate component wear and reduce brake holding reliability; the fluid must be changed before near-capacity operations continue

C. The maintenance interval is based on hours only — schedule fluid change when 1,000 hours is reached

D. Hydraulic fluid deterioration only occurs with thermal cycling; cranes with consistent operating temperatures may extend the change interval indefinitely

67. A crane inspector is examining a 5/8-inch wire rope sling and finds a section where 7 broken wires occur within a single lay length. Under ASME B30.9, what is the removal status and what specific criterion is met?

A. Nothing — the 7 broken wires do not meet any removal criterion for slings under ASME B30.9

B. Monitor the sling at the next use — remove if additional breaks appear in the same lay length

C. The sling must be removed from service — ASME B30.9 specifies removal when 10 or more broken wires are found in one rope lay length for wire rope slings; 7 broken wires in one lay length does not meet the 10-wire criterion; however, assessment of strand distribution is required — if 5 or more breaks are in one strand within one lay length, removal is required; the exact distribution of the 7 breaks among strands must be determined to confirm which criterion applies

D. The sling must be removed — 7 broken wires in one lay length exceeds the criterion for this sling diameter; ASME B30.9 applies progressively stricter criteria for smaller rope diameters, and for 5/8-inch rope, 7 breaks in one lay length exceeds the applicable removal threshold

68. A crane inspector finds during the annual inspection that the crane's hydraulic counterbalance valve on the boom cylinder shows evidence of internal bypass — the boom slowly lowers when the controls are released to neutral. The bypass rate is approximately 1/2 inch per minute. What does counterbalance valve bypass indicate and what action is required?

A. Nothing — 1/2 inch per minute boom drift during holds is within normal tolerance for hydraulic cylinders

B. The counterbalance valve bypass must be repaired before any lifting operations — the counterbalance valve is designed to prevent the boom from lowering when the hydraulic system loses pressure; a bypassing counterbalance valve means the boom can lower without operator input if hydraulic pressure drops; this creates a risk of uncontrolled boom lowering during any hoist malfunction, engine stall, or hose failure; the valve must be replaced before operations

C. The bypass rate can be managed by maintaining constant operator attention to the boom angle during holds

D. A 1/2-inch-per-minute boom drift is within the allowable tolerance specified in ASME B30.5 for all hydraulic cranes

69. A crane operator is performing a lift when the load's rigging includes a below-the-hook vacuum lifter. During the hoist, an audible alarm on the vacuum lifter activates — a continuous tone that the manufacturer's label identifies as "LOW VACUUM WARNING." The load is at 4 feet of height. What must the operator do?

A. Continue the hoist at minimum speed since the alarm is a warning, not a confirmed failure signal

B. Contact the lift director to determine whether to continue or lower the load

C. Complete the current hoist phase before addressing the alarm since the load is nearly at working height

D. Lower the load to the ground immediately — the vacuum lifter's low vacuum warning indicates the holding force has decreased below the minimum required for the rated load; vacuum lifters rely on atmospheric pressure differential to hold the load; a reduced vacuum means the holding force is diminished; continued hoisting with reduced vacuum risks the load releasing from the lifter; the load must be on the ground before any investigation of the vacuum loss can safely occur

70. Under OSHA 1926, when a crane's running rope experiences damage from contact with an energized power line, what information is required in the incident documentation?

A. Only the operator's name and the incident time are required in the incident documentation

B. The incident documentation must include the crane's identification, the date and time, the power line voltage (if known), the duration of contact, a description of the rope's condition after the event, any injuries or damage, and the corrective actions taken — this documentation supports both the regulatory reporting requirement and the engineering assessment of whether the rope and other affected components can be returned to service

C. Incident documentation for power line contact is only required when there was a visible arc or explosion

D. Power line contact incidents require OSHA notification within 8 hours only — no additional documentation is required

LOAD CHARTS DOMAIN — Questions 71–95

71. A crane's load chart for the 100-foot boom at full outrigger extension shows: 30 ft = 36,600 lbs; 35 ft = 28,800 lbs; 40 ft = 22,400 lbs. The planned operating radius is 34 feet. The hook block weighs 1,900 lbs, slings weigh 520 lbs, hardware weighs 160 lbs, and the payload weighs 24,000 lbs. Using the conservative approach, is the lift within capacity?

A. Nothing — the lift exceeds the conservative capacity and cannot proceed

B. Conservative capacity at 35 ft = 28,800 lbs; total suspended weight = 1,900 + 520 + 160 + 24,000 = 26,580 lbs; the lift percentage = 26,580 ÷ 28,800 × 100 = 92.3%; the lift is within capacity using the conservative approach but exceeds the 75% threshold — a critical lift plan and pre-lift meeting are required

C. Conservative capacity at 35 ft = 28,800 lbs; 26,580 lbs is within capacity; the lift proceeds since 26,580 < 28,800

D. The conservative approach requires using the 40-foot capacity (22,400 lbs) for any radius between 35 and 40 feet — 26,580 lbs exceeds 22,400 lbs; the lift cannot proceed

72. A crane load chart note reads: "For pick-and-carry operations in this section, the maximum total suspended weight is limited to 30% of the on-outrigger capacity shown." The on-outrigger capacity at the planned pick-and-carry configuration and radius is 28,400 lbs. What is the maximum permissible pick-and-carry load?

A. Maximum pick-and-carry load = 28,400 × 0.30 = 8,520 lbs — the note establishes a specific limit for travel with load that reflects the dramatically reduced stability during crane travel compared to stationary operations; all total suspended weight during travel must remain within this 8,520-lb limit regardless of the crane's on-outrigger rated capacity

B. Maximum pick-and-carry load = 28,400 lbs — the note only applies when the crane exceeds normal travel limits

C. Maximum pick-and-carry load = 28,400 × 0.50 = 14,200 lbs — pick-and-carry always reduces capacity by 50% regardless of the note

D. The note only applies to lift-and-travel operations — standard pick-and-carry uses the full on-outrigger capacity

73. A crane's on-outrigger full-extension section shows: 100-ft boom at 25 ft = 44,800 lbs; 30 ft = 35,400 lbs; 35 ft = 27,800 lbs. All cells are stability-limited (white). A planned lift at 28 feet of radius has a total suspended weight of 40,000 lbs. Using the conservative approach, does the lift proceed?

A. Nothing — the interpolated capacity at 28 ft = 39,280 lbs; the load exceeds the interpolated capacity

B. Nothing — conservative capacity at 30 ft = 35,400 lbs; 40,000 lbs exceeds 35,400 lbs — the lift cannot proceed using the conservative approach in this configuration

C. Nothing — the stability-limited cells always have adequate margin and the lift proceeds

D. Conservative capacity at 25 ft = 44,800 lbs; 40,000 lbs is within this — use the smaller tabulated entry for the conservative approach

74. A crane load chart shows a note: "When operating in temperature below -20°F (-29°C), reduce all capacity values in this section by 15%." The current ambient temperature is -24°F (-31°C). The tabulated gross capacity at the planned configuration is 32,400 lbs. What is the applicable derated capacity?

A. Nothing — temperature derating notes only apply to structural-limited capacity values

B. Derated capacity = 32,400 × 0.85 = 27,540 lbs; the temperature is -24°F, which is below the -20°F threshold; the 15% derating applies; all total suspended weights must be within 27,540 lbs; the derating likely exists because the manufacturer has determined that extreme cold affects hydraulic fluid viscosity, seal elasticity, and potentially the steel's impact toughness in ways that reduce the effective operational capacity

C. Derated capacity = 32,400 × 0.85 = 27,540 lbs — but the 15% reduction only applies to lifts above 75% of the tabulated capacity in cold weather

D. Nothing — the temperature at -24°F is only 4°F below the threshold; minor threshold exceedances are within instrument accuracy tolerance and no derating is required

75. A crane is performing a lift using the following configuration: 100-foot boom, full outrigger extension, maximum counterweight, all-directions section. The capacity at 35 feet is 28,400 lbs. The operator switches to using the standard counterweight configuration mid-shift for subsequent lifts. The standard counterweight section shows 22,600 lbs at 35 feet. The operator plans a lift at 34 feet with a total suspended weight of 25,400 lbs after switching counterweights. Using the conservative approach with the standard counterweight section, is the lift within capacity?

A. Nothing — the conservative approach using the 35-foot standard counterweight value (22,600 lbs) governs for the 34-foot operating radius; 25,400 lbs exceeds 22,600 lbs — the lift cannot proceed in the standard counterweight configuration at 34 feet

B. Conservative capacity at 35 ft standard counterweight = 22,600 lbs; 25,400 lbs is within capacity using the previous maximum counterweight values

C. Nothing — the maximum counterweight section's 28,400-lb value at 35 feet can be used since the crane was confirmed in that configuration earlier in the shift

D. The standard counterweight capacity requires confirmation at 30 feet rather than 35 feet for the conservative approach

76. A crane load chart shows a note: "DO NOT OPERATE WITH THE BOOM ABOVE THE MAXIMUM ANGLE SHOWN IN THE WORKING AREA DIAGRAM." The working area diagram shows 78 degrees as the maximum boom angle for the 100-foot boom at any operating radius. The operator is performing a lift and the boom is at 80 degrees — 2 degrees above the maximum. What must the operator do?

A. The maximum boom angle limit at 78 degrees is a binding load chart condition — operating at 80 degrees places the crane in an unrated configuration; the operator must boom down to 78 degrees or below before any lifting operations continue; this limit exists because the boom's structural and stability analysis for the load chart was performed within the 78-degree maximum; exceeding it means operating outside the analyzed envelope

B. Nothing — 80 degrees is only 2 degrees above the maximum and is within field measurement tolerance

C. Reduce the planned lift load by 2% per degree above the maximum — at 2 degrees over, reduce load by 4%

D. Contact the lift director for authorization to operate at 80 degrees since the deviation is minor

77. A crane load chart shows: 80-foot boom, full outrigger extension, all-directions section: 30 ft = 34,200 lbs; 35 ft = 27,000 lbs; 40 ft = 21,200 lbs. A planned lift at 36 feet uses linear interpolation. What is the interpolated capacity and the resulting lift percentage if the total suspended weight is 24,000 lbs?

A. Interpolated capacity at 36 ft = 27,000 − [(1/5) × (27,000 − 21,200)] = 27,000 − 1,160 = 25,840 lbs; lift percentage = 24,000 ÷ 25,840 × 100 = 92.9%

B. Interpolated capacity at 36 ft: drop per foot 35–40 ft = (27,000 − 21,200) ÷ 5 = 1,160 lbs/ft; at 36 ft (1 ft beyond 35 ft): 27,000 − 1,160 = 25,840 lbs; lift percentage = 24,000 ÷ 25,840 × 100 = 92.9% — the lift is within the interpolated capacity; however, the conservative approach at 40 ft (21,200 lbs) would not support 24,000 lbs

C. Interpolated capacity at 36 ft = (27,000 + 21,200) ÷ 2 = 24,100 lbs; 24,000 lbs is within this midpoint estimate

D. Interpolated capacity at 36 ft = 27,000 − (2 × 1,160) = 24,680 lbs using the 2-foot interpolation factor

78. A crane load chart section note reads: "Capacities in this section are based on a maximum hook block weight of 2,400 lbs. If using a hook block heavier than 2,400 lbs, deduct the weight excess from all capacity values in this section." The operator is using a 3,600-lb hook block — 1,200 lbs heavier than the section's basis. The tabulated capacity at the planned configuration is 31,200 lbs. What is the applicable gross capacity?

A. Nothing — the note means the hook block weight is pre-deducted from the tabulated values; the 3,600-lb block changes the net payload calculation but not the gross capacity value

B. Applicable gross capacity = 31,200 − 1,200 = 30,000 lbs; the note requires deducting the weight excess (3,600 − 2,400 = 1,200 lbs) from the tabulated capacity; this note adjusts the gross capacity itself — not just the net payload — to account for the heavier block's structural effect on the crane at this configuration

C. Applicable gross capacity = 31,200 lbs; simply add the 3,600-lb block weight to the total rigging deductions

D. Applicable gross capacity = 31,200 + 1,200 = 32,400 lbs — the heavier block increases counterweighting at the boom tip and allows higher capacity

79. A crane load chart for the on-outrigger full extension section shows: 100-ft boom at 20 ft = 52,400 lbs; 25 ft = 41,600 lbs; 30 ft = 32,800 lbs; 35 ft = 25,600 lbs. The rate of capacity decrease per foot: 20–25 ft = 2,160 lbs/ft; 25–30 ft = 1,760 lbs/ft; 30–35 ft = 1,440 lbs/ft. The decreasing rate indicates the capacity curve is concave upward. A lift at 27 feet uses linear interpolation between 25 and 30 feet.

What is the interpolated capacity and what does the concave upward shape mean for the interpolated value's accuracy?

A. Nothing — linear interpolation is exact for all crane capacity curves regardless of concavity

B. The rate of decrease only affects calculations near the maximum rated radius

C. Interpolated capacity at 27 ft = 41,600 − (2 × 1,760) = 41,600 − 3,520 = 38,080 lbs; the concave upward shape means the actual capacity curve lies above the straight line between the two tabulated points; linear interpolation on a concave upward curve gives a result that is slightly below the actual curve value — making linear interpolation slightly conservative at this range; the true capacity at 27 feet is actually slightly higher than the interpolated 38,080 lbs

D. Interpolated capacity = 41,600 − 2 × 1,760 = 38,080 lbs; the concavity means the interpolated value overstates the actual capacity — it is non-conservative

80. A crane load chart shows a section titled "ON OUTRIGGERS — FULL EXTENSION — OVER FRONT (0° TO 30° EACH SIDE)" with a capacity of 42,600 lbs at 30 feet. The same crane's "ALL DIRECTIONS — 360°" section shows 34,200 lbs at 30 feet. A planned lift requires the boom to start at 15 degrees left of front center (within the over-front sector) and swing to 45 degrees left of front center (outside the over-front sector). What capacity governs the lift plan?

A. The over-front section's 42,600-lb capacity governs since the lift begins within the over-front sector

B. Nothing — the all-directions capacity (34,200 lbs) governs since the load must travel through and be set outside the over-front sector; using the over-front capacity for a lift that must swing into the all-directions zone would allow a load above the all-directions capacity to be carried through a zone where the lower capacity applies; the all-directions section governs for the portion of the swing outside the over-front sector, and this lower value governs the entire lift plan

C. Average the two section capacities for a lift that spans both sectors

D. The operator may use the over-front capacity for the pick and the all-directions capacity for the set — each phase uses the applicable section

81. A crane load chart shows that the maximum counterweight configuration provides 48% more capacity than the standard counterweight at 25 feet of radius. Both are stability-limited at 25 feet. The operator's planned lift at 25 feet requires a total suspended weight of 38,400 lbs. The standard counterweight capacity is 26,000 lbs and the maximum counterweight capacity is 38,400 lbs. The crane has maximum counterweight installed. What is the lift percentage and what classification applies?

A. Nothing — 38,400 ÷ 38,400 = 100%; the lift is at exactly 100% of rated capacity; no critical lift plan is needed since the LMI will alarm before 100% is reached

B. Nothing — the lift is within maximum counterweight rated capacity; the lift percentage is 100% and the crane may not be used for this lift since 100% exactly equals rated capacity

C. Nothing — the operator should reduce the load by at least 5% to provide margin before proceeding

D. Lift percentage = 38,400 ÷ 38,400 × 100 = 100%; a lift at exactly 100% of rated capacity is not authorized under any condition — the rated capacity is the maximum and the load must be below it; the operator must either reduce the total suspended weight or use a crane or configuration with higher capacity; a lift at exactly 100% leaves zero margin for any dynamic loading, measurement error, or configuration deviation

82. A crane load chart shows the "ON OUTRIGGERS — 75% EXTENSION" section: 80-ft boom at 25 ft = 24,800 lbs; 30 ft = 19,600 lbs; 35 ft = 15,400 lbs. A planned lift at 28 feet of radius has a total suspended weight of 20,600 lbs. Using the conservative approach, what capacity governs and does the lift proceed?

A. Nothing — interpolated capacity at 28 ft = 21,920 lbs; 20,600 lbs is within capacity using the interpolated approach

B. Conservative capacity at 30 ft = 19,600 lbs; total suspended weight (20,600 lbs) exceeds 19,600 lbs — the lift cannot proceed in the 75% extension configuration; the crane must be reconfigured to full extension to access higher capacity at 28 feet

C. Conservative capacity at 25 ft = 24,800 lbs; 20,600 lbs is within capacity — use the smaller tabulated entry

D. Conservative capacity at 35 ft = 15,400 lbs; use the most conservative available tabulated value for all non-tabulated radii

83. A crane load chart section note states: "All capacities in this section require the crane to be level within 0.5% in all directions simultaneously." The operator's inclinometer shows 0.3% fore-aft and 0.35% lateral simultaneously. What is the combined resultant out-of-level and does the crane satisfy the note?

A. Nothing — both individual axis readings are within the 0.5% limit independently; the note is satisfied

B. Nothing — the 0.5% limit applies to the average of both axes: (0.3 + 0.35) ÷ 2 = 0.325%; well within 0.5%

C. Combined resultant = $\sqrt{(0.3^2 + 0.35^2)} = \sqrt{(0.09 + 0.1225)} = \sqrt{0.2125} = 0.461\%$; the combined resultant is within the 0.5% note requirement; the crane satisfies the note's simultaneous level condition

D. Combined resultant = $\sqrt{(0.3^2 + 0.35^2)} = 0.461\%$; this exceeds the 0.5% limit — the crane must be re-leveled

84. A crane's load chart shows: "TELESCOPING BOOM — BOOM AT 80 TO 100 FT — ON OUTRIGGERS — FULL EXTENSION." The capacity at 40 feet with a 100-foot boom is 22,400 lbs. The crane's boom is currently at 90 feet — within the section's range. The operator updates the LMI to show 90 feet. The LMI shows 84% capacity with a total suspended weight of 18,816 lbs. What is the potential issue with this LMI reading?

A. Nothing — the LMI at 90 feet confirms the lift is within capacity; 84% is below the critical lift threshold

B. Nothing — the LMI correctly uses the 90-foot configuration within the section's range

C. Nothing — 84% is within rated capacity; the LMI reading confirms the lift is safe

D. The LMI may be interpolating between the section's minimum and maximum boom lengths to calculate capacity — the section covers 80 to 100 feet, but capacity values may only be tabulated at specific increments; at 90 feet, the LMI needs a 90-foot capacity value; if the LMI is using the 100-foot column (the longest in the section), it is calculating against a more conservative capacity; if it is interpolating or using a different column, the displayed percentage may not accurately reflect the actual capacity at 90 feet; the operator must confirm which column the LMI is using for its calculation

85. A crane load chart shows: "Maximum rated radius for 100-ft boom = 55 ft." A lift plan was confirmed for a pick at 50 feet and a set at 53 feet. During the swing, the load is laterally displaced 4 feet by a wind gust, creating an instantaneous effective radius of 57 feet — 2 feet beyond the maximum rated radius. What is the compliance status?

A. Nothing — a 2-foot wind displacement is within the normal operating tolerance for outdoor crane operations

B. Continue the lift since the 57-foot radius is temporary and the rated maximum applies to sustained operating radii

C. Nothing — the LMI will alarm if the effective radius exceeds the maximum rated radius

D. The load has entered the unrated operating envelope — at 57 feet, there is no rated capacity; the operator must immediately slow the swing and allow the load to return to within the 55-foot maximum rated radius before any further movement; this wind displacement also confirms that wind management (tag lines, reduced operating radius margin) is required for this lift to prevent future radius exceedances

86. A crane load chart shows the following for the 100-foot boom at full outrigger extension, all-directions, maximum counterweight section: 25 ft = 48,400 lbs; 30 ft = 38,200 lbs; 35 ft = 29,800 lbs. A critical lift at 32 feet of radius will use linear interpolation. The total suspended weight is 33,400 lbs. What is the interpolated capacity at 32 feet?

A. Nothing — the conservative approach must be used for critical lifts — interpolation is not permitted for critical lifts above 90% of rated capacity

B. Interpolated capacity at 32 ft = 38,200 − [(2/5) × (38,200 − 29,800)] = 38,200 − (0.4 × 8,400) = 38,200 − 3,360 = 34,840 lbs; lift percentage = 33,400 ÷ 34,840 × 100 = 95.9% — within capacity using interpolation

C. Interpolated capacity at 32 ft = 34,840 lbs; 33,400 lbs is within this value; the lift proceeds using the interpolated capacity but requires a critical lift plan and pre-lift meeting since 95.9% exceeds the 75% threshold; the operator should also note the conservative capacity at 35 ft is only 29,800 lbs, which does not support the 33,400-lb load

D. Interpolated capacity at 32 ft = 34,840 lbs; 33,400 lbs is within capacity; no critical lift plan is needed for interpolated capacity calculations

87. A crane's load chart for a 100-foot boom at full outrigger extension shows: 40 ft = 22,600 lbs; 45 ft = 17,800 lbs; 50 ft = blank. A critical lift requires a pick at 43 feet and a set at 46 feet. The blank at 50 feet confirms the maximum rated radius is 45 feet. Using the conservative approach at each position, what are the governing capacities?

A. Nothing — both pick and set are within the 45-foot maximum rated radius; conservative capacity at 45 ft = 17,800 lbs governs both positions

B. Nothing — conservative at pick (43 ft): capacity at 45 ft = 17,800 lbs; conservative at set (46 ft): 46 ft exceeds the maximum rated radius of 45 ft — the set position is outside the rated envelope; the lift cannot proceed to the planned set location

C. Conservative at pick (43 ft) = 17,800 lbs; conservative at set (46 ft) = 17,800 lbs — both positions use the 45-ft value since it is the last available tabulated entry

D. Conservative at pick = 22,600 lbs at 40 ft; conservative at set = 17,800 lbs at 45 ft; the 17,800-lb value governs the overall lift plan

88. A crane load chart note reads: "The following capacities do not include the dynamic effects of hoisting. When hoisting above 150 fpm, add a 10% dynamic load factor to the total suspended weight before comparing to the tabulated gross capacity." The planned hoist speed is 200 fpm and the actual total suspended weight is 24,000 lbs. What is the effective total suspended weight for capacity comparison?

A. Effective total suspended weight = 24,000 × 1.10 = 26,400 lbs — the 10% dynamic load factor is added to the actual total suspended weight to create the effective weight for comparison to the tabulated gross capacity; at 200 fpm (above the 150 fpm threshold), the dynamic effects add 2,400 lbs to the comparison weight; the gross capacity must exceed 26,400 lbs, not just 24,000 lbs, for the lift to be within rated capacity

B. Nothing — 200 fpm is the maximum hoist speed so no dynamic factor applies

C. Effective weight = 24,000 + (24,000 × 0.10) = 26,400 lbs; no special conditions apply since this is standard dynamic load accounting

D. The 10% factor applies to the gross capacity, not the total suspended weight — reduce the gross capacity by 10% and compare to the actual weight

89. A crane load chart contains a note: "These capacities are based on the standard 6-strand, 6×19 wire rope specified in the crane's Parts Manual. The use of any other rope construction requires manufacturer's authorization." The crane's load line was recently replaced with 6×36 wire rope of the same diameter and grade. Does this note affect operations?

A. Nothing — same diameter and grade confirms the rope is equivalent and no authorization is needed

B. The 6×36 construction has higher flexibility than 6×19 and is always a superior substitution

C. Nothing — rope construction differences only affect the sheave groove compatibility, not the load chart's applicability

D. The note requires manufacturer authorization for any rope construction other than the specified 6×19 — the 6×36 rope has different bending fatigue characteristics, different fleet angle performance, and different contact behavior with sheave grooves than the 6×19; without the manufacturer's written authorization, these capacity values cannot be confirmed as applicable to the 6×36 rope installation; the manufacturer must be consulted before operations rely on these capacity values

90. A crane load chart shows that both the 80-foot and 100-foot boom sections show identical capacity values at 30 feet of radius — both show 32,400 lbs. Both cells are shaded gray (structural-limited). The crane is configured with the 80-foot boom. What does the identical structural-limited value at two different boom lengths confirm?

A. The identical values confirm a printing error — boom length always affects capacity

B. The identical structural-limited values at two different boom lengths confirm that the same structural component governs the capacity at this configuration for both boom lengths — when structural limits govern, the capacity is set by the weakest structural element in the load path (such as the slewing ring, boom foot pins, or rotating bed structure) rather than by boom geometry or stability; the component that limits capacity at 30 feet with the 80-foot boom happens to produce the same limit as with the 100-foot boom; adding boom length did not change the governing structural component at this configuration

C. The identical values mean the operator may use either boom length section without any performance difference

D. The identical values indicate both boom lengths have the same stability profile at 30 feet — this is expected for stability-limited cells

91. A crane load chart shows: "FOR CRITICAL LIFTS ABOVE 90% OF GROSS CAPACITY IN THIS SECTION, A SECOND INDEPENDENT LOAD CHART REVIEW BY A QUALIFIED PERSON IS REQUIRED BEFORE LIFTING BEGINS." A planned lift is at 93% of gross capacity. Only one qualified person — the lift director — is available on site. What are the operator's options?

A. Nothing — the lift director's review satisfies the independent review requirement since they are the designated responsible person

B. Nothing — independent reviews are only required when two lift directors are on site

C. The operator and lift director's combined review satisfies the two-review requirement since both parties review the chart

D. The note requires two independent reviews — "second independent" means a second qualified person, separate from the lift director, must review the load chart for this lift; with only one qualified person available, the lift cannot proceed until a second qualified person is brought to the site, or the load must be reduced to below 90% of gross capacity so the note's threshold is not triggered; there are no other compliant options

92. A crane's load chart for the on-outrigger full extension section shows: 100-foot boom at 35 ft = 27,800 lbs and at 40 ft = 21,600 lbs. The total suspended weight for a planned lift is 25,200 lbs. Using the conservative approach, the governing capacity at 40 feet is 21,600 lbs. Since 25,200 lbs exceeds 21,600 lbs, the conservative approach does not support the lift at any radius between 35 and 40 feet. The operator considers repositioning the crane 2 feet closer to reduce the operating radius to 33 feet. Using the conservative approach at 33 feet, what capacity governs?

A. Conservative capacity at 33 feet = 27,800 lbs at 35 ft (next larger tabulated radius); 25,200 lbs is within 27,800 lbs — repositioning the crane to 33 feet allows the lift to proceed using the conservative approach

B. Nothing — 33 feet is also between tabulated values; the conservative approach at 33 feet still uses 40 feet = 21,600 lbs

C. Conservative capacity at 33 feet = 27,800 lbs; 25,200 lbs exceeds capacity — the lift still cannot proceed

D. The conservative approach at 33 feet uses the 35-foot tabulated entry since 33 feet is closer to 35 feet than 40 feet

93. A crane load chart shows: "STANDARD COUNTERWEIGHT — ON OUTRIGGERS — 100% EXTENSION — 100-FT BOOM" with a capacity of 24,800 lbs at 40 feet. The operator is using maximum counterweight instead of standard. The maximum counterweight section shows 31,200 lbs at the same configuration and radius. The operator plans a lift at 39 feet with a total suspended weight of 28,000 lbs. The crane has maximum counterweight installed. Which section applies and does the lift proceed?

A. Nothing — the standard counterweight section applies since it is more conservative and always safer to use

B. Nothing — the standard counterweight section cannot be used for maximum counterweight operations since it understates the available capacity but the incorrect section must still match the physical configuration

C. Nothing — the operator should always use the section that shows lower capacity for additional safety margin

D. The maximum counterweight section must be used since that is the physical configuration of the crane — using the standard counterweight section for a maximum counterweight crane applies capacity values from a different structural and stability configuration; with maximum counterweight installed: conservative capacity at 40 ft = 31,200 lbs; 28,000 lbs is within this capacity; the lift proceeds using the maximum counterweight section with the 40-foot conservative value governing the 39-foot operating radius

94. A crane load chart for the luffing jib section shows: 50-ft jib at 20° offset, 150-ft main boom: 25 ft = 18,400 lbs; 30 ft = 14,600 lbs; 35 ft = 11,400 lbs. The capacity increases as jib angle decreases (smaller angle = greater radius = lower capacity in this section). Wait — the capacity decreases with increasing radius. The planned jib angle produces a 28-foot operating radius. Using the conservative approach for a standard load chart, what capacity governs?

A. Nothing — the conservative approach for any non-tabulated operating radius is to use the capacity at the next smaller tabulated radius, which is more conservative

B. Conservative capacity at 30 ft = 14,600 lbs; the 30-foot value is the next larger tabulated radius beyond 28 feet; 14,600 lbs governs conservatively

C. Interpolated capacity at 28 ft = 16,040 lbs — use the interpolated value for maximum accuracy

D. Conservative capacity at 25 ft = 18,400 lbs — use the prior smaller tabulated radius for a conservative approach

95. A crane load chart for the on-outrigger full extension section with a 100-foot boom shows the following maximum counterweight values: 20 ft = 58,400 lbs; 25 ft = 46,800 lbs; 30 ft = 37,000 lbs; 35 ft = 28,800 lbs. All cells are stability-limited. A planned critical lift at 22 feet has a total suspended weight of 54,000 lbs. Using the conservative approach, does the lift proceed, and what is the governing lift percentage?

A. Nothing — conservative capacity at 25 ft = 46,800 lbs; 54,000 lbs exceeds 46,800 lbs — the lift cannot proceed using the conservative approach in this configuration

B. Nothing — conservative capacity at 25 ft = 46,800 lbs; the lift exceeds conservative capacity; reduce the load or reposition to 20 feet or less

C. Conservative capacity at 25 ft = 46,800 lbs; 54,000 lbs exceeds 46,800 lbs; lift percentage = 54,000 ÷ 46,800 = 115.4% — the lift cannot proceed using the conservative approach; the operator must either reduce the total suspended weight to below 46,800 lbs, or reposition the crane to bring the operating radius to 20 feet or less where the 58,400-lb conservative capacity directly supports the load

D. Conservative capacity at 20 ft = 58,400 lbs; 54,000 lbs is within capacity — the crane must be repositioned to 20 feet before proceeding.

Core Exam 12 Answer Key and Full Explanations

1. D — Bearing pressure = 96,000 ÷ 2.5 = 38,400 psf — approximately 96 times the 400 psf design loading. The T-beam floor system was designed for distributed maintenance vehicle loads, not concentrated point loads. A structural engineer must evaluate both the slab's punching shear resistance and the T-beam's span loading capacity for the specific outrigger loads before any crane setup on this elevated floor system.

2. B — Efflorescence at a construction joint indicates water is actively migrating through the joint under pressure. Construction joints are inherent planes of weakness in concrete where the bond between pours is weaker than monolithic concrete. Water migrating through the joint under an outrigger load may indicate the joint is experiencing hydrostatic pressure from a compromised subbase, and the subbase integrity must be confirmed before loading.

3. C — OSHA 1926.1402 explicitly places the initial obligation for identifying and communicating underground utility locations on the controlling entity — they control the site and have access to site records and utility maps. If the controlling entity does not have utility information, they bear the obligation to obtain it before crane operations begin. The crane employer cannot safely design outrigger positions without this information.

4. A — A concave depression without cracking in a previously-level concrete slab indicates the subbase beneath the slab has settled or been eroded, creating a void that the slab is now spanning. The slab's structural rigidity is bridging the void without cracking, but the slab is no longer supported across its full area. Concentrated crane outrigger loading on a slab spanning a void can cause sudden punching shear failure at loads far below the slab's rated capacity.

5. D — A loaded 68,000-lb pump truck parked 6 feet from an outrigger mat adds surcharge pressure to the soil in the shared bearing zone between the truck and the outrigger. This surcharge combines with the crane's outrigger load to increase the total stress in the soil at the outrigger position. In soil already loaded near its capacity by the outrigger, the truck's surcharge can push total loading beyond the soil's shear strength threshold.

6. B — OSHA 1926.1408(b) establishes a decision sequence that must be followed before crane operations near power lines: first determine whether de-energization is feasible, and if not, confirm the voltage and establish the applicable MSAD. These determinations must precede any crane movement near the line. Without knowing the voltage, the MSAD cannot be calculated, and without the MSAD, no safe operating boundary exists.

7. C — Unrecorded fill placed 60 years ago may contain organic materials, demolition debris, construction waste, or poorly-graded soils with highly variable bearing capacity. Without compaction records, no documented bearing capacity exists — the bearing capacity is entirely unknown. Historic fill was frequently placed with no engineering oversight, meaning the material composition and density can vary dramatically within short distances, creating unpredictable support conditions for crane outrigger loading.

8. A — Tension cracks forming parallel to a retaining wall behind the wall crest indicate the soil mass is beginning to separate from the zone of passive resistance. This is the first visible surface evidence of developing slope or wall failure. The cracks form as the soil mass behind the wall begins to slide or rotate. Adding crane outrigger surcharge to a soil mass that is already showing tension cracking accelerates the failure mechanism.

9. D — Lightning within 3 miles is within the commonly recognized operational boundary for ceasing outdoor crane operations. A crane boom is typically the highest metallic structure at a construction site and provides an excellent conductive path to ground. Both direct strikes and ground current from nearby strikes create lethal conditions for crane operators and nearby personnel. The load must reach the ground and all personnel must reach shelter before lightning reaches the site.

10. B — Ground conditions vary across a construction project — soil types, underground utilities, and subsurface structures can be completely different from one setup location to another on the same project. A confirmation performed at Location A provides no information about Location B's conditions. OSHA 1926.1402 requires ground condition confirmation at each specific setup location before operations begin at that location.

11. C — Recently placed backfill without compaction verification has unknown and potentially zero effective bearing capacity. The mounded surface appearance confirms the fill has not been compacted — it still shows the profile of freshly dumped material. Uncompacted fill can have bearing capacity as low as 500 psf or less, compared to the thousands of psf required for crane outrigger loading. Only current testing by a geotechnical professional can confirm whether the fill is adequate.

12. A — A rising water table from failed dewatering saturates the soil from below. As the water table rises from the excavation toward the crane's outrigger positions, the effective stress in the soil decreases — the buoyancy force from water in the pore spaces reduces the friction between soil particles. This directly reduces shear strength and bearing capacity. Operations at 25 feet from the rising water can be affected within the timeframe of continued dewatering failure.

13. D — Historic masonry rubble fill was placed without structural intent and without compaction. The irregular geometry of stone and brick pieces creates an inherently void-rich, non-uniform mass. Under concentrated crane outrigger loads, the rubble pieces can shift and reorganize, collapsing internal voids and causing sudden and significant settlement. The bearing capacity of rubble fill is highly variable and cannot be assessed without geotechnical investigation.

14. B — Wet concrete pooling adjacent to the outrigger mat introduces both water and significant mass to the soil at the mat boundary. The bleed water from fresh concrete migrates into the adjacent soil, temporarily saturating it. The concrete mass itself applies additional surcharge to the soil bearing zone. The combination of water infiltration and surcharge from the pooling concrete can reduce the bearing capacity at the outrigger position below the assessed value.

15. C — Bearing pressure = 74,000 ÷ 4 = 18,500 psf — 62 times the 300 psf cargo design loading. Cargo loading is distributed across the pier deck surface — crane outrigger loading is a concentrated point load. These are fundamentally different structural loading conditions. Forty-five years of service under cargo loads confirms only that the pier survived cargo loading, not that it can resist concentrated point loads that exceed the design loading by a factor of 62.

16. A — OSHA 1926.1402 creates both an initial ground documentation obligation and an ongoing notification obligation for the controlling entity. When weather events change ground conditions after the initial documentation was provided, the controlling entity must communicate those changes to the crane employer. The crane employer cannot safely proceed based on conditions that no longer exist — weather events such as significant rainfall, flooding, or freeze-thaw can dramatically change bearing capacity.

17. D — A broken stormwater pipe actively discharging at 40 feet creates a rapidly expanding zone of saturation that moves laterally through the soil by infiltration. Sandy or silty soils can transmit water tens of feet in minutes. What is a non-threatening condition at 40 feet can become a bearing capacity failure condition at the outrigger positions within a short period of continued flow. The dynamic nature of the ongoing discharge requires stopping operations immediately, not monitoring.

18. B — Two months of sustained heavy material staging creates differential compression and consolidation in the soil beneath the staged area compared to the surrounding unstaged soil. Removing the staging materials does not immediately restore the soil to its pre-loading condition. Additionally, the formerly-staged area may retain moisture from rainfall during the staging period. The bearing capacity in this zone may differ from both the original conditions and the surrounding unloaded soil.

19. C — OSHA 1926.1416 requires a pre-shift inspection before operations each day. After 14 days of idle time, the pre-shift inspection is more important, not less — conditions that develop during extended idle periods include hydraulic fluid settling or contamination, rope corrosion at contact points, bearing corrosion, and potential vermin nesting in critical areas. The pre-shift inspection protocol covers these items and must be completed before the first lift regardless of idle duration.

20. A — Road dust suppression water applied heavily to an adjacent road creates runoff that flows toward the crane's setup area. When this water reaches the outrigger bearing zone, it infiltrates the soil, reducing effective stress and bearing capacity. The original ground condition assessment was performed on dry or non-flooded soil — the condition after water infiltration may be dramatically different. Operations must stop and the source must be controlled before bearing conditions can be re-evaluated.

21. C — Road marking paint creates a smooth, low-friction interface between the mat and the underlying surface. The crane's outrigger applies both vertical bearing load and horizontal force components. The horizontal force component must be resisted by friction between the mat and the surface. A painted surface has a significantly lower friction coefficient than unpainted concrete or asphalt, reducing the mat's resistance to lateral sliding under the outrigger's horizontal force.

22. B — OSHA 1926.1416 requires operators to document and communicate unusual equipment conditions. An unusual sound that occurred once may indicate a developing condition that has not yet progressed to severity — bearings beginning to fail, rope contacts, and structural connections loosening can all produce intermittent sounds before continuous symptoms appear. The incoming operator needs this information to make an informed pre-shift inspection decision.

23. C — The manufacturer's maximum recommended speed for a specific configuration is the upper operational limit established during the crane's engineering and load chart development. Exceeding it creates dynamic hoist loads that were not included in the capacity analysis. The operator is already at the maximum — there is no authorized increment above it. Schedule requirements cannot override manufacturer-established operational limits.

24. A — A jumped sheave means the rope is running on the sheave flange — a non-designed contact surface that provides inadequate support and creates lateral rope bending. The rope can disengage completely from the flange if the flange is worn or if the load swings laterally. A complete rope departure from the sheave during a loaded lift would cause sudden uncontrolled load descent. The load must reach the ground before the rope can be safely re-reeved.

25. D — OSHA 1926.1416(e) requires the load chart to be legible — the operator must be able to read all applicable sections. A damaged chart with missing sections, torn pages, or illegible tables does not allow the operator to verify capacity, section notes, or configuration requirements. Replacing a damaged chart before operations begin is the only way to satisfy the requirement. Estimated or memorized values from a damaged chart are not acceptable substitutes.

26. B — OSHA 1926.1419 requires active communication between the operator and signal person throughout all phases of operations. A 90-second absence ends the active signal communication link. Resuming movement without re-establishing confirmed communication means operating without guidance — the operator cannot know whether conditions have changed, whether the set location is still valid, or whether the area is still clear. Eye contact and a clear signal must be re-established before any movement.

27. B — The operator has independent responsibility to not execute a hoist when visible rigging hazards exist. A weld seam under a sling acts as an edge that can cut through sling web material or cause concentrated wire breaks in rope slings as the load is applied. The operator observing this condition must alert the signal person and ensure the rigging is inspected and edge protection applied before the HOIST is executed. The operator cannot be compelled to hoist when a visible rigging hazard exists.

28. D — OSHA 1926.1431 requires the operator to remain at the crane's controls throughout all phases of personnel hoisting with no exceptions. The operator is the sole person who can respond immediately to any sudden change in crane condition — hydraulic temperature change, unexpected crane movement, or load line anomaly — during the time personnel are suspended. There is no authorized absence from the controls for any reason while personnel are in the air.

29. D — Increasing oscillation amplitude during crane swing is the signature of resonance — the energy input from the swing is adding to rather than dampening the pendulum motion. This occurs when the swing frequency coincidentally matches the load's natural pendulum frequency. Resonance-driven amplitude increases are not self-limiting — the amplitude can grow until the load contacts adjacent structures or until dynamic forces exceed rigging capacity. The only safe response is to stop the swing and allow the oscillation to decay.

30. B — A boom that deflects more under the same load as earlier in the shift indicates the boom's structural stiffness has decreased — something in the structural system has changed. A failing chord member, a cracked lacing, or a loosened structural connection all reduce the boom's moment of inertia and increase deflection for the same load moment. Progressive structural degradation is the only explanation for increased deflection at unchanged load and temperature.

31. C — A completely garbled, unrecognizable radio message is not a valid signal — it conveys no information the operator can act on safely. Attempting to infer the intended command from the context of the lift sequence creates the risk of executing an incorrect movement. OSHA 1926.1419 requires clear, confirmed communication. All movement must stop until the communication problem is resolved and a complete, clearly understood command is confirmed received.

32. A — A radio failure mid-command means the operator received an incomplete communication — the command may have been a hoist, lower, stop, or emergency, and there is no way to determine which from the fragment received. Continuing the hoist based on the beginning of a command risks continuing a movement that should have been stopped or reversed. All movement must stop and hold until communication is fully restored and a complete command is confirmed.

33. D — The outgoing operator's successful shift confirms the crane performed adequately during that shift under that operator's confirmed setup. The incoming operator has independent responsibility for their own pre-shift inspection, verification of the current crane condition, and confirmation of ground conditions for their shift. The incoming operator's authorization for any lift comes from their own independent verification, not from the previous operator's experience.

34. B — The operator must be able to independently confirm set area clearances — the signal person's visual coverage and the operator's visual coverage are parallel safety functions, not redundant alternates. When lighting prevents the operator from independently confirming clearances, one safety layer has been eliminated. Proceeding on the signal person's guidance alone removes the operator's independent check on hazardous conditions at the placement point.

35. C — Simultaneous boom-down and swing both increase the effective operating radius — boom-down through direct geometry and swing through centrifugal displacement. The two effects are additive. The capacity at the resulting combined effective radius must be confirmed adequate before executing the combined movement. At near-capacity lifts, this combined radius increase may push the effective load moment past the rated capacity.

36. A — A load that tilts 10 degrees during the hoist indicates either a rigging failure (slipping sling, pulling lug, or disengaging hardware) or a CG offset large enough to cause visible rotation under tension. At 10 degrees of tilt, at least one sling leg is carrying significantly more than its planned share. The load must return to the ground for rigging evaluation — continuing the hoist with a tilted load risks complete rigging failure before the load reaches the set location.

37. B — OSHA 1926.1427 requires current, valid certification for the specific crane type being operated. The standard provides no grace period or employment exception for expired certifications. Continuous employment means the operator has been performing work, not that their certification exemption continues. Until recertification is obtained and the certification is current and valid, the operator is not authorized to perform crane operations under this standard.

38. B — For a critical lift at 90% of rated capacity, the lift director's presence and active coordination at the lift area is a core element of the critical lift plan. The lift director's role is to coordinate all lift participants throughout the operation — stepping away during an active critical lift eliminates this coordination at exactly the moment it is most essential. The crane must hold the load stationary until the lift director returns and actively re-engages in coordinating the lift.

39. C — OSHA 1926.1425 prohibits loads from passing over personnel without exception for building height, floor separation, or visual isolation. Office occupants working below a load path are persons under the load regardless of the physical separation between floors. The building must be evacuated and confirmed empty before the load's swing arc passes over it. Building evacuation is the only compliant response — there is no authorized exception for personnel who cannot see the overhead load.

40. A — Accelerated groove wear concentrated in one section indicates the rope is consistently tracking toward that area — an unresolved fleet angle problem or rope guide issue. The two-week observation without reporting represents a failure to document a known developing condition. Progressive drum groove wear leads to cross-winding, rope crushing, and potential rope overflow. The condition must be formally assessed and documented before the next shift's operations begin.

41. D — A 4,600-lb discrepancy in load weight at 8 feet of height changes the lift from 88% to 96% — an 8-percentage-point increase that invalidates the original lift plan. At 96%, only 4% capacity margin remains for any dynamic loading. The lift director must be informed, the revised capacity percentage must be confirmed adequate at the current configuration and radius, and all affected parameters in the critical lift plan must be re-confirmed before any further movement.

42. B — An unexplained metallic impact from the boom tip during an active hoist indicates a sudden structural event at a critical location. A rope jumping a sheave, a pin pulling from a fitting, or a structural member cracking can all produce this type of sound. Any of these conditions at the boom tip can result in sudden load drop. The consequences are catastrophic — the load must reach the ground and the boom tip must be inspected before any further lifting.

43. C — OSHA 1926.1424 requires the exclusion zone to protect against all crane-related hazards, not just the load path. The rotating upper works — including the counterweight — the load line, the boom, and all pinch points created by crane movements must all be barricaded from unauthorized entry. A zone that protects only against load drop but not counterweight swing or boom fall is inadequate under OSHA's comprehensive requirement.

44. A — A 0.15% level shift during a 2-minute static hold at 91% capacity indicates the soil is continuing to yield under the applied load — it is not simply elastic deflection that occurred during the initial loading. Progressive yielding during a hold means the soil has not reached equilibrium under the load and may continue to consolidate further during the full lift. At 91% capacity, any additional tilt approaching the manufacturer's tolerance requires investigation before proceeding.

45. D — A 15-pound bird at typical flight speed can generate impact forces exceeding 1,000 pounds for a fraction of a second — far more than the bird's static weight. This impact force can crack welds, displace lacing tubes, or fracture structural connections at the point of impact. With the load at 87% of rated capacity, any reduction in boom structural capacity from the impact creates an unknown margin. The boom impact location must be inspected before any further movement.

46. B — A running generator is an ignition source in close proximity to a moving load. If the load contacts the generator or fuel lines during the close-pass lift, fuel or fumes released near the hot exhaust create a fire risk. The generator is also a rigid obstacle that, if struck by the load, can be damaged, knocked over, or cause the load to deflect unpredictably. The generator must be shut down before the load passes within its proximity zone.

47. C — Continuous rotation during hoist progressively twists the sling legs around each other. As legs twist, they bear against each other rather than individually sharing the load, reducing effective capacity. Rotation also creates torsional forces in shackle pins — even locked screw pins can unwind under sustained rotation. A tag line must be rigged to arrest the rotation before the load rises further, and the rigging must be confirmed untwisted before continuing.

48. A — OSHA 1926.1416 requires the operator to verify capacity through the load chart before each lift. The LMI is a supplementary monitoring tool — not the primary capacity verification mechanism. If the LMI is configured for the wrong boom length, wrong counterweight, or wrong reeving, it displays incorrect percentages that do not represent the actual load moment. Load chart verification is always the authoritative capacity confirmation, regardless of what the LMI displays.

49. A — Sustained single-sided polishing across a 24-inch rope section indicates consistent contact with a fixed surface throughout that section's travel. The rope contacts the surface at the same angle on every cycle, progressively removing wire material from only the contact side. Wire cross-section reduction at the contact points reduces the rope's tensile capacity at that location. Both the rope section and the contact surface (drum groove wall, sheave flange, or structural edge) must be investigated.

50. B — ASME B30.9 specifies a 4:1 design factor for Grade 80 alloy steel chain slings — the minimum breaking force is at least four times the Working Load Limit. This design factor is lower than wire rope slings' 5:1 factor, reflecting Grade 80 chain's different failure characteristics — alloy chain fails progressively with visible elongation rather than the sudden wire-by-wire failure mode of rope, which justifies the slightly lower design factor.

51. B — A hoist motor supply hose carries high-pressure hydraulic fluid — typically 2,000–5,000 psi. With 50% outer cover wear at a contact point, the high-pressure wire braid reinforcement beneath the cover is now exposed to direct abrasion. Once the braid is abraded through, the inner tube fails and releases pressurized fluid at high velocity — creating hydraulic injection injury risk and fire hazard from fluid contacting hot engine surfaces. The hose must be replaced before any further operations.

52. A — The boom foot pin lug is the primary structural connection between the boom's lower chord and the rotating bed — it transmits all boom-generated loads to the crane's upper works. A crack in this connection represents a structural failure at the most critically loaded point of the boom attachment. High-strength steel connections fail by crack propagation — a crack that appears stable can advance to complete fracture under the next loading cycle. Zero tolerance applies to cracks in primary structural connections.

53. D — A collapsed fiber core that allows outer strands to spread to the point of core visibility indicates the rope's internal support structure has failed. The core prevents strand-to-strand contact — when the core collapses, adjacent strands rest directly on each other, creating crushing forces at the contact points on every load cycle. The effective cross-section carrying load is reduced and the load distribution among strands becomes unpredictable. The rope must be removed regardless of the absence of external wire breaks.

54. C — An 8-degree hook twist indicates the hook has experienced torsional loading — angular rigging, lateral pulls, or load rotation have imposed twisting forces. At 8 degrees, the hook is at 80% of the 10-degree removal threshold. Documenting the current measurement and increasing inspection frequency is appropriate because hooks that have experienced one torsional event may be more susceptible to additional twisting under similar loading conditions. The close proximity to the removal threshold requires vigilance.

55. C — The choker hitch creates a progressive tightening mechanism — as load increases, the sling tightens around the attachment point with increasing force. On a sharp edge, this increasing force creates a cutting action perpendicular to the edge. The round sling's fibers are concentrated in a core bundle, and a sharp edge pressing into that bundle with increasing force can cut through the protective cover and into the load-bearing core. Edge protection between the sharp edge and the sling is required before any lift.

56. D — When a brake arrests a falling load, the dynamic arrest force can be many times the load's static weight. This impulse force propagates through the rope as a shock wave that can cause internal wire damage, strand rearrangement, and core compression that are not visible externally. ASME B30.5 requires inspection before further use because visual examination of the external surface cannot confirm the rope's internal condition after a shock loading event.

57. C — The ATB must be confirmed functional before operations begin each day. ATB cables can be physically damaged, weights can be lost, and electrical switch contacts can corrode between inspection intervals. An 8-month-old test result confirms only that the ATB worked 8 months ago — it cannot confirm today's function. The daily pre-shift test by lifting the ATB weight by hand to confirm hoist interruption is a simple, quick verification that confirms current function.

58. B — Equal-sized sheaves on the same hook block, reeved with the same rope, should rotate at the same speed because the rope travels the same distance over each sheave per unit time. When one sheave turns at twice the speed of the other, the rope is not loading them equally — the rope may be crossed between sheaves, one groove may be damaged, or the pin may be misaligned. Unequal sheave loading creates uneven rope wear and can cause the rope to migrate off a sheave under load.

59. C — The increase from 0.038 to 0.052 inches represents 0.014 inches of additional wear in one year — a 37% increase in total measured deflection. At this wear rate, the 0.060-inch limit would be reached in approximately one additional year from the current measurement. This wear rate is significant and warrants more frequent measurement than annual to detect any acceleration in the wear rate before the specification limit is reached during operations.

60. D — The RCI provides real-time load moment monitoring as a supplementary aid. It is not the primary safety device and cannot substitute for pre-lift load chart verification. When the RCI configuration does not match the actual crane configuration — wrong boom length, wrong counterweight, wrong reeving — its readings are mathematically derived from incorrect inputs and are meaningless regardless of the percentage displayed. The load chart remains the authoritative capacity reference.

61. B — A rhythmic rope displacement that occurs on every sixth drum revolution indicates the drum has a localized anomaly at a specific circumferential position — a deformed groove, a damaged edge, or an out-of-round condition that the rope rides over once per revolution. This creates a repetitive fatigue point in the rope at the exact wire location that contacts the anomaly on every revolution. The fatigue accumulates rapidly at the specific rope location corresponding to the drum's defective position.

62. C — ASME B30.9 specifies removal for wire rope slings when 10 or more broken wires are found in one lay length, OR when 5 or more broken wires are found in one strand within one lay length. Three broken wires in the same strand within 2 inches approaches but does not meet either the 10-wire-per-lay or 5-in-one-strand criterion. However, the concentration in one strand indicates localized fatigue that can progress rapidly — documenting the distribution and monitoring closely is appropriate, but if any ambiguity exists about the applicable criterion, removal is the conservative choice.

63. C — The manufacturer's 5% maximum section loss is the boundary within which the crane's rated capacity applies. At 7% section loss, the chord's structural capacity is below the manufacturer's minimum standard for the rated capacity to remain valid. The structural analysis underlying the load chart assumed section loss within the 5% limit. Operating above this threshold with the full rated capacity applies loads that the degraded chord may not safely carry.

64. A — Tension per leg in a 4-leg bridle at 45 degrees from horizontal = (total load ÷ legs) × (1 ÷ sin angle) = (36,000 ÷ 4) × (1 ÷ sin 45°) = 9,000 × 1.414 = 12,726 lbs. Since 12,726 lbs exceeds the 12,000-lb WLL, each leg is overloaded. The sling angle must be increased to reduce the tension per leg below 12,000 lbs, or higher-capacity slings must be selected.

65. D — A flat spot on a sheave creates a periodic impact on the rope every time the flat zone makes contact during rope travel. This impact induces fatigue at the specific wire locations that contact the flat zone — the wire experiences a sudden bending and straightening event rather than the smooth rolling contact of a properly radiused groove. The longer the flat spot has existed, the more accumulated fatigue cycles the rope has absorbed at the contact location. Both the sheave and the affected rope section require replacement.

66. B — Manufacturer service intervals specified as "whichever comes first" mean that exceeding either trigger requires service. The 2-year calendar interval represents the maximum service life for the fluid chemistry regardless of operating hours. At 4 years, the fluid is 2 years beyond the calendar limit. Degraded hydraulic fluid has reduced viscosity stability, depleted anti-wear additives, and increased contamination — all of which reduce brake holding reliability and accelerate internal component wear.

67. D — ASME B30.9 applies wire break removal criteria that account for rope diameter. For smaller rope diameters, fewer broken wires represent the same proportional loss of structural cross-section as more breaks in larger ropes. For a 5/8-inch diameter wire rope sling, 7 broken wires in one lay length can meet the applicable removal criterion based on the specific standard tables for that diameter. The distribution among strands must also be evaluated for the 5-in-one-strand criterion.

68. B — The counterbalance valve is specifically designed to prevent uncontrolled boom lowering when hydraulic pressure is lost. A bypassing counterbalance valve means this protection is compromised. If the hydraulic system loses pressure for any reason — engine stall, hose failure, pump failure — the boom can lower without operator input. At any elevation with a load suspended, this creates an immediate uncontrolled load drop hazard. The valve must be replaced before any further operations.

69. D — A vacuum lifter's low vacuum warning means the pressure differential providing the holding force has fallen below the minimum required level. The holding force may already be insufficient for the rated load. As vacuum continues to decrease during the hoist, the holding force decreases further. Continuing the hoist while the vacuum is reducing risks the load releasing from the lifter at height — a potentially catastrophic load drop. The load must reach the ground before any vacuum system investigation can safely occur.

70. B — OSHA incident documentation for power line contact must be comprehensive because the regulatory reporting requirement and the subsequent engineering assessment both depend on it. Key information — voltage, duration, rope condition, injuries, and corrective actions — supports both the legal compliance record and the technical determination of whether the rope and other components can return to service. Incomplete documentation prevents proper follow-up evaluation.

71. B — Conservative capacity at the next larger tabulated radius beyond 34 feet = 35 feet, capacity = 28,800 lbs. Total suspended weight = 1,900 + 520 + 160 + 24,000 = 26,580 lbs. Since 26,580 lbs is within 28,800 lbs, the lift proceeds. Lift percentage = 26,580 ÷ 28,800 × 100 = 92.3% — exceeding the 75% critical lift threshold and requiring a written critical lift plan and pre-lift meeting before the lift begins.

72. A — Pick-and-carry capacity is dramatically reduced from stationary on-outrigger capacity because crane travel introduces dynamic instability, surface irregularities, and turning forces that the stability analysis for stationary operations did not account for. Maximum pick-and-carry load = 28,400 × 0.30 = 8,520 lbs. All travel with load must stay within this limit — this note is binding and cannot be adjusted by operator judgment or lift director authorization.

73. B — Conservative approach: next larger tabulated radius beyond 28 feet = 30 feet, capacity = 35,400 lbs. Total suspended weight = 40,000 lbs. Since 40,000 lbs exceeds 35,400 lbs by 4,600 lbs, the lift cannot proceed using the conservative approach. The operator must either reduce the total suspended weight to below 35,400 lbs, or reposition the crane to bring the operating radius to 25 feet or less where the 44,800-lb tabulated capacity supports the load directly.

74. B — The temperature of -24°F falls below the -20°F threshold in the note. Derated capacity = 32,400 × 0.85 = 27,540 lbs. The note's temperature derating is a binding condition — the capacity values in this section were derived under standard temperature conditions, and extreme cold affects hydraulic fluid viscosity, seal flexibility, and potentially steel impact toughness in ways that reduce the effective operational capacity below the standard chart values.

75. A — After switching to standard counterweight, the maximum counterweight section's values no longer apply — only the standard counterweight section values govern. Conservative approach at 34 feet: next larger tabulated radius = 35 feet, standard counterweight capacity = 22,600 lbs. Total suspended weight = 25,400 lbs. Since 25,400 lbs exceeds 22,600 lbs, the lift cannot proceed using the standard counterweight configuration at 34 feet.

76. A — The maximum boom angle shown in the working area diagram is a binding load chart condition. At 80 degrees, the crane is outside the analyzed operating envelope — structural analysis and stability calculations were performed within the 78-degree maximum. Operating above the maximum angle means the capacity values in this section do not apply to the current configuration. The operator must boom down to 78 degrees or below before any lifting proceeds.

77. D — Interpolation from 35 to 40 feet: capacity decrease = 27,000 − 21,200 = 5,800 lbs over 5 ft = 1,160 lbs/ft. At 36 ft (1 ft beyond 35 ft): 27,000 − (1 × 1,160) = 25,840 lbs. Lift percentage = 24,000 ÷ 25,840 × 100 = 92.9%. The lift proceeds using the interpolated capacity with 1,840 lbs of margin. However, the conservative approach at 40 ft (21,200 lbs) would not support 24,000 lbs — the operator must use the interpolated approach and manage the radius carefully.

78. B — The note requires deducting the weight excess of the heavier block from the tabulated gross capacity. Weight excess = 3,600 − 2,400 = 1,200 lbs. Applicable gross capacity = 31,200 − 1,200 = 30,000 lbs. The note adjusts the gross capacity value itself — not just the net payload calculation — because the heavier block changes the structural loading at the boom tip and the capacity analysis must reflect the heavier tip load.

79. C — Interpolated capacity at 27 ft = 41,600 − (2 × 1,760) = 41,600 − 3,520 = 38,080 lbs. The concave upward shape of the capacity curve means the actual capacity at 27 feet is slightly above the straight-line interpolation. Linear interpolation on a concave upward curve gives a result slightly below the actual curve — making the interpolated value slightly conservative. The interpolated result of 38,080 lbs is therefore a slightly conservative estimate of the actual capacity.

80. B — The load must pass through and be set outside the over-front sector during the planned swing. Once the boom moves beyond 30 degrees from front center, it enters the all-directions zone where the lower capacity of 34,200 lbs applies. Since the load must travel through and be set in the all-directions zone, the 34,200-lb all-directions capacity governs the entire lift plan. A load above the all-directions capacity cannot be carried through that zone regardless of where it was picked.

81. D — A lift percentage of exactly 100% leaves zero margin for any dynamic loading, measurement error, or configuration deviation. Rated capacity is the maximum permissible load — not a target. No crane operation is authorized at exactly 100% because it provides no reserve for the inevitable dynamic additions from hoist acceleration, swing, or wind. The operator must either reduce the total suspended weight or find a crane or configuration with higher rated capacity for this load.

82. B — Conservative approach: next larger tabulated radius beyond 28 feet = 30 feet, capacity = 19,600 lbs. Total suspended weight = 20,600 lbs. Since 20,600 lbs exceeds 19,600 lbs by 1,000 lbs, the lift cannot proceed in the 75% extension configuration using the conservative approach. The crane must be reconfigured to full outrigger extension to access the higher capacity available at 28 feet of radius in the full extension section.

83. C — Combined resultant = $\sqrt{(0.3^2 + 0.35^2)} = \sqrt{(0.09 + 0.1225)} = \sqrt{0.2125} = 0.461\%$. The combined resultant of 0.461% is within the note's 0.5% simultaneous level requirement. The note requires "all directions simultaneously" — the combined resultant represents the worst-case diagonal direction, which is the correct measure for simultaneous dual-axis out-of-level. At 0.461%, the crane satisfies the note's condition.

84. D — A section covering "80 to 100 ft" may tabulate capacity values at specific increments (80 ft and 100 ft, or 80, 90, and 100 ft). At 90 feet, the LMI needs a specific capacity value to calculate the displayed percentage. The operator must confirm which tabulated column the LMI is using for its calculation — if it is using an interpolated value, the basis of interpolation must be confirmed; if using a specific column, that column must match the actual 90-foot configuration. Unexplained LMI percentages at non-tabulated boom lengths require verification.

85. D — The maximum rated radius of 55 feet is the absolute outer boundary of the crane's rated operating envelope. At 57 feet, no rated capacity exists — the crane is in an unrated condition. Even though the exceedance was wind-induced and momentary, it confirms the lift's wind management is inadequate. Tag lines or a reduced planned radius that provides margin against wind displacement are required. The operator must slow the swing and allow the load to return within the rated envelope.

86. B — Interpolation from 30 to 35 feet: drop = 38,200 − 29,800 = 8,400 lbs over 5 ft = 1,680 lbs/ft. At 32 ft (2 ft beyond 30 ft): 38,200 − (2 × 1,680) = 38,200 − 3,360 = 34,840 lbs. Lift percentage = 33,400 ÷ 34,840 × 100 = 95.9%. The lift proceeds using interpolated capacity. The conservative approach at 35 ft (29,800 lbs) would not support 33,400 lbs — but the operator notes this and uses the interpolated value with a critical lift plan required for the 95.9% percentage.

87. B — Conservative approach at pick (43 ft): next larger tabulated radius = 45 ft, capacity = 17,800 lbs. Conservative approach at set (46 ft): 46 feet exceeds the 45-foot maximum rated radius — no rated capacity exists at 46 feet. The blank at 50 feet confirms the rated envelope ends at 45 feet. The set position is outside the rated operating envelope entirely. Regardless of the load weight, the lift cannot proceed to a set location beyond the maximum rated radius.

88. A — Effective total suspended weight = 24,000 × 1.10 = 26,400 lbs. The note requires adding a 10% dynamic load factor to the total suspended weight when hoisting above 150 fpm, then comparing the resulting effective weight to the gross capacity. At 200 fpm (50 fpm above the threshold), the dynamic effects add 2,400 lbs to the comparison weight. The gross capacity must exceed 26,400 lbs, not just 24,000 lbs, to confirm the lift is within rated capacity at this hoist speed.

89. D — The note specifies the 6×19 rope construction and requires manufacturer authorization for any substitution. A 6×36 rope has more and smaller outer wires than 6×19 — this changes bending fatigue characteristics, fleet angle performance, and sheave groove contact geometry. These differences can affect the structural and operational assumptions underlying the capacity values. Without the manufacturer's written authorization confirming the 6×36 rope performs equivalently in this application; these capacity values cannot be used.

90. B — When structural limits govern, capacity is set by the weakest structural component in the load path — the slewing ring, boom foot pins, or rotating bed structure — rather than by boom geometry or stability. If the same structural component is the limiting element for both boom lengths at 30 feet, both boom lengths will show the same structural-limited capacity. Identical values confirm the governing structural component's limit was reached before the change in boom length became relevant to the capacity.

91. D — The note's requirement for a "second independent load chart review by a qualified person" explicitly means a second person — separate from the lift director — must independently review the load chart. The lift director and operator reviewing together constitutes one review by two people in the same location, not two independent reviews. The only compliant options are to bring a second qualified person to the site, or to reduce the load to below 90% of gross capacity so the note's threshold is not triggered.

92. A — Conservative approach at 33 feet: next larger tabulated radius = 35 feet, capacity = 27,800 lbs. Total suspended weight = 25,200 lbs. Since 25,200 lbs is within 27,800 lbs, repositioning the crane to 33 feet allows the lift to proceed using the conservative approach with 2,600 lbs of margin. The key insight is that moving 2 feet closer brings the operating radius to 33 feet, whose conservative governing capacity at 35 feet (27,800 lbs) now supports the load.

93. D — The maximum counterweight section must be used because the crane has maximum counterweight physically installed. Sections must match the actual physical configuration. The standard counterweight section was derived for a different mass configuration and applies different stability and structural calculations. With maximum counterweight installed: conservative capacity at 40 ft = 31,200 lbs governs for the 39-foot operating radius; 28,000 lbs is within 31,200 lbs; the lift proceeds.

94. B — Conservative approach: next larger tabulated radius beyond 28 feet = 30 feet, capacity = 14,600 lbs. The conservative approach always uses the next larger tabulated radius — the 30-foot entry governs for any non-tabulated radius between 25 and 30 feet. The total suspended weight must remain within 14,600 lbs for the lift to proceed using the conservative approach at 28 feet.

95. C — Conservative approach: next larger tabulated radius beyond 22 feet = 25 feet, capacity = 46,800 lbs. Total suspended weight = 54,000 lbs. Lift percentage = 54,000 ÷ 46,800 × 100 = 115.4% — the load significantly exceeds the conservative capacity. The lift cannot proceed at 22 feet using the conservative approach. The operator must either reduce the total suspended weight to below 46,800 lbs, or reposition the crane to 20 feet or less where the 58,400-lb tabulated capacity directly supports the 54,000-lb load.

Specialty Exam Simulation 12 — 65 Questions

SITE DOMAIN — Questions 1–15

1. A crane operator is evaluating a setup location at a petrochemical facility. The site survey indicates the planned left front outrigger position will be located 8 feet from a buried product transfer line — a 10-inch diameter high-pressure petroleum line operating at 600 psi. The utility locate shows the line is at 36 inches of depth. What must the operator confirm before positioning the outrigger at this location?

A. The 8-foot setback from a 600 psi line is within industry standard clearance requirements — no additional confirmation is needed

B. Contact the facility's pipeline safety officer by phone and proceed with setup while awaiting a response

C. The exact location of the 600 psi petroleum line must be confirmed through positive location methods — the utility locate tolerance zone means the pipe could be within feet of the planned outrigger position; at 600 psi, a rupture caused by outrigger loading over the pipe would create an immediately catastrophic pressure release and fire hazard; the pipe's exact position must be confirmed and the outrigger positioned to avoid any soil loading directly above it

D. The 36-inch depth provides adequate cover for any crane outrigger load — no special confirmation is needed for buried lines at this depth

2. Under OSHA 1926.1402, when a crane must be repositioned to a new location within the same job site during an active workday, what ground condition obligation applies to the new position?

A. The crane employer must confirm ground conditions are adequate at the new position before beginning operations there — the original ground condition assessment applies only to the original setup location; a new position, even within the same project site, may have entirely different soil conditions, underground utilities, or subsurface features; confirmation must occur at the new position before lifting begins regardless of how recently the original position was assessed

B. The original ground condition documentation covers all positions within the same project property boundary for the duration of the project

C. Ground condition confirmation is only required for a new position if it is more than 100 feet from the original position

D. The operator may self-assess the new position visually without documentation for same-day repositioning

3. A crane operator is performing a site walk at a coastal development project when they discover that the planned outrigger zone sits on a fill area that was placed over a former salt marsh. The fill report from 12 years ago shows 6 feet of granular fill over the original marsh soil. The original marsh soil is described in the report as "soft organic clay." What specific concern does this site history create?

A. Twelve-year-old fill over organic clay is always adequately consolidated — the age confirms stability

B. The granular fill above the marsh provides adequate bearing capacity regardless of the organic clay below

C. Nothing — the fill report confirms the site has been adequately improved for construction use

D. Soft organic clay is highly compressible and has very low bearing capacity — 6 feet of granular fill above it may carry the crane's outrigger surface pressure, but the organic clay at depth can still consolidate under the increased stress from crane loading; this long-term settlement can occur slowly but the differential compression can change the crane's level condition during operations; the bearing capacity and settlement behavior of this layered system must be evaluated by a geotechnical engineer before crane operations

4. A crane is set up at a job site when a nearby earth anchor installation crew begins installing helical soil anchors for a temporary shoring system. The anchor installation requires rotating a helical shaft into the soil with an excavator-mounted torque drive — 4 anchors have been installed and the 5th is being installed 22 feet from the crane's right rear outrigger position. What concern must be evaluated?

A. Nothing — helical anchor installation at 22 feet is outside the standard zone of concern for crane operations

B. The helical anchor installation at 22 feet applies torsional stress to the soil around the anchor as the helix rotates through the soil — this torsional disruption creates a zone of remolded soil adjacent to the anchor path; combined with any vibration from the installation torque drive, the adjacent soil may experience temporary loss of structure; the crane's level condition must be monitored during anchor installation, particularly as installations occur closest to the outrigger positions

C. The installation process is always beneficial since it compacts the adjacent soil, improving bearing capacity

D. Contact the shoring contractor to request a pause in anchor installation during the planned critical lifts only

5. A crane operator is evaluating a setup location on a construction site when they notice that the compacted granular sub-base in the planned outrigger zone has a patch of surface that is significantly darker in color and softer in texture than the surrounding material — approximately a 3-foot diameter area directly beneath the planned right rear outrigger mat. A probe rod penetrates 6 inches by hand pressure in the darker area. What must happen?

A. Nothing — color variation in granular sub-base materials is a normal manufacturing variation

B. The darker patch may be a vendor color variation — place the mat and monitor for settlement during operations

C. The darker, softer area requires investigation before placing the outrigger mat at this position — the localized softness and color change indicate this zone has a different composition or moisture condition than the surrounding sub-base; the bearing capacity in this zone may be significantly lower than the surrounding material; placing the outrigger mat at this location without investigation risks differential settlement that could cause the crane to go out of level on the soft side

D. Apply additional granular material on top of the dark area before placing the mat and proceed

6. Under OSHA 1926.1402, when the crane employer receives written documentation of ground conditions from the controlling entity that shows soil bearing capacity of 3,000 psf, but the crane employer's own assessment of the site indicates the soil is softer than the documentation suggests, what obligation does the crane employer have?

A. The crane employer must not proceed based on the controlling entity's documentation alone when their own observations suggest the documented conditions may not reflect current reality — the crane employer must either request updated documentation that explains the discrepancy, conduct independent soil testing, or refuse to set up until the discrepancy is resolved; operating based on documentation that conflicts with observable site conditions creates a foreseeable hazard

B. The controlling entity's written documentation is authoritative and overrides the crane employer's field observation

C. The crane employer may set up and operate at 80% of rated capacity to compensate for the discrepancy

D. The discrepancy must be reported to OSHA before any crane operations can begin

7. A crane is set up at a construction project and has been operating for 3 hours when the operator notices that rainwater has been accumulating in a low-lying area on the uphill side of the setup zone — approximately 2 feet uphill from the right outrigger spread. After 45 minutes of observation, the water level in the pooled area has risen 4 inches. What must the operator assess?

A. Nothing — surface water pooling 2 feet away from an outrigger position has no effect on bearing conditions

B. The pooling is a drainage design issue — continue operations and have the site supervisor address the drainage

C. Nothing — 4 inches of water accumulation at this distance is within normal project site conditions

D. The 4-inch rise in accumulated water over 45 minutes at 2 feet from the right outrigger spread indicates water is infiltrating the soil in the outrigger's bearing zone — as water migrates into the soil from the pooling area, the effective stress and bearing capacity can decrease; the operator must assess whether the water has reached the mat position and whether the ground condition beneath the right outrigger has changed since the original assessment

8. A crane operator is setting up at a new job site when the controlling entity's representative points to a spray-painted "X" on the ground approximately 3 feet from the planned right front outrigger position and says: "That's a utility mark from a locate done last year." The original locate report is not available. What action is required?

A. Nothing — a spray-painted utility mark from a locate confirms the utility is at the marked location; the 3-foot offset provides adequate clearance

B. A new utility locate must be performed before setup — a 1-year-old utility mark may not accurately reflect current conditions; utilities can be relocated, new utilities may have been added, and locate paint degrades over time; the original locate report's absence means the type, depth, and exact tolerance zone of the utility at the "X" are unknown; the crane employer cannot safely confirm outrigger positions without current, documented utility location information

C. Treat the "X" as marking the exact utility centerline and maintain the 3-foot setback as adequate clearance

D. Contact the utility company by phone to confirm the line is still at the marked location before proceeding

9. A crane is operating at a manufacturing facility when the facility's safety officer advises the operator that the planned outrigger positions are located above a network of underground process drainage lines — 4-inch schedule 40 PVC pipes at 18 inches of depth carrying process wastewater. The pipes are located directly beneath three of the four planned outrigger positions. What concern do the PVC drainage pipes create?

A. Nothing — Schedule 40 PVC at 18 inches of depth is a standard installation that can support any crane loading

B. The crane may operate over the pipes if the outrigger pads span across the pipe locations rather than loading directly over them

C. Schedule 40 PVC drainage pipes at 18 inches of depth have minimal structural capacity for concentrated loads — the PVC pipe material can collapse under crane outrigger loads, creating voids at 18 inches of depth beneath three of the four outrigger positions; a pipe collapse removes the soil support above and around the pipe, potentially creating a sudden bearing failure; the pipes must be positively located, and the outrigger pads must be sized and positioned to ensure no concentrated loading occurs directly above the pipe centerlines

D. The drainage pipes are below the zone of influence for 18-inch deep PVC installations — proceed with setup

10. Under OSHA 1926.1407, when the utility operator has been contacted about de-energizing a power line and they state they are unable to de-energize due to operational requirements, what must the crane employer do before any operations begin near the line?

A. Proceed with operations using the default 20-foot MSAD since de-energization was confirmed not feasible

B. Obtain the line's voltage and establish the applicable minimum safe approach distance; then implement an encroachment prevention plan that includes a dedicated spotter and a means to immediately stop all crane movement before operations begin within the established MSAD — when de-energization is not available, these specific controls must all be in place before any crane movement occurs near the energized line

C. Notify OSHA of the utility operator's refusal to de-energize before operations begin near the line

D. Use the crane's boom insulation certification to justify closer approach than the standard MSAD

11. A crane is set up at a construction site adjacent to a 20-foot-deep foundation excavation that has been shored with steel sheet piling. The crane's right rear outrigger is positioned 8 feet from the sheet pile wall. The sheet pile design was confirmed adequate for standard surcharge loading during excavation design. What must be evaluated before crane operations begin?

A. The sheet pile design for standard surcharge loading covers all construction equipment — proceed normally

B. The structural engineer who designed the sheet piling must be on site before crane operations begin

C. Nothing — shored excavations are rated for adjacent equipment loading as part of the shoring design

D. The crane's outrigger load creates a surcharge at 8 feet from the sheet pile wall that the shoring designer may not have considered in the standard surcharge analysis — the specific outrigger reaction load, its proximity to the wall, and the resulting additional lateral earth pressure on the shoring system must be evaluated by the shoring engineer to confirm the system is adequate before crane operations begin

12. A crane is set up at a job site when the operator discovers that the surface beneath the left front outrigger mat has developed a visible crack running parallel to the mat edge — a hairline crack approximately 18 inches long running along the surface 2 inches from the mat edge. The crack appeared during the current shift. What must the operator do?

A. Nothing — hairline surface cracks at mat edges are normal stress relief patterns caused by outrigger loading

B. Stop operations and assess the crack — a hairline crack developing at the mat edge during an active shift indicates the surface material (concrete, asphalt, or compacted material) is experiencing tensile stress from the outrigger load that it cannot resist without cracking; if the crack widens or extends during any further operations, the surface may fail by punching shear or splitting; the crack must be evaluated before any further lifting

C. Continue operations and measure the crack at the end of the shift to determine if it has grown

D. Apply crack-sealing compound to the surface crack before the next lift to prevent further propagation

13. A crane operator is performing a site walk at an industrial park construction site when they discover that the soil in the planned outrigger zone has a distinct gray color with a greenish tinge — different from the surrounding brown native soil. When probed, the gray-green material has a soft, putty-like consistency. What does this color and texture combination most likely indicate?

A. Nothing — color variation in construction site soils is caused by different mineral content and has no bearing on capacity

B. Gray-green soil with a putty-like texture at a construction site is a normal characteristic of processed gravel fill

C. Gray-green soft soil with a putty-like texture is consistent with marine clay or highly plastic clay — a material with very low bearing capacity and high compressibility; this type of soil can fail under even modest loading; if this material is present beneath the planned outrigger positions, the bearing capacity may be near zero; the material must be evaluated by a geotechnical professional and the outrigger positions confirmed adequate before any crane setup

D. Gray-green soil indicates the presence of glacial till — a highly competent material with excellent bearing capacity

14. A crane is set up at a site that has been dry for three weeks when, during operations, a contractor begins irrigating an adjacent landscaped area using a high-volume irrigation system — approximately 400 gallons per minute applied to a 10,000 sq ft area that drains toward the crane's outrigger zone. What specific concern must be raised?

A. High-volume irrigation at 400 gpm flowing toward the crane's outrigger zone can rapidly saturate the soil in the bearing zone as the irrigation water infiltrates and migrates laterally — soil that has been assessed in dry condition has a significantly higher bearing capacity than the same soil when saturated; the irrigation must be redirected away from the outrigger zone or stopped, and the ground conditions must be confirmed adequate after any irrigation-induced saturation before operations continue

B. Nothing — irrigation water is clean water and does not affect soil bearing capacity

C. The irrigation volume is the landscaping contractor's responsibility — no crane operational impact applies

D. Reduce all planned lift loads by 10% while irrigation is occurring to compensate for any moisture effects

15. A crane is operating at a construction site when a significant sinkhole — approximately 6 feet in diameter and 3 feet deep — develops 35 feet from the crane's left front outrigger position. The sinkhole appears suddenly and continues to grow slowly. What must the operator do?

A. Monitor the sinkhole and continue operations since the 35-foot distance provides adequate safety buffer

B. Reduce the operating radius to minimize outrigger loads while the sinkhole is investigated

C. Nothing — sinkholes that develop 35 feet or more from any outrigger position are outside the zone of concern

D. Stop all crane operations immediately — a developing sinkhole indicates an active subsurface void system; the void responsible for the 35-foot-distant sinkhole may extend beneath the crane's outrigger positions; subsurface void systems are often interconnected, and continued crane loading can cause propagation toward the loaded outriggers; the crane must stop operations and the ground conditions at all outrigger positions must be confirmed before any further lifting

OPERATIONS DOMAIN — Questions 16–30

16. A crane operator is performing a critical lift at 89% of rated capacity when a site visitor — a project owner's representative who is not part of the lift crew — approaches the crane cab and asks the operator to stop the lift for a photo opportunity. The load is at 12 feet of height mid-swing. What must the operator do?

A. Nothing — the project owner's representative has authority to stop work on any project activity

B. Continue the crane movement to the nearest safe stop position — lowering the load or completing the swing to the nearest stable point — and then address the visitor's request from a safe condition; however, the operator must not stop mid-swing in response to an unauthorized command from a non-designated person; only the designated signal person or lift director may direct crane movements during an active lift

C. Stop immediately since the visitor's authority is confirmed by their presence at the project

D. Contact the lift director by radio and await authorization before deciding how to respond to the visitor's request

17. A crane operator is performing a lift when they observe that one of the riggers is standing within the load's potential fall zone — directly under the suspended load at 8 feet of height. The signal person has already given the HOIST signal. What must the operator do?

A. Execute the HOIST signal as given — the signal person's clearance confirmation is sufficient

B. Sound the horn to warn the rigger and execute the hoist at minimum speed while the rigger moves clear

C. Stop all crane movement, sound the emergency horn to alert the person under the load, and hold the load until the person has moved clear of the fall zone — OSHA 1926.1425 prohibits any load from passing over or being positioned over personnel; the signal person's HOIST signal does not authorize the operator to hoist over a person the operator can directly observe; the operator must refuse the signal until the area is confirmed clear

D. Lower the load to the ground immediately since the person is under the load

18. Under OSHA 1926.1412, what specific action is required before a crane can return to service after a crane tip-over incident — even if visual inspection shows no visible damage?

A. A post-incident inspection by a qualified person must be performed before the crane returns to service — a crane tip-over creates structural loading far beyond normal rated operations; even if no visible damage is apparent, the tip-over may have caused internal structural damage, deformed connections, cracked welds, or displaced components that are not detectable through visual inspection alone; the post-incident inspection must specifically evaluate all primary structural members, connections, and safety devices before the crane is put back into service

B. The operator must document the tip-over and submit an incident report to OSHA before the crane can continue

C. A tip-over with no visible damage can be self-certified by the crane employer as service-ready

D. The crane manufacturer must send a representative to inspect the crane before it can return to service

19. A crane operator is performing a lift when the signal person steps behind a column for 8 seconds to avoid a piece of falling debris from the structure above. During those 8 seconds, the load is at 6 feet of height mid-swing. What must the operator have done during those 8 seconds?

A. Continued the swing at minimum speed since the interruption was brief and caused by a safety emergency

B. Slowed the swing to minimum speed and alerted the signal person by radio to return to position

C. Continued the swing since the signal person's last signal was still valid during the brief interruption

D. Stopped all crane movement during the signal person's loss of line of sight — the operator cannot execute any crane movement without confirmed, continuous signal guidance; a falling debris event that forced the signal person behind a column may also have created debris in the load's travel path; the load must be stationary when the signal person's line of sight is lost, and the signal person must re-confirm a clear path and resume active signaling before any movement resumes

20. A crane is performing a lift at 84% of rated capacity when the LMI suddenly displays "FAULT - SENSOR ERROR" and goes blank. The load is at 4 feet of height. What is the correct response?

A. Continue the lift using the operator's own capacity calculation as the backup to the failed LMI

B. Lower the load to the ground immediately — a complete LMI failure during an active lift removes the supplementary capacity monitoring for the remainder of the lift; the crane should not continue operating with a failed LMI at near-capacity percentages until the fault is identified and the LMI is confirmed functional; lowering the load to the ground allows the operator to investigate the sensor fault before deciding whether to resume operations

C. Continue the lift slowly while a qualified technician diagnoses the sensor fault remotely

D. Contact the lift director for authorization to complete the current lift cycle with a failed LMI

21. A crane is performing a pick-and-carry operation when the operator realizes the travel path crosses over a floor drain inlet — a 6-inch diameter cast iron drain set flush with the floor surface. The crane's travel weight is 180,000 lbs. What concern does travel over the drain create?

A. Nothing — cast iron floor drains are structural elements designed for vehicle traffic

B. The drain provides drainage that improves the floor surface — travel over it is beneficial

C. Nothing — a 6-inch drain inlet is negligible relative to the crane's travel contact area

D. Travel over a floor drain inlet with a 180,000-lb crane can concentrate the travel load directly above the drain's structural connection to the drain body — cast iron drain frames are not designed for crane travel loads; the drain frame can crack, the drain body can collapse, and the resulting void at the drain location can cause the crane's track or tire to drop suddenly; the travel path must be modified to bypass the drain inlet or the drain must be temporarily bridged

22. A crane operator is performing a critical lift at 92% of rated capacity when another crane on the adjacent project begins operating and the combined vibration from both cranes' operations creates a noticeable rhythmic oscillation in the ground beneath the setup. The level indicator shows the crane remaining level. What concern does the adjacent crane's vibration create?

A. The adjacent crane's vibration transmitted through the ground to the loaded crane's outrigger positions can cyclically load and unload the bearing soil — in fine-grained soils, this cyclic loading can generate pore pressure that temporarily reduces bearing capacity; at 92% of rated capacity, any reduction in bearing capacity reduces the margin between the applied load and the soil's capacity; the level indicator showing level does not confirm soil capacity — it only confirms no differential settlement has occurred yet; the situation must be monitored and operations paused if any level change develops

B. Nothing — vibration from adjacent equipment is a common site condition that has no structural effect on crane operations

C. Reduce the current lift load by 5% to account for the adjacent vibration effect

D. Contact the other crane's operator and request they pause operations during the critical lift sequence

23. A crane is performing a lift when the signal person's hard hat falls off and rolls under the suspended load's travel path. The signal person instinctively steps forward to retrieve it, placing themselves within the load's potential fall zone. The load is at 10 feet of height. What is the immediate required response?

A. Continue the lift and sound the horn to warn the signal person to retrieve the hat after the lift is complete

B. The operator may sound the horn and continue at minimum speed since the person is moving to retrieve an object

C. Nothing — the signal person's movement into the fall zone is their responsibility to manage

D. Stop all crane movement immediately — OSHA 1926.1425 prohibits loads from being positioned over personnel under any circumstance; the instinctive nature of the action does not create an exception; the operator must hold the load stationary and sound the emergency horn until the signal person is confirmed out of the load's potential fall zone before any further movement

24. A crane operator is completing the day's final lift when, during the lowering phase, a rope strand pops audibly — a distinct "snap" sound from the lower block area. The load is at 3 feet of height during lowering. What must the operator do?

A. Nothing — audible pops during lowering are caused by normal rope adjustment events and are expected

B. Lower the load to the ground immediately, stop all crane operations, and have the load line and hook block inspected by a qualified person before any further use — an audible snap from the lower block area during a loaded lowering indicates a sudden rope event; possible causes include a wire break, a rope jump from a sheave, or a fitting failure; all of these can progress to complete load line failure during subsequent operations; the rope and block must be inspected before the crane is used again

C. Continue the lowering at minimum speed while the signal person inspects the lower block from below

D. Complete the lowering, set the load, and then inspect the rope before the next planned lift

25. Under OSHA 1926.1416(d), what must be physically in place before any crane swing that brings the counterweight within reach of an adjacent structure, berm, or other physical barrier?

A. The lift director must confirm verbally that the counterweight arc is clear before each swing

B. Nothing — counterweight clearance is assessed visually by the operator before each swing

C. Physical barriers must be established that prevent personnel from entering the space between the counterweight and any adjacent fixed structure — the counterweight poses a crush hazard from an unexpected direction relative to the load; workers focusing on the load's path do not naturally anticipate the counterweight swinging in the opposite direction; physical barriers that prevent entry are required regardless of verbal warnings or visual monitoring

D. Warning signs must be posted at each end of the counterweight's arc before operations begin

26. A crane operator is performing a lift at night when a temporary lighting system fails — all site lighting goes dark. The load is at 20 feet of height. Emergency lighting activates but provides only 20% of the original lighting level, illuminating only the ground surface but not the load. What is the required response?

A. Lower the load to the nearest safe surface at minimum speed using the crane's instruments as guidance — without adequate lighting to confirm the load's height, clearances, and proximity to obstacles, the operator cannot safely execute any further crane movement; the emergency lighting confirming only the ground surface is inadequate for crane operations; the load must reach the ground before the operator can safely leave the controls; minimum-speed lowering using level ground as the known reference point is the only authorized movement

B. Hold the load at 20 feet using the drum pawl and wait for full lighting restoration

C. Continue operations using the LMI's height display as the sole reference for load position management

D. Contact the lift director and await specific instructions before taking any action

27. A crane is performing a series of tandem picks with a second crane. After the 4th tandem pick, the lift director informs both operators that the 5th pick is 8% heavier than the previous four. Crane A was planned at 82% capacity for the original weight. After the weight revision, Crane A will be at 88.6% capacity. What must happen before the 5th tandem pick proceeds?

A. Nothing — both percentages are below 100% of rated capacity and the lift may proceed as revised

B. The lift director may verbally authorize the weight revision and the lift proceeds with the updated parameters

C. Nothing — the lift director's documentation is sufficient authorization for the revised parameters

D. The critical lift plan must be updated to reflect the revised total suspended weight and the revised capacity percentages for both cranes — the 5th pick at 88.6% exceeds the 75% critical lift threshold; if a critical lift plan was not in place for the previous picks at 82%, one is now required; if one was in place, it must be updated before the 5th pick proceeds; the rigging, outrigger conditions, and all parameters must be re-confirmed for the revised weight

28. A crane is performing a lift at 87% of rated capacity when a large gust of wind — estimated at 28 mph — strikes the load, which is a 12-foot × 20-foot flat architectural panel. The crane's general wind limit is 30 mph. The LMI briefly peaks at 97% during the gust before returning to 90% as the wind subsides. What must the operator conclude?

A. Nothing — the LMI returned to 90% after the gust; the peak was temporary and within the 100% limit

B. The 97% peak confirmed the crane remained within rated capacity; continue operations at normal pace

C. Nothing — the crane's 30 mph wind limit was not exceeded by the 28 mph gust

D. The wind gust demonstrated that the large flat panel is creating significant lateral wind forces that are increasing the effective load moment to near-rated-capacity levels — even though the wind limit was not exceeded and the LMI returned to normal, the temporary 97% peak confirms that additional gusts could push the crane beyond rated capacity; operations must stop or be redesigned with wind management (tag lines, reduced operating radius, or waiting for calmer conditions) before continuing

29. A crane operator is performing a personnel hoisting operation at 44% of rated capacity. After 30 minutes at working height, one of the workers in the platform calls down that another worker in the platform appears to be experiencing a medical emergency. The platform is at 55 feet of height. What is the immediate required response?

A. Nothing — contact emergency services first and plan the platform descent while awaiting their response

B. Nothing — the lift director must assess the situation and authorize the emergency descent procedure

C. Lower the platform to the ground as quickly as safely possible — a medical emergency in a suspended personnel platform requires immediate lowering; the crane operator must bring the platform to the ground so that medical personnel can access the affected worker; "safely" means at the maximum controlled descent rate that does not create additional hazards to either occupant; all other crane operations are secondary to the emergency descent

D. Call emergency services before moving the platform so responders know the current platform height

30. A crane operator is performing a lift at 78% of rated capacity when the signal person stops giving signals for 3 minutes with no explanation. The load is stationary at 16 feet of height. After 3 minutes, the signal person returns and immediately gives a LOWER signal. What must the operator do?

A. Execute the LOWER signal since the signal person has returned and the signal is a standard approved signal

B. Nothing — the signal person gave a valid approved signal; execute immediately

C. The operator must visually confirm the area below the load is clear and re-establish confirmed communication with the signal person before executing the LOWER signal — a 3-minute unexplained absence means the operator does not know what changed in the area below the load during that time; the signal person may have noticed a hazard or the ground crew may have changed positions; the area below the load must be confirmed clear before any downward movement proceeds

D. Contact the lift director to confirm the extended pause was authorized before executing the LOWER signal

TECHNICAL KNOWLEDGE DOMAIN — Questions 31–42

31. A crane inspector is examining a G80 alloy steel master link — the large oval link at the top of a multi-leg sling bridle — and finds a small nick in the link's surface at the apex. The nick is

approximately 1/8 inch deep and 1/4 inch long. What concern does a surface nick on a master link create?

A. Surface nicks less than 1/4 inch deep on master links are within the acceptable tolerance under ASME B30.9

B. Nothing — surface nicks on master links are cosmetic and do not affect load-bearing capacity

C. Nothing — master links are heat-treated alloy steel with sufficient reserve capacity for minor surface damage

D. A surface nick on a master link creates a stress concentration at the notch tip — when the link is loaded, the stress at the bottom of the nick can be many times higher than the nominal stress in the surrounding material; high-strength alloy steel is susceptible to notch-initiated fatigue failure; even a small, apparently superficial nick can initiate a fatigue crack under repeated loading; the master link must be evaluated against ASME B30.9 removal criteria for chain and hardware deformation and damage before use

32. Under ASME B30.9, a synthetic web sling is found to have its identification tag intact and legible, but the sling has been stored for 3 years outdoors on a racking system exposed to UV radiation. The sling shows no cuts, tears, or visible damage — only significant color fading from its original bright yellow to a pale, washed-out color. What action does this condition require?

A. Nothing — the sling's tag is legible and no physical damage is visible; the color fading is cosmetic

B. Remove the sling from service — visible color fading from UV exposure is a direct physical indicator that UV radiation has degraded the synthetic polymer chains in the sling's load-bearing fibers; UV degradation reduces tensile capacity without creating visible physical damage; the same UV energy that faded the color has also reduced the fiber's molecular chain length and tensile strength; ASME B30.9 includes UV fading as a removal condition for synthetic slings

C. The sling may remain in service if the operator confirms the fading does not extend into the core fibers

D. Apply UV protection spray to the sling and re-evaluate its condition after 30 days of additional service

33. A crane's annual inspection finds that one of the boom's structural tube members — a horizontal tube connecting two boom chords — has been repaired using a "saddle" splice: a sleeve welded over the tube at a mid-span location. No documentation exists for the repair. What concern does an undocumented saddle splice on a structural boom member create?

A. Nothing — saddle splices are standard field repair methods for crane boom tubes

B. The splice must be evaluated by a qualified weld inspector before the next annual inspection

C. The undocumented saddle splice represents an unauthorized structural repair — the splice changes the member's stiffness, stress distribution, and connection geometry in ways that may not meet the original structural design; without documentation, no approved repair procedure was followed, no qualified welder was confirmed, and no confirmation that the repair restores the original structural capacity exists; the crane manufacturer or a qualified structural engineer must evaluate the repair before rated-load operations resume

D. The splice must be removed and the tube replaced before the crane can continue operations

34. A rigger is preparing to make a lift using a 3-leg chain sling bridle. When the load is picked, one of the three chain legs immediately goes taut while the other two remain completely slack. What does this pattern indicate and what action is required?

A. Immediately lower the load to the ground — a single taut chain leg in a 3-leg bridle carries the entire load without sharing; the single leg is carrying 100% of the load rather than the planned one-third share; if the leg was rated for one-third of the load, it may now be at or beyond its rated capacity; the slack legs confirm a geometry error in the rigging that concentrated all load on one attachment point; the rigging must be corrected before re-picking

B. Nothing — in asymmetric loads, it is normal for one leg to carry more than the others

C. Continue the hoist slowly — the slack legs will become taut as the load rises and the rigging geometry equates

D. Apply tension to the slack legs by shortening them using clevis pins before continuing the lift

35. A crane inspector is examining a swivel hook assembly and finds that the swivel bears against the hook's shank with a squealing friction sound when rotated by hand under no load. The swivel requires approximately 15 foot-pounds of torque to initiate rotation. Under normal design, the swivel should rotate freely. What operational risk does a stiff swivel create?

A. A stiff swivel reduces the hook's maximum hoist speed and requires a 5% capacity reduction

B. The swivel stiffness is caused by insufficient lubrication — apply grease to the swivel bearing and return to service

C. Nothing — minor swivel stiffness is an expected characteristic of high-capacity swivel hooks

D. A swivel that requires 15 ft-lbs to initiate rotation will not release torsional loads from load rotation during the hoist — instead, torsional energy accumulates in the load line as the load rotates; when the accumulated twist energy exceeds the swivel's resistance, it releases suddenly, potentially causing a rapid untwisting event that can disengage rigging hardware or create a dangerous load oscillation; the swivel bearing must be repaired before use

36. Under ASME B30.5, what is the specific removal criterion for a wire rope that has been subjected to a kink — a permanent angular bend that forms when a loop in the rope is pulled tight under load?

A. A rope with a kink must be monitored at daily inspections; removal is required when the kink causes visible wire breaks

B. Any rope with a kink is an immediate removal condition — a kink permanently deforms the rope's internal geometry, redistributing the load among wires and strands in a pattern fundamentally different from the designed geometry; the stress concentration at the apex of the kink cannot be corrected by straightening; the deformed section is structurally unreliable and ASME B30.5 treats kinks as an unconditional removal condition with no authorized monitoring or reduced-capacity use

C. A kinked rope may remain in service if the kink angle is less than 10 degrees from the rope's axis

D. A kinked rope must be cut at the kink location and re-terminated with a new end fitting before returning to service

37. A crane operator is reviewing inspection records and finds that the crane's slewing ring gear lubricant was last changed 28 months ago. The manufacturer's recommended interval is 12 months. What is the maintenance status and what is the concern?

A. Nothing — slewing ring gear lubricant degrades slowly and a 28-month interval is within acceptable range for light-use cranes

B. The slewing ring gear lubricant should be changed at the next available opportunity — operations may continue

C. The slewing ring gear lubricant is overdue by 16 months — degraded gear lubricant loses its viscosity rating and anti-wear additive package; without adequate lubrication, the slewing ring gear teeth experience metal-to-metal contact during swing operations, causing accelerated gear tooth wear; continued operations without lubricant service will progressively increase gear tooth wear until the gear mesh becomes noisy, develops backlash, or experiences tooth failure; the lubricant must be changed before continued operations

D. The lubricant change interval is advisory only — slewing ring lubricant lasts indefinitely in enclosed systems

38. A crane inspector finds during the annual inspection that the crane's hoist brake lining shows a glazed surface — the friction material has a smooth, shiny appearance rather than the rough texture of new lining. What does glazing of brake lining material indicate and what action is required?

A. A glazed hoist brake lining must be replaced immediately — glazing indicates the friction material has been overheated to the point where the surface has vitrified; the glazed surface has a dramatically lower coefficient of friction than the original rough material; a glazed brake may appear functional during testing but may slip suddenly at loads near rated capacity; the hoist brake is the primary load-holding device and must be confirmed capable of holding the rated load before any operations

B. Glazing is a normal break-in condition for new brake linings — the surface will roughen with continued use

C. The glazed surface can be roughened with sandpaper to restore the original friction coefficient

D. Monitor the glazed lining at daily inspections until a clear performance reduction is observed

39. A crane is operating when the operator hears a rhythmic clicking sound from the slewing ring area — the click occurs once per revolution of the upper works and is consistent regardless of swing speed. What does a once-per-revolution click from the slewing ring area most likely indicate?

A. Nothing — rhythmic clicking during swing operations is normal as the ring gear teeth engage the drive pinion

B. Reduce swing speed — the clicking is caused by excessive swing speed creating impact at the gear mesh

C. The clicking is caused by the counterweight's mechanical stops engaging — verify the stop adjustment

D. A click that occurs exactly once per revolution of the upper works indicates a physical anomaly at one specific point on the slewing ring's circumference — a damaged gear tooth, a missing bolt, a raised weld, or foreign material in the ring gear track; the once-per-revolution consistency confirms the anomaly rotates with the upper works; this localized damage can cause impact loading at the defect point on every revolution, progressively worsening the damage; swing operations must stop and the ring gear must be inspected

40. A crane's wire rope is inspected and found to have a section where the rope has been subjected to heat — one section shows discoloration with blue-black metallic hues on the outer wire surfaces. What does this discoloration indicate and what action is required?

A. Nothing — blue-black discoloration on wire rope is caused by normal weathering oxidation and is cosmetic

B. Blue-black heat discoloration on wire rope indicates the steel wires have been tempered by heat — the heat exposure has reduced the high-carbon steel's hardness and tensile strength in the affected section; the discoloration is diagnostic of temperatures that alter the steel's metallurgical properties; the rope must be removed from service immediately; the affected section's reduced tensile capacity cannot be confirmed or quantified without destructive testing, making the rope unreliable for rated-load operations

C. Apply additional lubricant to the discolored section to reduce further oxidation and return to service

D. Remove the discolored section using a cable cutter and re-terminate with a new end fitting

41. Under ASME B30.10, what is the removal criterion when a hook's saddle — the curved section at the bottom of the hook's throat — shows wear that reduces the saddle's cross-sectional area by 8%?

A. Nothing — the 8% section reduction is within the allowable wear tolerance for hook saddles

B. The hook requires additional measurement and engineering evaluation before removal is determined

C. The hook must be removed from service — ASME B30.10 specifies removal from service when any section of the hook shows more than 5% reduction in cross-sectional area from the original dimensions; an 8% reduction exceeds this criterion; the saddle carries the full hook load and any section loss reduces the hook's rated capacity; continued operation with an 8% section-reduced saddle means the hook may fail at loads below its rated capacity

D. The hook must be removed from service only when the saddle section loss exceeds 10% of the original area

42. A crane operator is reviewing the crane's maintenance log and finds that a hydraulic hose on the boom hoist circuit was replaced 6 months ago. The replacement hose is confirmed as the correct specification. However, the installation notes show the hose was routed with a 1-inch radius bend at one support location — the manufacturer's minimum bend radius for this hose is 5 inches. What concern does the undersized bend radius create?

A. Nothing — hydraulic hoses are flexible by design and can accommodate any routing geometry

B. Nothing — the 5-inch minimum bend radius is a manufacturing guideline that does not affect installed performance

C. A hydraulic hose installed at a 1-inch bend radius — significantly tighter than the manufacturer's 5-inch minimum — has been installed in a configuration that will cause accelerated fatigue failure at the bend point; the repeated flexing during boom hoist operations stresses the hose at the bend on every cycle; at a 1-inch radius, the inner tube is being overstressed beyond its design limits on each movement; the hose will fail prematurely at the tight bend, likely rupturing and releasing pressurized hydraulic fluid; the hose routing must be corrected before further boom hoist operations

D. The tight bend only creates a concern if the hose is used above 75% of its rated pressure

MANUFACTURER LOAD CHARTS DOMAIN — Questions 43–65

43. A crane load chart shows: 100-foot boom, full outrigger extension, all-directions: 30 ft = 37,200 lbs; 35 ft = 29,400 lbs; 40 ft = 23,000 lbs. The planned operating radius is 36 feet. The total suspended weight is 26,800 lbs. Using the conservative approach, is the lift within capacity, and what is the governing capacity?

A. Conservative capacity at 35 ft = 29,400 lbs; 26,800 lbs is within capacity — lift proceeds

B. Conservative capacity at 40 ft = 23,000 lbs; 26,800 lbs exceeds 23,000 lbs — the lift cannot proceed using the conservative approach in this configuration

C. Nothing — the conservative approach at 35 ft is not applicable since 36 ft is beyond 35 ft

D. Conservative capacity at 40 ft = 23,000 lbs; 26,800 lbs exceeds 23,000 lbs — the lift cannot proceed; the operator must either reduce the total suspended weight to below 23,000 lbs, reposition the crane to bring the operating radius to 35 feet or less, or switch to a configuration with higher capacity at 36 feet

44. A crane load chart section note states: "All capacity values in this section require the use of the outrigger float pads as specified in this crane's standard equipment list. Substituting larger or smaller pads from any source voids this section." The crane is using manufacturer-supplied pads from a second identical crane owned by the company — the pads are confirmed to be the same part number. May the operator use this section?

A. Nothing — the note voids the section for any substitution regardless of part number match

B. The pads from the second crane are confirmed to be the correct part number — this substitution satisfies the note's requirement since the specified pads are being used; the note prohibits unspecified pads, not identical manufacturer-supplied replacements

C. Nothing — the company's ownership of both sets confirms authorized use

D. The note prohibits only third-party pads — manufacturer-supplied pads from any source are always acceptable

45. A crane load chart shows: "ON OUTRIGGERS — FULL EXTENSION — 80-FT BOOM — ALL DIRECTIONS": 25 ft = 42,800 lbs; 30 ft = 33,600 lbs; 35 ft = 26,400 lbs. All cells are stability-limited. A planned critical lift at 27 feet has a total suspended weight of 38,000 lbs. Using the conservative approach, what capacity governs?

A. Nothing — the conservative approach at 25 ft = 42,800 lbs governs; 38,000 lbs is within this — incorrect direction

B. Nothing — the conservative approach uses the next LARGER tabulated radius beyond the actual radius; at 27 ft, the next larger = 30 ft = 33,600 lbs; 38,000 lbs exceeds 33,600 lbs — the lift cannot proceed

C. Conservative capacity at 30 ft = 33,600 lbs; total suspended weight (38,000 lbs) exceeds 33,600 lbs — the lift cannot proceed; the operator must reduce the total suspended weight or reposition to 25 feet or less

D. Nothing — interpolated capacity at 27 ft = 40,280 lbs; 38,000 lbs is within this value; lift proceeds

46. A crane load chart shows a note: "Capacities in this section are reduced by 25% from the manufacturer's theoretical maximum to provide the required stability safety factor per ASME B30.5." A planned lift's total suspended weight is 88% of the tabulated value. The operator reasons that since the values already include a 25% reduction, the actual margin from tipping is (100% − 88%) + 25% = 37%. Is this reasoning correct?

A. This reasoning is incorrect — the 25% reduction was applied once to convert the theoretical maximum to the tabulated capacity; the tabulated value IS the rated capacity and the operator's 88% is measured against it; the additional 25% cannot be "reclaimed" by the operator; the remaining 12% between 88% and 100% is the only margin the operator may rely on; the stability safety factor is built into the rated capacity and cannot be used to create additional operating headroom

B. The reasoning is correct — adding the margin and the safety factor is appropriate when the manufacturer confirms the derating basis

C. The reasoning is partially correct — only 50% of the 25% safety factor may be reclaimed for operational use

D. The reasoning confirms the lift is safe — proceed with the 88% lift with confidence in the combined margin

47. A crane's load chart for the on-outrigger full extension section shows: 100-ft boom at 35 ft = 27,800 lbs; 40 ft = 22,000 lbs; 45 ft = 17,200 lbs. The blank at 50 feet confirms the maximum rated radius is 45 feet. A planned critical lift has a pick at 40 feet and a set at 43 feet. The total suspended weight is 19,600 lbs. Using the conservative approach at both positions, does the lift proceed, and what governs?

A. Nothing — at the set position (43 ft), conservative capacity at 45 ft = 17,200 lbs; 19,600 lbs exceeds 17,200 lbs; the lift cannot proceed to the set location in this configuration

B. Conservative capacity at 40 ft = 22,000 lbs governs both positions; 19,600 lbs is within 22,000 lbs; lift proceeds

C. Nothing — the conservative capacity at set (45 ft = 17,200 lbs) governs both positions since it is the most restrictive; 19,600 lbs exceeds 17,200 lbs; the lift cannot proceed

D. Conservative at pick (40 ft) = 22,000 lbs; conservative at set (43 ft) = 17,200 lbs at 45 ft; 19,600 lbs exceeds 17,200 lbs — the lift cannot proceed to the planned set location; the set location must be redesigned to keep the operating radius within 40 feet where the 22,000-lb conservative capacity supports the load

48. A crane load chart contains a note: "For operations where the load line is reeved with fewer than 4 parts of line, use the single-line pull capacity table in Appendix C rather than the values shown in this section." The crane is currently reeved with 2-part line. The Appendix C table is not present in the operator's copy of the chart. What must happen before operations begin?

A. Nothing — 2-part line operations can use the main section values since they are more conservative than single-line

B. The operator must obtain a complete copy of the load chart including Appendix C before operations begin — the note explicitly directs 2-part line operations to a different section; using the main section values for 2-part reeving applies capacity values derived for 4-part reeving to a configuration with different structural loading and single-line pull characteristics; without Appendix C, no valid capacity values exist for the current 2-part reeving configuration

C. The operator may use the main section values reduced by 50% since 2-part line provides half the mechanical advantage of 4-part line

D. The lift director may authorize using the main section values temporarily while Appendix C is obtained

49. A crane load chart note reads: "All capacities in this section are contingent on the crane being positioned on a surface with a bearing capacity of at least 5,000 psf as confirmed by a geotechnical

engineer." The controlling entity provides a soil report showing 5,200 psf bearing capacity. The soil report is 8 months old. Does the note's condition appear to be satisfied?

A. The 5,200 psf bearing capacity confirmed in the soil report satisfies the note's 5,000 psf minimum requirement

B. The soil report is 8 months old — while the documented capacity (5,200 psf) exceeds the note's 5,000 psf minimum, the current bearing capacity may differ from what was documented 8 months ago due to weather, construction activity, or soil disturbance; the note's condition requires confirmed bearing capacity, not historical documentation; the operator should confirm with the controlling entity whether the 8-month-old report reflects current conditions before relying on these capacity values

C. An 8-month-old engineering report satisfies any current project requirement indefinitely

D. The soil report exceeds the minimum by only 200 psf — apply a 10% conservatism deduction to all capacity values

50. A crane load chart shows: 100-ft boom at full outrigger extension: 25 ft = 44,600 lbs; 30 ft = 35,200 lbs; 35 ft = 27,600 lbs. The rate of capacity decrease per foot: 25–30 ft = 1,880 lbs/ft; 30–35 ft = 1,520 lbs/ft. A planned lift at 33 feet uses linear interpolation between 30 and 35 feet. What is the interpolated capacity?

A. Interpolated capacity at 33 ft = 35,200 − (3 × 1,520) = 35,200 − 4,560 = 30,640 lbs; confirming: drop per foot 30–35 ft = (35,200 − 27,600) ÷ 5 = 7,600 ÷ 5 = 1,520 lbs/ft; at 33 ft (3 ft beyond 30 ft): 35,200 − 4,560 = 30,640 lbs

B. Interpolated capacity = 35,200 − (3 × 1,880) = 29,560 lbs using the wrong interval rate

C. Interpolated capacity = 27,600 + (2 × 1,520) = 30,640 lbs — interpolating forward from 35 ft with an addition error

D. Interpolated capacity = (35,200 + 27,600) ÷ 2 = 31,400 lbs using the midpoint average method

51. A crane load chart for a luffing jib shows: "50-FT JIB — 120-FT MAIN BOOM — MAXIMUM COUNTERWEIGHT — 25° JIB OFFSET": at 30 ft = 16,400 lbs; at 35 ft = 13,200 lbs; at 40 ft = 10,400 lbs. The planned jib angle produces a 32-foot operating radius. Using the conservative approach, what capacity governs?

A. Conservative capacity at 30 ft = 16,400 lbs — the conservative approach uses the next LARGER tabulated value; wait, 30 ft is less than 32 ft, not larger; re-evaluating

B. Nothing — interpolated capacity at 32 ft = 15,112 lbs; the lift proceeds using interpolation

C. Nothing — the conservative approach at 30 ft = 16,400 lbs governs since 32 ft is between 30 and 35 ft

D. Conservative capacity at 35 ft = 13,200 lbs; the conservative approach uses the next larger tabulated radius beyond the actual radius of 32 feet; the next larger tabulated radius is 35 feet; 13,200 lbs governs conservatively for the 32-foot operating radius

52. A crane load chart shows a section for "ON OUTRIGGERS — 50% EXTENSION — 100-FT BOOM" and a section for "ON OUTRIGGERS — FULL EXTENSION — 100-FT BOOM." The 50% extension section shows 18,400 lbs at 35 feet; the full extension section shows 28,600 lbs at 35 feet. The crane's actual outrigger extension is confirmed at 75%. Which section applies?

A. Nothing — the 50% extension section applies as the more conservative available section

B. The 75% extension configuration is between the two rated positions — neither the 50% nor the 100% section accurately represents the actual configuration; the operator must use the 50% extension section as the most conservative rated section that does not overstate capacity for the actual 75% configuration, or contact the manufacturer for a 75% extension capacity value

C. Nothing — the full extension section applies since 75% is above 50% and moving toward full extension

D. The operator may interpolate between the 50% and 100% sections based on the proportional spread to estimate the 75% capacity

53. A crane load chart note reads: "The following capacities reflect on-rubber (carrier-supported) operations. Before using these values, confirm the carrier suspension system is functional and all tires are at the manufacturer's specified inflation pressure." The operator confirms the suspension is functional but has not checked tire pressure. One tire is visibly lower than the others — estimated at 60% of its normal inflation. What must happen?

A. Nothing — tire pressure variations of 40% do not affect crane structural capacity values

B. The visibly under-inflated tire must be inflated to the manufacturer's specified pressure before these capacity values can be used — the note explicitly conditions the capacity values on confirmed tire pressure; under-inflation reduces the tire's load-carrying capacity and changes the crane's effective tilt angle; a 40% pressure deficit in one tire creates an asymmetric support condition that was not accounted for in the capacity analysis; the note's condition cannot be satisfied with an under-inflated tire

C. Apply a 10% capacity reduction for the single under-inflated tire and proceed

D. The under-inflated tire may be used for light lifts below 50% of the tabulated on-rubber capacity

54. A crane's load chart shows the following for the on-outrigger full extension, all-directions, maximum counterweight section: 35 ft = 28,800 lbs; 40 ft = 22,600 lbs; 45 ft = 17,400 lbs. A series of 12 identical picks is planned at 37 feet of operating radius with a total suspended weight of 20,800 lbs. Using the conservative approach, what capacity governs and what additional requirement applies to each lift in the series?

A. Conservative capacity at 40 ft = 22,600 lbs; 20,800 lbs is within capacity; lift percentage = 92.2%; each lift exceeds the 75% critical lift threshold — a written critical lift plan and pre-lift meeting are required; additionally, before each lift in the repetitive series, the operator must confirm the crane remains level, the configuration is unchanged, and ground conditions are unaltered from the previous lift

B. Nothing — repetitive lifts only require the initial critical lift plan confirmation; subsequent identical lifts proceed automatically

C. Conservative capacity at 40 ft = 22,600 lbs; lift percentage = 92.2%; critical lift documentation is required only for the first lift; subsequent identical lifts at the same percentage are exempt from the critical lift requirement

D. Conservative capacity at 35 ft = 28,800 lbs; 20,800 lbs is within this — use the conservative approach from the smaller adjacent tabulated entry

55. A crane load chart shows: "ON OUTRIGGERS — FULL EXTENSION — 100-FT BOOM — STANDARD GANTRY." The crane on site has an extended gantry installed. The extended gantry section is on page 12 of the load chart, which is present and legible. The extended gantry section shows 18% higher capacity values at 35 feet than the standard gantry section. The operator uses the standard gantry section, reasoning it is more conservative. What error does this reasoning contain?

A. Nothing — using a lower-capacity section is always acceptable for additional conservatism

B. Nothing — the standard gantry section is a valid conservative choice when the actual configuration provides higher capacity

C. Nothing — the operator's conservative approach is a best practice regardless of which section is higher

D. The operator must use the section matching the actual physical configuration — the extended gantry section applies because the extended gantry is physically installed; the standard gantry section was derived for a different structural geometry and load path; applying its values to the extended gantry configuration is applying capacity values from a structurally different crane regardless of which direction the values differ; the extended gantry section must be used

56. A crane load chart section note reads: "All capacities in this section are based on the crane operating with the standard 6-part wire rope reeving. For 4-part or 2-part reeving, see single-line pull rating table." The operator is using 6-part reeving as specified. During the lift, the operator considers switching to 4-part reeving to increase hook speed. What must happen before the change?

A. Nothing — switching reeving is a crane configuration change that has no effect on the applicable load chart section

B. The operator may switch to 4-part reeving since the single-line pull rating table will still be available

C. Switching to 4-part reeving is not permitted during an active lift — additionally, the operator must stop, lower the load, and consult the single-line pull rating table to confirm the 4-part reeving has adequate capacity for the planned load before re-reeving; the standard section values no longer apply after the reeving change; the capacity for 4-part reeving is in a different section that must be confirmed adequate before any lifting with the new configuration

D. Contact the lift director before any mid-shift reeving changes regardless of the planned load weight

57. A crane load chart for the on-outrigger full extension, 360-degree all-directions section shows: 20 ft = 56,200 lbs; 25 ft = 44,800 lbs; 30 ft = 35,400 lbs; 35 ft = 27,600 lbs. The capacity decreases 24,300 lbs from 20 to 35 feet. A planned lift at 22 feet has a total suspended weight of 52,000 lbs. What is the compliance status using the conservative approach?

A. Nothing — the conservative approach uses the 25-ft capacity (44,800 lbs); 52,000 lbs exceeds 44,800 lbs — the lift cannot proceed; incorrect reasoning shown

B. Nothing — the interpolated value at 22 ft = 53,720 lbs; 52,000 lbs proceeds with interpolation

C. Conservative capacity at 25 ft = 44,800 lbs; total suspended weight (52,000 lbs) exceeds 44,800 lbs — the lift cannot proceed using the conservative approach; the operator must reduce the total suspended weight or reposition to 20 feet or less where the 56,200-lb tabulated capacity directly supports the load

D. Conservative capacity at 20 ft = 56,200 lbs; 52,000 lbs is within the prior tabulated value — use the smaller tabulated entry as the conservative governing value

58. A crane's manufacturer load chart shows a single tabulated section titled: "ON OUTRIGGERS — FULL EXTENSION — ALL BOOM CONFIGURATIONS 60 TO 120 FT." The section shows a single set of capacity values that apply to all boom lengths from 60 to 120 feet. The crane is configured with an 80-foot boom. What must the operator understand about using this section?

A. The operator must use the most conservative capacity column in this section since the section covers multiple configurations with a single set of values — the single capacity set was likely derived for the worst-case configuration within the 60–120 ft range, making it applicable to all boom lengths in the range; however, the operator must verify this interpretation is confirmed by the section's notes before relying on this reasoning; if the section has no qualification notes, confirm the interpretation with the manufacturer

B. The single capacity set is derived for the 120-foot boom configuration and is conservative for all shorter booms

C. Nothing — the single capacity set applies identically to all boom lengths between 60 and 120 feet; no special interpretation is needed

D. Nothing — use the tabulated values without concern since the manufacturer would not publish values unsafe for any configuration within the stated range

59. A crane load chart note reads: "The capacities in this section were established under ideal conditions with no wind loading on the crane structure. For operations with sustained winds above 20 mph, contact the manufacturer for wind derating guidance." The operator is performing a lift with sustained 22 mph winds. The manufacturer's technical representative is available by phone. What must the operator do before proceeding?

A. Nothing — 22 mph is within the crane's general 25 mph wind limit; the note is advisory for operations above 25 mph

B. The 22 mph sustained wind exceeds the note's 20 mph threshold — the manufacturer must be contacted for specific wind derating guidance before proceeding; the note establishes that the tabulated capacity values do not account for wind loading on the crane structure above 20 mph; operating with 22 mph sustained wind using unmodified capacity values means using values that do not reflect the actual loading conditions; the manufacturer's guidance is required before any lift at these wind conditions

C. Continue operations and document the wind speed for the manufacturer's review after the lift is complete

D. Nothing — manufacturer guidance notes are advisory and do not constitute binding requirements for field operations

60. A crane load chart shows that the crane's on-outrigger full extension section at 35 feet of radius has a different value in the "OVER FRONT" sector than in the "ALL DIRECTIONS" section. The over-front capacity is 42,400 lbs and the all-directions capacity is 33,800 lbs. The planned lift will pick at 10 degrees left of front center and swing to 75 degrees left of front center to set the load. What capacity must be used for lift planning?

A. The over-front capacity (42,400 lbs) governs since the pick occurs within the over-front sector

B. The all-directions capacity (33,800 lbs) governs the entire lift — the load must swing through and be set in the all-directions zone; the lower all-directions capacity applies throughout the swing path outside the over-front sector and at the set location; the total suspended weight must remain within 33,800 lbs for the entire lift

C. Average the two section capacities (38,100 lbs) for a lift spanning both sectors

D. The over-front capacity governs the pick and the all-directions capacity governs only the set point

61. A crane load chart for the on-outrigger full extension section shows that both the 80-foot and 100-foot boom sections show exactly the same capacity value at 25 feet of radius — 44,200 lbs — and both cells are white (stability-limited). The crane is configured with the 80-foot boom. What does the identical stability-limited value at two different boom lengths confirm?

A. The identical values indicate a printing error since longer booms always change the capacity

B. Nothing — the values are the same; either boom may be used at the same capacity without distinction

C. The identical stability-limited values at two different boom lengths confirm that the same stability condition governs at 25 feet for both configurations — the counterweight position, outrigger spread, and the load moment at 25 feet produce the same tipping resistance threshold regardless of which boom is installed; the capacity is set by the stability geometry (outrigger spread and counterweight position) rather than boom structural characteristics at this radius; the 80-foot boom operator should proceed normally using 44,200 lbs as the stability-limited capacity

D. The identical values mean the operator must verify the LMI is configured for the exact boom length since the same percentage applies to both

62. A crane load chart contains the following note: "When lifting loads that exceed 75% of the gross capacity in this section, the load must be weighed on a certified scale within 24 hours of the planned lift. Estimated or calculated weights are not acceptable above 75%." The operator has a recent bill of lading showing the load weighs 28,400 lbs — 82% of the gross capacity. The load was manufactured 6 days ago and weighed at the factory. What must the operator confirm?

A. The factory weight from the bill of lading satisfies the note's requirement for load weight confirmation at any capacity level

B. Nothing — a bill of lading is a legal document that satisfies all weight verification requirements under any load chart note

C. Nothing — manufacturer documentation always satisfies weight verification requirements regardless of timing

D. The note requires the load to be weighed on a certified scale within 24 hours of the lift — the factory weight from 6 days ago does not satisfy the 24-hour requirement; the load must be re-weighed on a certified scale within 24 hours before the lift can proceed; this requirement exists because loads can gain weight from moisture absorption, attached material, or field modifications after the original weighing; the factory measurement from 6 days ago cannot confirm the current weight

63. A crane load chart for a crawler crane shows: "ON CRAWLERS — MAXIMUM COUNTERWEIGHT — OVER FRONT — 150-FT BOOM": at 50 ft = 82,400 lbs; at 55 ft = 66,800 lbs; at 60 ft = blank. The maximum rated radius is 55 feet. A critical lift at 52 feet has a total suspended weight of 72,000 lbs. Using the conservative approach, what capacity governs?

A. Nothing — the interpolated capacity at 52 ft = 75,800 lbs; 72,000 lbs is within this value; the lift proceeds

B. Nothing — conservative capacity at 55 ft = 66,800 lbs; 72,000 lbs exceeds 66,800 lbs — the lift cannot proceed

C. Nothing — conservative capacity at 50 ft = 82,400 lbs; 72,000 lbs is within this — use the smaller tabulated value

D. Conservative capacity at 55 ft = 66,800 lbs; 72,000 lbs exceeds 66,800 lbs by 5,200 lbs — the lift cannot proceed at 52 feet using the conservative approach; the operator must either reduce the total suspended weight to below 66,800 lbs or reposition the crane to 50 feet or less where the 82,400-lb tabulated capacity supports the load directly

64. A crane load chart note reads: "DO NOT USE THESE CAPACITIES WHEN THE CRANE IS ON SLOPES EXCEEDING 0.5% GRADE IN ANY DIRECTION." The crane's inclinometer reads 0.4% in the fore-aft axis and 0.2% in the lateral axis simultaneously. The combined resultant out-of-level = $\sqrt{(0.4^2 + 0.2^2)} = \sqrt{(0.16 + 0.04)} = \sqrt{0.20} = 0.447\%$. Does the crane satisfy the note?

A. Nothing — both individual axis readings are within the 0.5% limit independently; the note is satisfied regardless of the combined resultant

B. The combined resultant of 0.447% is within the 0.5% note requirement — the crane satisfies the note's simultaneous grade condition in all directions; the crane may use these capacity values

C. The note requires evaluation of the worst individual axis — 0.4% is the worst axis; 0.4% < 0.5% — note satisfied

D. The combined resultant of 0.447% exceeds the 0.5% note requirement in the diagonal direction — the crane must be re-leveled

65. A crane load chart shows: 100-foot boom, on-outrigger, full extension, all-directions: 35 ft = 27,800 lbs; 40 ft = 22,000 lbs; 45 ft = 17,000 lbs. A planned lift at 42 feet of radius has a total suspended weight of 19,600 lbs. Using the conservative approach, the governing capacity is 17,000 lbs at 45 feet. The total suspended weight of 19,600 lbs exceeds 17,000 lbs. The operator considers repositioning to 38 feet. Using the conservative approach at 38 feet, what capacity governs and does the lift proceed?

A. Nothing — conservative at 38 ft uses the 40 ft entry = 22,000 lbs; 19,600 lbs is within 22,000 lbs; the lift proceeds after repositioning to 38 feet; the lift percentage = 89.1% which exceeds the 75% critical lift threshold — a written critical lift plan is required

B. Conservative at 38 ft still uses 45 ft = 17,000 lbs — the same governing value as at 42 ft; the lift still cannot proceed

C. Conservative at 38 ft uses the 40 ft entry = 22,000 lbs; 19,600 lbs is within capacity; the lift proceeds without special requirements since it is below 90%

D. Conservative at 38 ft uses the 35 ft entry = 27,800 lbs; 19,600 lbs is well within capacity; the lift proceeds easily.

Specialty Exam 12 Answer Key and Full Explanations

1. C — A 600 psi petroleum line represents a catastrophic rupture hazard — a pressurized petroleum release creates an immediate fire and explosion hazard in addition to the physical rupture force. The utility locate tolerance zone means the pipe could be within feet of the planned outrigger position, not at the marked centerline. Positive location through vacuum excavation confirms the pipe's exact position so the outrigger can be confirmed clear of the pipe's actual location.

2. A — OSHA 1926.1402 requires ground condition confirmation at each specific setup location before crane operations begin there. Soil types, underground utilities, and subsurface conditions vary across even small distances on a construction site. The confirmation at the original position applies only to that position — a new location requires its own independent confirmation regardless of the same-day timing or shared project ownership.

3. D — Soft organic clay is one of the least competent bearing soils — it has very low shear strength, high compressibility, and can consolidate progressively under sustained load. Six feet of granular fill

above it may distribute the surface pressure adequately, but the organic clay layer at depth still experiences increased stress from the crane loading above. This stress increase can cause long-term settlement and potential differential level changes during operations that must be evaluated by a geotechnical engineer.

4. B — Helical anchor installation applies torsional and vertical stress to the soil surrounding the anchor shaft, remolding and temporarily disrupting the soil structure in the adjacent zone. The torque drive also creates ground vibration during installation. In fine-grained soils, this disruption can temporarily reduce bearing capacity near the crane's outrigger positions. Monitoring for level change during installation and pausing if any change is observed is the appropriate operational control.

5. C — A localized darker, softer area in a compacted granular sub-base indicates a zone with different composition or moisture content — possibly wet fill, organic material, or improperly compacted material. The 6-inch hand-probe penetration confirms the material in this zone has significantly lower density than the surrounding sub-base. Placing the outrigger mat over this softer zone without investigation risks differential settlement that would cause the crane to tilt during operations.

6. A — The crane employer bears independent responsibility for confirming ground conditions are adequate for their specific crane loads. When the operator's field observations suggest the documented conditions may not reflect current reality, proceeding on documentation alone creates a foreseeable hazard. The discrepancy must be resolved through updated documentation, independent testing, or refusal to set up — not dismissed in favor of the controlling entity's paperwork.

7. D — Water pooling 2 feet from an outrigger and rising 4 inches over 45 minutes indicates active water accumulation that will continue to migrate into the soil in the bearing zone. As water infiltrates, the effective stress between soil particles decreases, directly reducing bearing capacity. The proximity and the active rising trend together indicate the bearing conditions beneath the right outrigger may change during continued operations — evaluation is required.

8. B — A 1-year-old utility locate mark provides only historical location information. Utilities can be relocated between locate and crane operations, and new utilities may have been installed in the intervening year. Without the original locate report, the utility's type, depth, and tolerance zone are unknown — the "X" mark alone provides no actionable safety information. Current, documented utility location information is required before outrigger positions can be safely confirmed.

9. C — Schedule 40 PVC at 18 inches of depth has minimal structural capacity for concentrated loads. Crane outrigger loads create bearing pressures that can far exceed the pipe's collapse pressure, causing

the pipe to crush and creating a void at 18 inches of depth. A void forming beneath three of four outrigger positions during operations could cause sudden bearing failure. Outrigger pads must be positioned and sized to avoid loading the soil directly above pipe centerlines.

10. B — When de-energization is not feasible, OSHA 1926.1408 requires the specific MSAD to be established based on the confirmed voltage, and an encroachment prevention plan must be in place with a dedicated spotter and a direct means of immediately stopping all crane movement. These three elements together constitute the minimum required controls when de-energization is unavailable. Operations may not begin until all three elements are confirmed in place and functional.

11. D — A standard surcharge analysis for sheet pile shoring assumes distributed construction loads — not concentrated point loads from crane outriggers. The specific outrigger reaction load at 8 feet from the wall creates a concentrated lateral earth pressure increase that may not have been included in the original shoring design's surcharge assumptions. The shoring engineer must confirm the system can safely carry the additional outrigger-induced lateral pressure before crane operations begin.

12. B — A crack developing parallel to the mat edge during an active shift indicates the surface material is experiencing tensile stress from the outrigger load that it cannot resist without cracking. This is the first visible sign of punching shear or splitting failure developing at the mat edge. Continued lifting at the current load can widen and extend the crack, potentially causing sudden surface failure. The crack must be assessed before any further loading occurs.

13. C — Gray-green soil with a putty-like consistency is a characteristic presentation of marine clay or highly plastic clay — a material with very low shear strength and extremely high compressibility. Marine clays can have bearing capacities near zero and can flow laterally under concentrated loads. Crane outrigger loading on this material without investigation would create an immediate bearing failure risk. Geotechnical evaluation is required before any crane setup in this zone.

14. A — High-volume irrigation at 400 gpm creates rapid soil saturation through lateral infiltration in the downhill direction toward the crane's outrigger zone. The original bearing capacity assessment was performed on dry soil — the same soil when saturated can have dramatically reduced bearing capacity, particularly in sandy or silty materials. The irrigation must be redirected or stopped before the saturation reaches the outrigger bearing zone.

15. D — A developing sinkhole indicates an active subsurface void that is still growing. Subsurface void systems are frequently interconnected and can extend many feet from the visible surface expression. At 35 feet, the void system may already extend beneath the crane's outrigger positions. Continued crane

loading on soil above an expanding void system accelerates void collapse. Operations must stop until ground conditions at all outrigger positions are confirmed stable.

16. B — Only the designated signal person or lift director may direct crane movements during an active lift. An unauthorized visitor stopping the crane mid-swing creates a hazardous half-completed lift condition. The operator must complete the movement to the nearest safe stopping point — the set location or a stable hold position — before addressing the visitor's request. Responding to unauthorized commands by stopping mid-swing creates additional risk.

17. C — OSHA 1926.1425 prohibits loads from passing over or being positioned over personnel under any circumstance. The operator's independent visual observation of a person in the fall zone overrides the signal person's HOIST signal — the operator has an independent obligation that the signal cannot negate. Sounding the emergency horn warns the person while the hold prevents the load from being positioned over them. Active signaling may only resume when the area is confirmed clear.

18. A — A crane tip-over subjects every structural member, connection, weld, and safety device to forces many times greater than normal rated operations. Even without visible damage, internal structural failures — cracked welds, bent connections, deformed members — can occur without surface evidence. OSHA 1926.1412(f) requires post-incident inspection before return to service precisely because visual inspection cannot confirm the absence of these internal failures.

19. D — The signal person's loss of line of sight means active signal communication ended the moment they stepped behind the column. The operator must stop all crane movement the moment the signal person loses line of sight — not when they return. The falling debris event may also have created obstacles in the load's travel path. Only when the signal person returns to an unobstructed position and confirms a clear path may movement resume.

20. B — A complete LMI failure removes the supplementary capacity monitoring tool during an active near-capacity lift. While the LMI is supplementary and not the primary capacity confirmation, operating at 84% with no LMI creates a condition where any unexpected load increase — from actual load weight discrepancy, radius increase from boom deflection, or centrifugal displacement — cannot be detected. Lowering the load allows the sensor fault to be investigated before deciding whether to resume.

21. D — Cast iron floor drain frames are designed for pedestrian and light vehicle loads — not 180,000-lb crane travel loads. The drain frame sits in an opening in the floor slab, and crane travel loading concentrated at the frame can crack or collapse the frame and its connection to the drain body. A sudden

drop of a crane track or tire into a collapsed drain can cause severe structural damage and potential tip-over. The travel path must bypass the drain or the drain must be bridged before travel.

22. A — Adjacent crane vibration transmitted through the ground creates cyclic loading and unloading of the bearing soil at the crane's outrigger positions. In fine-grained soils, this cyclic stress can generate pore water pressure that reduces effective stress and bearing capacity temporarily. The level indicator confirming the crane is currently level does not confirm soil capacity is adequate — it only confirms no measurable differential settlement has occurred yet. Any level change during vibration requires immediate operational stoppage.

23. D — OSHA 1926.1425 prohibits loads from being positioned over personnel with no exceptions for involuntary or instinctive actions. The crane operator's obligation is absolute — stopping all movement when a person is under the load is required regardless of how or why they entered the fall zone. The emergency horn alerts the person while the hold prevents the load from being over them. Movement resumes only when the zone is confirmed clear by the signal person.

24. B — An audible snap from the lower block area during a loaded lowering is a structural event at a critical location in the load path. Wire breaks, rope jumps, and fitting failures can all produce this sound and all can progress to complete load line failure during subsequent operations. The "snap" indicates a sudden change in the load path — continuing operations before inspection risks a complete failure during the next loaded lift. The rope and block must be inspected before any further use.

25. C — OSHA 1926.1416(d) requires physical barriers to prevent personnel from entering the space between the counterweight and any adjacent fixed structure. Workers focusing on the load's path naturally ignore the counterweight swinging in the opposite direction behind the crane. Physical barriers provide protection independent of worker awareness — verbal warnings and visual monitoring cannot guarantee that no one enters this crush zone during every crane movement throughout the shift.

26. A — Emergency lighting at 20% illuminating only the ground is inadequate for crane operations — the operator cannot confirm the load's height, clearances, or proximity to obstacles at 20 feet. The only safe authorized movement in this condition is to lower the load to the ground, using the ground surface as the known reference point at minimum speed. Holding the load at 20 feet waiting for full lighting restoration leaves a suspended load unmonitored for an indeterminate period.

27. D — The revised 5th pick weight changes the lift from a potentially uncritical lift to one confirmed at 88.6% — above the 75% critical lift threshold. Any critical lift requires a written critical lift plan before proceeding. The additional weight also changes the rigging requirements, outrigger load

calculations, and both cranes' capacity percentages. All affected parameters must be re-confirmed in writing before the 5th tandem pick proceeds.

28. D — The 97% LMI peak during the gust demonstrates that the flat panel's large wind area creates load moment additions that approach rated capacity at winds below the general limit. The general wind limit was established for compact loads — a 12×20 foot flat panel has over 240 square feet of wind-exposed area, generating forces many times those on a compact load at the same speed. Without wind management controls, additional gusts could push the crane beyond rated capacity.

29. C — A medical emergency in a suspended personnel platform requires the fastest safe descent possible. The platform must reach the ground so emergency medical personnel can access the affected worker — this cannot happen while the platform remains at 55 feet. OSHA 1926.1431 requires controlled lowering at the fastest safe rate. Calling emergency services, notifying the lift director, and all other responses are secondary to getting the platform to the ground.

30. C — A 3-minute unexplained absence means conditions in the area below the load may have changed in ways the operator cannot know. The signal person returning and immediately giving a LOWER signal does not confirm what changed during the absence. Before lowering, the operator must visually confirm the area below is clear and re-establish confirmed communication — confirming both parties are ready and the area is confirmed clear — before executing any downward movement.

31. D — A nick on a high-strength alloy steel master link creates a stress concentration at the notch tip. Under repeated loading, the stress at the notch tip can be several times the nominal stress — sufficient to initiate a fatigue crack in high-strength steel. High-strength materials are more notch-sensitive than mild steel, meaning a smaller notch creates proportionally greater stress concentration. The master link carries the total load from all bridle legs and must be evaluated against ASME B30.9 removal criteria.

32. B — UV radiation photodegrades synthetic polymer chains — the same energy that fades the dye also breaks structural bonds in the load-bearing fibers. ASME B30.9 includes visible UV fading as a removal condition because it is a direct physical indicator that structural capacity has been reduced. The color change confirms cumulative UV energy has been absorbed — the fiber degradation is present even though no cuts or tears are visible.

33. C — An undocumented saddle splice means no approved repair procedure was followed, no qualified welder certification was recorded, and no confirmation that the repair restores the original structural capacity exists. The splice changes the member's stiffness and stress distribution at the splice location. Without documentation, neither the repair quality nor its structural adequacy can be confirmed.

The manufacturer or a qualified structural engineer must evaluate the repair before any rated-load operations.

34. A — A single taut chain leg in a 3-leg bridle means one leg is carrying 100% of the load — not the planned one-third share. If the leg's WLL was selected for one-third of the total load, the single overloaded leg may be at or above its rated capacity. The two slack legs provide zero load sharing. The geometry error that caused this condition must be identified and corrected before re-picking the load.

35. D — A swivel requiring 15 ft-lbs to rotate will accumulate torsional energy from load rotation rather than releasing it through swivel rotation. As the load rotates, twist accumulates in the wire rope above the swivel. When the accumulated twist energy exceeds the swivel's resistance torque, it releases suddenly — potentially in a rapid untwisting event that can disengage shackle pins, unscrew threaded hardware, or cause violent load oscillation. The swivel bearing must be repaired before any lifting.

36. B — ASME B30.5 treats kinks as an unconditional removal condition. A kink permanently deforms the rope's internal geometry — the wires and strands cannot return to their designed positions after plastic deformation. The stress concentration at the kink apex is permanent and cannot be corrected by straightening. There is no authorized monitoring period, no reduced-capacity use, and no field repair that makes a kinked rope serviceable for crane operations.

37. C — Slewing ring gear lubricant is overdue by 16 months on a 12-month interval. Degraded lubricant loses its viscosity rating and anti-wear additive package over time and through thermal cycling. Without adequate lubrication, gear tooth contact creates metal-to-metal friction during swing operations, producing accelerated tooth wear. Progressive gear tooth wear increases backlash, creates impact loading at each tooth mesh, and can ultimately cause gear tooth failure during an operational swing.

38. A — Glazing occurs when friction material is overheated to the point where the surface vitrifies — the heat treatment fundamentally changes the surface from rough, high-friction material to a smooth, low-friction surface. The glazed surface has dramatically reduced coefficient of friction, meaning the brake can slip at loads far below what the lining thickness would suggest it can hold. The hoist brake is the primary load-holding device — a glazed brake cannot be trusted with rated capacity operations.

39. D — A click that occurs exactly once per revolution of the upper works identifies a physical anomaly at one specific point on the slewing ring's circumference. As the upper works rotates, the anomaly contacts the ring gear path, drive pinion, or the ring's structural connection once per revolution. Possible causes include a damaged gear tooth, a missing or loose slewing ring bolt, or foreign material

in the gear track. Progressive impact at one point on every revolution accelerates the damage at that location.

40. B — Blue-black discoloration on steel wire rope is diagnostic of heat exposure sufficient to temper the steel — typically above 400°F. At these temperatures, the high-carbon steel's hardness and tensile strength are permanently reduced. The degree of strength reduction depends on the temperature reached and cannot be quantified without destructive testing. A rope with unknown heat-induced metallurgical changes cannot be relied upon for rated-load operations and must be removed from service.

41. C — ASME B30.10 specifies removal from service when any section of the hook shows more than 5% reduction in cross-sectional area. An 8% reduction exceeds this criterion. The hook's saddle carries the full suspended load — any section loss reduces the hook's ability to carry its rated capacity. Operating with 8% section reduction means the hook may fail at loads below its rated WLL, which is why the standard's 5% criterion exists as a conservative protective limit.

42. C — The manufacturer's minimum bend radius represents the tightest bend the hose can withstand without overstressing the inner tube and reinforcement layers. At a 1-inch actual bend radius versus the 5-inch minimum, the hose is being bent to one-fifth of its design limit on every boom hoist movement. Each flexing cycle stresses the inner tube beyond its design limits, accumulating fatigue damage. The hose will fail prematurely at the tight bend, releasing pressurized hydraulic fluid.

43. D — Conservative approach: next larger tabulated radius beyond 36 feet = 40 feet, capacity = 23,000 lbs. Total suspended weight = 26,800 lbs. Since 26,800 lbs exceeds 23,000 lbs by 3,800 lbs, the lift cannot proceed using the conservative approach at 36 feet. The operator must reduce the total suspended weight to below 23,000 lbs, reposition to 35 feet or less where 29,400 lbs governs, or find a configuration with higher capacity at 36 feet.

44. B — The note prohibits substituting pads "from any source" — but the critical qualifier is that the specified pads are being used. Pads with the same part number as the manufacturer's standard equipment are the specified pads, regardless of which crane they came from. The note was written to prevent non-standard pads from being used — not to prevent identical manufacturer-supplied pads from being used on a second identical crane.

45. C — Conservative approach: next larger tabulated radius beyond 27 feet = 30 feet, capacity = 33,600 lbs. Total suspended weight = 38,000 lbs. Since 38,000 lbs exceeds 33,600 lbs by 4,400 lbs, the lift cannot proceed using the conservative approach. The operator must reduce the total suspended weight to

below 33,600 lbs, or reposition the crane to 25 feet or less where the 42,800-lb tabulated capacity directly supports the 38,000-lb load.

46. A — The 25% reduction was applied once by the manufacturer when calculating the tabulated capacity — it is baked into the rated value. The operator's 88% is measured against the rated capacity, which is the maximum. The stability safety factor cannot be arithmetically combined with the operator's remaining margin to create a larger effective margin. The operator has only the 12% between 88% and 100% as working margin.

47. D — Conservative approach at pick (40 ft): exact tabulated entry = 22,000 lbs. Conservative approach at set (43 ft): next larger tabulated radius beyond 43 ft = 45 ft = 17,200 lbs. Total suspended weight = 19,600 lbs. Since 19,600 lbs exceeds the set's governing capacity of 17,200 lbs, the lift cannot proceed to the planned 43-foot set location. Redesigning the set location to within 40 feet where 22,000 lbs governs is the compliant solution.

48. B — The note explicitly directs operations with fewer than 4 parts of line to Appendix C — this is a binding redirection, not an option. The main section values were derived for 4-part reeving and apply different structural loading and single-line pull assumptions than 2-part reeving. Without Appendix C, no valid capacity values exist for the current configuration. A complete load chart is required before any operations begin.

49. C — The 5,200 psf documented capacity meets the note's 5,000 psf minimum requirement on its face. However, the 8-month-old report documents conditions at the time of testing — conditions that may have changed due to weather, construction disturbance, or soil saturation. The operator should confirm with the controlling entity whether current conditions match the documented conditions before relying on these capacity values. Historical documentation is not the same as current confirmed conditions.

50. A — Interpolation from 30 to 35 feet: capacity decrease = 35,200 − 27,600 = 7,600 lbs over 5 ft = 1,520 lbs/ft. At 33 ft (3 ft beyond 30 ft): 35,200 − (3 × 1,520) = 35,200 − 4,560 = 30,640 lbs. This is the correct interpolated capacity at 33 feet using the 30-to-35-foot interval rate of 1,520 lbs/ft.

51. D — Conservative approach: next larger tabulated radius beyond 32 feet = 35 feet, capacity = 13,200 lbs. The conservative approach always uses the next larger tabulated radius when the actual radius falls between tabulated entries. At 32 feet (between 30 and 35 feet), the next larger tabulated radius is 35 feet — making 13,200 lbs the governing conservative capacity for the 32-foot operating radius.

52. B — The crane's actual 75% outrigger extension falls between the two rated configurations. Neither the 50% nor the 100% section accurately represents the actual configuration — applying either one applies capacity values from a different physical setup. The conservative approach for an unrated intermediate extension position is to use the 50% section (the rated section below the actual extension that does not overstate capacity), or contact the manufacturer for a 75% rating.

53. C — The note's condition requires confirmation that all tires are at the manufacturer's specified inflation pressure. A tire at 60% of specified pressure has 40% less load-carrying capacity than a properly inflated tire. This under-inflation changes the effective crane support geometry and was not accounted for in the capacity analysis. The note's condition cannot be satisfied with a visibly under-inflated tire — the tire must be inflated to specification before these values apply.

54. A — Conservative capacity at the next larger tabulated radius beyond 37 feet = 40 feet, capacity = 22,600 lbs. Total suspended weight = 20,800 lbs. Lift percentage = 20,800 ÷ 22,600 × 100 = 92.2% — this exceeds the 75% critical lift threshold. A written critical lift plan and pre-lift meeting are required for each lift in the series. Before each repetitive lift, the operator must confirm level condition, unchanged configuration, and unaltered ground conditions.

55. D — Load chart sections must match the physical crane configuration — the correct section is determined by what is physically installed, not by which section shows lower values. The extended gantry changes the boom suspension geometry and structural load distribution throughout the crane. Using the standard gantry section for an extended gantry crane applies capacity values from a structurally different configuration regardless of the directional difference in values. The matching section is mandatory.

56. C — Switching reeving from 6-part to 4-part changes the applicable load chart section from the main section to the single-line pull table. This is a configuration change that cannot be made during an active lift — the load must be lowered before any reeving change. After re-reeving, the 4-part capacity must be confirmed adequate for the planned load from the appropriate section before any lifting. The main section values are invalid after the reeving change.

57. C — Conservative approach: next larger tabulated radius beyond 22 feet = 25 feet, capacity = 44,800 lbs. Total suspended weight = 52,000 lbs. Since 52,000 lbs exceeds 44,800 lbs by 7,200 lbs, the lift cannot proceed using the conservative approach at 22 feet. The operator must reduce the total suspended weight to below 44,800 lbs, or reposition to 20 feet or less where the 56,200-lb tabulated capacity directly supports the load.

58. A — A section covering all boom lengths from 60 to 120 feet with a single capacity set requires the operator to understand the basis for those values. The section was likely derived for the worst-case (typically the longest) boom configuration within the range, making it conservative for shorter booms. However, this interpretation must be confirmed by the section's notes or by the manufacturer — proceeding without confirming the basis could mean using values that were not intended to apply to all configurations within the range.

59. D — The note establishes a binding condition for operations above 20 mph sustained wind — manufacturer guidance is required before proceeding. The 22 mph wind exceeds this threshold, meaning the tabulated values do not account for the wind loading on the crane structure at this wind speed. Using unmodified values under conditions the note explicitly identifies as outside their basis means operating without valid capacity confirmation. The manufacturer's guidance must be obtained before any lift at 22 mph.

60. B — The load must swing from the over-front sector through the all-directions zone and be set at 75 degrees — well outside the over-front sector. The all-directions capacity of 33,800 lbs applies throughout the portion of the swing outside the over-front sector and at the set location. The total suspended weight must remain within 33,800 lbs for the entire lift because the load must travel through and be set in the all-directions zone where the lower capacity governs.

61. C — Identical stability-limited values at two different boom lengths confirm that the governing stability condition — the relationship between the counterweight's restoring moment and the load's overturning moment — produces the same tipping threshold at 25 feet regardless of which boom is installed. Adding boom length increased the tip mass at the boom tip but did not change the stability-governing parameters (counterweight position and outrigger spread) enough to change the capacity at this radius. The operator proceeds normally using 44,200 lbs.

62. D — The note's 24-hour weighing requirement is specific and binding — it requires the load to be weighed within 24 hours of the lift, not at any previous time. A factory measurement from 6 days ago cannot confirm the current weight because loads can gain weight from moisture absorption, attached hardware, or field modifications after the original weighing. The 82% lift percentage triggers the note, and the note's condition must be satisfied before proceeding.

63. D — Conservative approach: next larger tabulated radius beyond 52 feet = 55 feet, capacity = 66,800 lbs. Total suspended weight = 72,000 lbs. Since 72,000 lbs exceeds 66,800 lbs by 5,200 lbs, the lift cannot proceed at 52 feet using the conservative approach. The compliant options are to reduce the total suspended weight to below 66,800 lbs, or reposition the crane to 50 feet or less where the 82,400-lb tabulated capacity directly supports the load.

64. B — Combined resultant = $\sqrt{(0.4^2 + 0.2^2)} = \sqrt{(0.16 + 0.04)} = \sqrt{0.20} = 0.447\%$. The note requires the grade not to exceed 0.5% "in any direction" — the combined resultant represents the worst-case diagonal direction. At 0.447%, the combined resultant is within the 0.5% limit. The crane satisfies the note's condition and may use these capacity values.

65. A — Conservative approach at 38 feet: next larger tabulated radius = 40 feet, capacity = 22,000 lbs. Total suspended weight = 19,600 lbs. Since 19,600 lbs is within 22,000 lbs, repositioning to 38 feet allows the lift to proceed. Lift percentage = $19{,}600 \div 22{,}000 \times 100 = 89.1\%$ — this exceeds the 75% critical lift threshold, requiring a written critical lift plan and pre-lift meeting before the repositioned lift begins.