SIMULATION SET 3

DOMAIN BREAKDOWN — 95 QUESTIONS:

SITE DOMAIN — Questions 1–21

1. A mobile crane is being set up on a job site where the only available outrigger positions are on a surface that was graded and compacted by the general contractor two days before the planned lift. The compaction work is not documented with any testing results. Which of the following is the most appropriate action before crane setup proceeds?

A. Accept the compacted surface since the general contractor bears responsibility for ground preparation under OSHA 1926.1402

B. Perform the lift at 75% of rated capacity as a precaution when ground compaction documentation is unavailable

C. Require bearing capacity documentation or a qualified person's evaluation of the compacted surface before finalizing outrigger positions

D. Set up the crane and perform a preliminary test pick at 50% capacity to observe ground behavior before the full lift

2. Which of the following correctly states the general relationship between cribbing contact area and ground bearing pressure for a crane outrigger?

A. Doubling the cribbing contact area cuts the ground bearing pressure in half for the same outrigger reaction load

B. Doubling the cribbing contact area doubles the ground bearing pressure because more surface area transmits more force

C. Cribbing contact area affects only the distribution of load to adjacent soil layers and does not change bearing pressure at the surface

D. Ground bearing pressure is independent of cribbing size and depends solely on the outrigger reaction load magnitude

3. A crane operator is performing pre-shift inspection and discovers that the fluid collected at the bottom of the cab overnight appears orange-brown in color, has a petroleum odor, and is present in a volume of approximately half a cup. What is the most likely source of this fluid and the required action?

A. The fluid is likely transmission fluid from a worn seal — add fluid to the transmission and monitor during the shift

B. The fluid is likely windshield washer solution that leaked from the reservoir — clean up the spill and continue operations

C. The fluid is likely coolant from the cab's heating system — add coolant to the reservoir and check for leaks before operating

D. The fluid is likely hydraulic fluid from a fitting or line within the cab — identify the source, confirm it is not a pressurized leak, and have the system inspected before continuing operations

4. Under OSHA 1926.1402, the term "firm" as applied to ground conditions required for crane setup means which of the following?

A. The ground surface must be paved with asphalt or concrete capable of supporting vehicle traffic

B. The ground must be capable of supporting the crane's weight and operating loads without excessive settlement, shifting, or failure during setup and operations

C. The ground must have a documented bearing capacity of at least 2,000 psf as verified by a geotechnical engineer

D. The ground must be reinforced with engineered crane pads when soft soil conditions are identified

5. A telescopic boom crane is set up and leveled on firm ground. During the first lift of the shift, the operator observes through the cab window that one side of the crane appears to have settled slightly — the ground on the right rear side looks disturbed around the outrigger pad. What should the operator do?

A. Continue the current lift to the set position and then evaluate the ground condition during the next lift cycle

B. Reduce the operating radius for all remaining lifts to decrease the load on the settled outrigger position

C. Stop all crane movement immediately, lower the load to the ground, and inspect the ground condition at the right rear outrigger before any further lifting occurs

D. Adjust the right rear outrigger jack to re-level the machine while maintaining the load at its current height

6. Which of the following describes the correct use of the 811 utility locate system in the context of crane setup?

A. Dialing 811 notifies the utility location service, which contacts member utility operators who then mark the approximate location of their underground lines on the surface before the work begins — this must be completed before any crane outrigger is placed in an area where underground utilities may be present

B. Dialing 811 provides the caller with a map of all underground utilities in the planned work area delivered electronically within 24 hours

C. The 811 system applies only to excavation work and is not required for crane setup operations that do not involve ground disturbance

D. The 811 system must be used only when the crane will be operating within 20 feet of a confirmed utility location

7. A crane is operating on a job site next to a completed building. The crane's working radius for a specific lift requires the boom to pass over the corner of the building's roof. What is the primary site-related concern this creates?

A. The building's masonry construction may create radio frequency interference with the crane's LMI system

B. The roof materials may create a slipping hazard for the signal person if they need to climb onto the roof

C. The crane's rated capacity does not account for lifts over structures and requires a special certification

D. The load path over the building creates a risk of injury to personnel inside the building and damage to the structure if the load is dropped or if the rigging fails

8. What is the specific OSHA citation classification for a crane safety violation that an employer knew about but failed to correct, and which carries the highest potential penalty?

A. Serious violation — the employer knew about the hazard

B. Willful violation — the employer intentionally failed to correct a known hazard

C. Other-than-serious violation — the hazard exists but is unlikely to cause serious injury

D. Repeat violation — the same violation was cited within the past five years

9. A crane is being relocated to a new setup position on the same job site after completing a series of lifts. The planned travel route crosses a fresh concrete pour that was completed 18 hours ago. The concrete mix design specified a minimum 4,000 psi compressive strength at 28 days. What is the concern with traveling over this concrete?

A. The fresh concrete surface will be damaged cosmetically by the crane's tires but is structurally capable of supporting the crane's weight after 18 hours of curing

B. The 28-day design strength specification is irrelevant since concrete reaches 70% of design strength within 24 hours of placement

C. Concrete at 18 hours of age has achieved only a small fraction of its design compressive strength and may not support the crane's travel loads — a structural assessment of the early-strength concrete is required before the crane travels over it

D. Concrete pours less than 48 hours old are automatically exempt from crane travel restrictions under OSHA 1926 Subpart CC

10. An operator discovers during site assessment that one of the planned outrigger positions will be located directly above a storm sewer box culvert that runs 3 feet below grade. The culvert is 4 feet wide and 3 feet tall with reinforced concrete walls. What action is appropriate?

A. Have the reinforced concrete culvert structurally evaluated by a qualified engineer to determine whether it can support the specific outrigger reaction load at that position before setup proceeds

B. Proceed with setup since reinforced concrete culverts are designed for traffic loading and can support crane outrigger loads without evaluation

C. Move the outrigger 2 feet away from the culvert centerline as a standard precaution

D. Install additional timber cribbing to bridge the culvert and distribute the outrigger load to the surrounding soil

11. Under OSHA 1926.1424, what is the purpose of establishing an exclusion zone around crane operations and who may enter it?

A. The exclusion zone limits noise exposure to workers in adjacent areas — only workers with hearing protection may enter

B. The exclusion zone restricts crane movement — the operator must stop all crane movement whenever the zone boundary is visible from the cab

C. The exclusion zone defines the area where equipment maintenance may occur during lift operations

D. The exclusion zone protects personnel from being struck by the rotating crane, counterweights, or a swinging load — only personnel with a specific role in the lift that requires their presence may enter

12. A crane is set up on outriggers and the lift director notices that the outrigger pads on the left side of the crane are resting on paved asphalt while the right side pads are on compacted gravel. Both surfaces appear stable. What concern does this mixed-surface condition create?

A. Asphalt surfaces are always rated for higher bearing capacity than gravel and the asymmetry is beneficial

B. The asphalt and gravel surfaces may have different stiffness characteristics, causing unequal settlement under load and potentially shifting the crane's level condition during the lift

C. Mixed surface conditions are standard practice and require no special evaluation

D. The only concern with mixed surfaces is the aesthetic appearance of uneven cribbing heights

13. A crane is positioned to perform a lift near an active railroad. The signal person is positioned between the railroad track and the crane, with both the load and the track in their view. During the lift, a train approaches. What is the correct response regarding the signal person's position?

A. The signal person may remain in position as long as they can maintain awareness of both the load and the approaching train simultaneously

B. The signal person should move closer to the crane to allow the train more clearance while continuing to direct the lift

C. The signal person must immediately move to a safe distance from the railroad right-of-way — the lift must stop until the train has passed and the signal person can resume from a safe position with clear sight lines

D. The signal person should wave to the train operator to confirm awareness and then continue directing the lift

14. What does the term "angle of repose" mean in the context of crane site assessment near excavations?

A. The natural angle at which a specific soil type will remain stable without lateral support — relevant to assessing whether an excavation slope will remain stable when additional surcharge loads from crane outriggers are applied nearby

B. The recommended boom angle for maximum stability during crane operations

C. The maximum slope gradient permitted for crane travel during pick-and-carry operations

D. The angle at which the crane's counterweight approaches the horizontal during maximum boom angle operations

15. Under ASME B30.5, what specific condition must exist before the first load-bearing lift of a work shift begins?

A. The lift director must have reviewed and signed the day's lift plan

B. The crane's fuel level must be confirmed as sufficient for the planned work shift duration

C. All required inspection items must have been verified and any deficiencies either corrected or reported and the crane authorized for operation

D. The annual inspection certificate must have been reviewed and confirmed as current by the operator

16. A crane is set up with all four outriggers deployed and the crane leveled. The lift director observes that the crane is level but one outrigger jack is extended 6 inches further than the other three to accommodate a depression in the ground surface at that corner. What concern does this create beyond the level condition itself?

A. The unequal jack extension reduces the crane's hydraulic system efficiency by increasing the stroke on one cylinder

B. The outrigger at the deeper depression position may be sitting above a subsurface void or soft zone that allowed the pad to sink into the depression — the ground condition at that specific location requires evaluation

C. Unequal jack extension is normal and expected when the ground surface is not perfectly flat

D. The extended jack provides additional stability to the low-corner outrigger and improves the crane's stability margin

17. A job site safety plan requires that all crane lifts within 50 feet of occupied buildings be cleared with the building's safety officer before beginning. The lift director asserts that this requirement applies only to critical lifts and directs the operator to begin a lift at 38 feet from an occupied office building without the required clearance. What is the correct response?

A. The operator should reduce the operating radius to 55 feet to move outside the 50-foot requirement zone

B. The operator should verify the site safety plan's requirement and comply with it before beginning the lift, regardless of the lift director's instruction — site safety plan requirements are enforceable obligations

C. The lift director has the authority to waive site safety plan requirements for non-critical lifts when schedule requires

D. The operator must notify OSHA before beginning any lift within 50 feet of an occupied building

18. An operator is working on a job site in an area where the ambient temperature has been above 95°F for the past three days. The ground consists of expansive clay that is known to shrink and crack when dry and expand and soften when wet. No rain has occurred in two weeks. What ground condition concern does the hot, dry weather create for crane setup?

A. Dry, cracked expansive clay develops a hard, brittle surface layer that may appear stable but can fracture unpredictably under concentrated outrigger loads — the bearing capacity of dried expansive clay may be significantly different from the assessed capacity, and cracks in the surface indicate the soil has lost cohesion in the upper layer

B. Hot weather increases soil bearing capacity because moisture evaporation consolidates the clay

C. Two weeks without rain is insufficient to affect clay bearing capacity since clay changes occur only after 30 or more dry days

D. The dry conditions are favorable for crane operations since dry clay has higher bearing capacity than wet clay without exception

19. What is the correct color of utility locate markings indicating natural gas, oil, or other petroleum product pipelines under the APWA uniform color code?

A. Red, which covers all pressurized underground utilities

B. Purple, which covers all petroleum and fuel-related underground infrastructure

C. Orange, which covers all energy-related utilities including gas and oil

D. Yellow, which specifically indicates gas, oil, steam, petroleum, and gaseous materials

20. A telescopic boom crane operator is asked to set up for a lift in an area where underground parking exists beneath the paved surface. The parking garage is confirmed to be directly below one of the planned outrigger positions. The structure was designed for parking traffic loads. What must be determined before the operator sets up at that position?

A. Whether the parking garage is currently occupied by vehicles — if empty, the structure can support crane outrigger loads

B. Whether the parking structure's roof slab at that position is structurally rated to support the specific crane outrigger reaction load, which must be determined by a structural engineer

C. Whether the crane's outrigger pad is larger than the parking structure's column spacing

D. Whether the parking garage was built within the past 10 years, as newer construction standards provide adequate capacity for crane operations

21. A crane operator is directed to perform a lift in an area that is visible on the site plan as a designated "engineered crane pad" location. The pad was installed by the foundation contractor three weeks earlier. Before setting up on the engineered pad, what should the operator verify?

A. That the site plan shows the crane pad dimensions match the crane's outrigger spread

B. That no other equipment has been parked on the pad since its installation, since vehicle loads can damage engineered pads

C. That the engineered pad was designed and constructed for the specific crane model and configuration planned for the lift — engineered pads are crane-specific and model assumptions must be verified

D. That the surface of the pad is clean and free of debris before outrigger deployment

OPERATIONS DOMAIN — Questions 22–48

22. An operator receives a hand signal from the signal person showing a closed fist with the thumb pointing straight up. What crane movement does this command?

A. Raise the boom angle — the signal is the RAISE BOOM signal with arm extended and thumb up

B. Hoist the load upward using the main hoist drum

C. Extend the telescopic boom sections to increase boom length

D. Use the main hoist — the fist tap on the hard hat followed by thumb up indicates main hoist selection

23. Under OSHA 1926.1431, what action must the operator take if fire breaks out in the crane cab while personnel are suspended in a personnel platform?

A. Continue to hold the platform at current height while fighting the fire with the cab extinguisher

B. Lower the platform to the ground as quickly as safely possible using the hoist controls before evacuating

C. Request help from ground personnel to operate the crane while the operator evacuates the cab

D. Jump clear of the crane immediately using the emergency egress procedure — land with feet together and shuffle away from the machine without touching the ladder or crane body during exit

24. A load of 28,000 pounds is being hoisted using a two-part line configuration. As the load approaches mid-height, the operator feels unusual vibration through the controls. The LMI is reading 82% of capacity. What is the most appropriate immediate action?

A. Increase hoist speed to move the load quickly through the vibration-inducing height

B. Stop hoisting and hold the load at current height while assessing the source of the vibration before continuing

C. Lower the load at maximum speed to get it to the ground before the vibration worsens

D. Contact the signal person by radio to confirm whether the vibration is visible from the ground

25. During a critical lift at 89% of rated capacity, the operator must swing the load 180 degrees to reach the set location. The swing covers the full arc from one side of the crane to the other. What does the operator need to verify regarding capacity throughout this movement?

A. Only the starting position and ending position radii need to be verified — the arc between them is automatically within capacity if both endpoints are within capacity

B. The capacity must be confirmed along the entire swing arc, including any position where the load's effective radius may be greater than at the pick or set points due to boom geometry changes during the swing

C. A 180-degree swing requires a separate critical lift plan beyond the one already prepared for the primary lift

D. The operator may increase the operating speed during the middle of the swing where the radius is typically shortest and capacity is highest

25. During a critical lift at 89% of rated capacity, the operator must swing the load 180 degrees to reach the set location. The swing arc passes through a position where the boom is directly over the side of the crane. What does the operator need to verify regarding capacity throughout this movement?

A. Only the starting position and ending position radii need to be verified since both endpoints are within capacity

B. The capacity must be confirmed at all points along the swing arc — if the crane's load chart has directional capacity values, the capacity may change as the boom moves from one sector to another, and the load must remain within the rated capacity in every direction throughout the arc

C. A 180-degree swing automatically requires an upgrade to maximum counterweight before proceeding

D. The operator may accelerate through any intermediate position where capacity is temporarily reduced to minimize the time spent at that radius

26. Under OSHA 1926.1427, what specific obligation does the employer have regarding the operator's competency beyond verifying that the operator holds a valid NCCCO certification?

A. The employer must provide additional written certification that the operator is approved for the specific crane model being used

B. The employer must conduct an oral examination of the operator's knowledge of the load chart before each critical lift

C. The employer must ensure the operator has verified calibration of all safety devices before beginning a new project

D. The employer must evaluate and document that the operator is competent to safely operate the specific crane at the specific worksite — the employer's independent assessment is required in addition to the third-party certification

27. An operator is directed to perform a lift and receives the following information from the lift director: the load weighs "approximately 35,000 to 40,000 pounds." The crane's net capacity at the planned radius is 41,500 pounds. What is the correct response?

A. Use the upper estimate of 40,000 pounds for planning purposes and verify that the rigging weights keep the total below 41,500 pounds

B. Request a confirmed, documented load weight before beginning the lift — a weight range spanning 5,000 pounds is not a sufficiently confirmed load weight for planning a lift at this capacity percentage

C. The lift may proceed since both estimates are within the net capacity, confirming the lift is within rated limits

D. Average the two estimates at 37,500 pounds, add estimated rigging weight, and proceed if the total is below net capacity

28. What does the ASME B30.5 requirement for "positive load lowering" (also referred to as prohibition on free-fall) specifically require during crane operations?

A. The load must always be lowered at a speed greater than zero feet per minute

B. All lowering of loads must be accomplished using the hoist drum motor under power — the load cannot be allowed to descend by gravity alone through brake release without drum engagement

C. Lowering speed must be confirmed by LMI readout before each lowering operation

D. The load must be lowered by the drum brake release mechanism only when the hook block is above the midpoint of available travel

29. An operator is performing a lift when the site loses electrical power due to a grid outage. The crane's diesel engine continues to run normally and all hydraulic functions remain operational. The LMI system goes dark and displays no information. What should the operator do?

A. Continue the lift using the load chart from memory since the LMI failure is not a mechanical crane failure

B. Lower the load immediately because any LMI failure requires immediate cessation of operations

C. Proceed with the lift using the written load chart in the cab as the capacity reference — the LMI is an operational aid, not the primary capacity authority, and the written load chart remains valid

D. Contact the LMI manufacturer for remote diagnostics before deciding whether to continue

30. A signal person uses the standard TRAVEL signal — arm extended at shoulder height, fist closed, rotating in a forward circular motion. The crane is a crawler crane. What additional clarification may be needed before the operator executes the travel command?

A. The signal person should use the radio to confirm the travel speed before executing the movement

B. For crawler cranes, the TRAVEL signal should specify which track or both tracks are to travel — a single fist indicates one track while two fists rotating indicates both tracks

C. The travel signal is only used for wheeled cranes and should not be given to a crawler crane operator

D. The signal person should confirm the direction of travel by pointing before giving the travel signal

31. Which of the following describes the correct method for verifying that a crane's hoist brake is holding adequately during pre-shift functional testing?

A. Hoist a load slightly off the ground, release the hoist controls to neutral, and confirm that the load does not move, drift, or descend when the controls are released

B. Test the hoist brake by engaging the drum pawl and releasing the hydraulic pressure to confirm the pawl holds the drum

C. Lower a load at maximum speed and apply the hoist brake suddenly to confirm it stops the load quickly

D. The hoist brake is tested only during monthly inspections — pre-shift testing is not required under ASME B30.5

32. Under OSHA 1926.1416, which of the following is an operation that is specifically prohibited during crane operations regardless of configuration or load weight?

A. Performing a lift with the operator's window open during rain

B. Using the main hoist and auxiliary hoist simultaneously on different loads

C. Using the crane to drag or pull loads horizontally by applying lateral force through the load line

D. Performing a lift that requires the boom to pass over any personnel pathway on the job site

33. A crane is performing a lift where the load must be swung over an area where another crew is working below. The signal person confirms the area appears clear. What must the operator do before executing the swing?

A. Notify the other crew by radio that the load will be passing over their work area

B. Sound the crane's horn as a warning signal and then execute the swing once the horn signal has been given

C. Confirm visually or through the signal person that all personnel have physically cleared the area below the swing path before initiating the swing — OSHA 1926.1425 prohibits loads from passing over personnel

D. Reduce swing speed to the minimum when passing over any personnel area on the job site

34. An operator is instructed to hoist a concrete form panel that is 20 feet wide, 12 feet tall, and estimated to weigh 8,400 pounds. The rigging consists of a four-leg chain sling bridle. Wind speed on site is 24 mph. The crane's general wind limit for operations is 30 mph. What additional consideration must the operator evaluate before the lift?

A. A 24 mph wind is below the general limit and no additional evaluation is required

B. The 30 mph limit applies only to structural steel and the operator must reduce the limit by 20% for concrete panels

C. The signal person must be repositioned upwind of the load before the lift can proceed in 24 mph wind

D. The large flat surface of the panel acts as a sail in 24 mph wind, creating lateral forces that may exceed the crane's capacity assumptions — the operator must evaluate whether the wind force on the panel is acceptable for this lift regardless of the general wind speed limit

35. A crane's telescopic boom is being extended under a light load to reach a new pick position. After the boom extension is complete, the operator notices the LMI reading has jumped from 71% to 88%. No change was made to the load or the rigging. What is the most likely explanation?

A. The boom extension increased the operating radius by moving the hook farther from the crane centerline, and the lower capacity at the greater radius caused the LMI percentage to increase even though the load weight did not change

B. The LMI system recalibrated automatically during the boom extension, producing a corrected reading

C. The boom extension added rope to the reeving system, increasing the load on the hoist drum measurement sensor

D. The boom extension caused the counterweight to shift position, reducing the restoring moment and therefore the rated capacity

36. Under OSHA 1926.1417, what must the operator do if directed by a supervisor to perform a lift that would require exceeding the rated capacity shown in the load chart?

A. Perform the lift at the directed load and document that the instruction came from the supervisor

B. Contact the crane manufacturer for an emergency field authorization before complying with the supervisor's direction

C. Refuse the direction — the operator must not exceed rated capacity regardless of instructions from any party, and the operator's authority under OSHA 1926.1417 is unconditional in this regard

D. Reduce the operating radius until the rated capacity exceeds the load weight before complying with the direction

37. An operator is monitoring the crane's hydraulic system temperature gauge during heavy operations on a warm day. The gauge reads in the red zone, indicating overheating. What is the correct operational response?

A. Continue operations and notify the maintenance department at the end of the shift

B. Immediately stop crane operations, lower all loads to the ground, and allow the hydraulic system to cool before resuming — overheated hydraulic fluid loses viscosity and lubrication properties, risking pump and motor damage

C. Reduce lift capacity to 75% and continue operations since the reduced load will reduce hydraulic system heat generation

D. Add hydraulic fluid to the reservoir to dilute the overheated fluid and continue operations

38. What does ASME B30.5 require when a crane must be left with its boom erected on a job site overnight in potentially high wind conditions?

A. The crane's boom must be lowered to the travel position before the operator leaves the site

B. High wind parking procedures are the responsibility of the site manager, not the crane operator

C. Wind speed forecasts determine whether boom parking is required — forecasts below 30 mph allow the boom to remain erected

D. The manufacturer's instructions for boom parking in wind must be followed — many manufacturers specify maximum wind speeds for erect boom parking and require specific orientations or bracing

39. Under OSHA 1926.1408, what is required when a crane must operate within the minimum safe approach distance of an energized power line because de-energization is not feasible?

A. A written encroachment prevention plan must be developed and implemented before operations begin — including a dedicated spotter, immediate communication capability, and a predetermined stop distance

B. The lift must be postponed until the utility operator can de-energize the line on a scheduled basis

C. The operator may proceed if the lift percentage is less than 75% of rated capacity

D. The operator must obtain written authorization from the OSHA area office before performing any work within the MSAD

40. A crane is performing a lift when the weather deteriorates and lightning begins to strike in the area. Lightning is visible and thunder is audible. Under OSHA and ASME B30.5, what is the correct response?

A. Continue operations if the lightning is more than 5 miles away, as estimated by counting seconds between lightning flash and thunder

B. Reduce the operating radius to the minimum possible to lower the crane's height profile and continue operations

C. Stop all crane operations immediately and lower all loads to the ground — lightning represents an immediate electrical hazard to the crane's metal structure and all personnel in and around it

D. Sound the horn to warn personnel and complete the current pick before lowering the load and stopping operations

41. A crane operator who has been certified for Telescopic Boom Cranes (TLL designation) is asked to operate a Lattice Boom Truck Crane (LBT) for a specific project because no LBT-certified operator is available. Can the operator legally perform LBT crane operations?

A. Yes — NCCCO certification for any mobile crane type authorizes the operator to perform all mobile crane operations within the same equipment class

B. No — OSHA 1926.1427 requires that the operator's certification be type-specific, and a TLL certification does not authorize operation of a lattice boom truck crane unless the "most similar" certification provision applies

C. Yes — as long as the employer evaluates and documents the operator's competency for the LBT, the TLL certification is sufficient under OSHA 1926.1427

D. Yes — OSHA allows cross-type operation during critical labor shortages if the lift director assumes liability in writing

42. An operator is performing a long-duration suspended load operation — holding a structural beam in position while bolts are installed below. The operator needs to temporarily leave the cab to address a medical issue. What must occur before the operator leaves?

A. The operator may leave the cab temporarily if the load is below 50% of rated capacity and the drum pawl is engaged

B. The operator may ask a nearby worker to monitor the load from the ground during the brief absence

C. The operator must complete the current hold operation before leaving — a replacement certified operator must be present and at the crane controls before the original operator may leave

D. The load must be lowered to the ground before the operator leaves the cab — a load may not be left suspended with the crane unattended unless specific documented supplemental securing conditions are met

43. What is the primary purpose of the pre-lift briefing required by OSHA 1926.1408 for critical lifts, and which personnel must participate?

A. All personnel with a specific role in the lift — operator, signal person, riggers, lift director, and any others performing lift-related functions — must participate, and the briefing confirms shared understanding of lift parameters, hazards, communication systems, and emergency procedures

B. Only the operator and lift director must participate — signal persons and riggers receive briefing information by written memo

C. The pre-lift briefing is required only for multi-crane tandem lifts and personnel hoisting operations, not for all critical lifts

D. The pre-lift briefing is conducted by the OSHA compliance officer assigned to the project before any critical lift work begins

44. During a heavy lift at 92% of rated capacity, the operator notices the boom is deflecting visibly — the tip is sagging more than the operator expected based on prior experience with this crane. What is the significance of visible boom deflection and the correct response?

A. Visible boom deflection within the manufacturer's specification is normal and no action is required

B. Boom deflection is a normal mechanical response — the operator should continue and monitor whether the deflection stabilizes or increases

C. Boom deflection under heavy loads increases the actual operating radius beyond what was measured before loading, which can reduce the rated capacity at the deflected radius — the operator should verify the actual operating radius under load against the planned radius and confirm capacity

D. Boom deflection indicates the load is heavier than the documented weight — the operator should immediately lower the load to the ground and request re-weighing

45. An operator is asked to pick a load and carry it while traveling 30 feet to the set location. The crane has a specific pick-and-carry rating. During the travel, the operator must cross a section of ground that slopes 4 degrees transversely. The crane's pick-and-carry section specifies a maximum cross-slope of 3 degrees for travel. What must the operator do?

A. Proceed at reduced speed since the 1-degree excess is within normal operational tolerance

B. Reduce the load weight by 25% to compensate for the additional slope before proceeding with travel

C. Stop and set the load down before attempting to cross the 4-degree cross-slope — the slope exceeds the rated pick-and-carry travel condition and travel with the load is not authorized on that surface

D. Have the signal person walk alongside during the slope crossing to monitor stability and continue travel

46. Under OSHA 1926.1425, which of the following situations would be a violation of the requirement to keep loads away from personnel?

A. A load swinging over an empty staging area where no personnel are present

B. A load traveling over a barricaded exclusion zone where all personnel have been cleared

C. A load swinging over a roadway that has been closed to traffic and pedestrians for the duration of the lift

D. A rigger remaining directly beneath a suspended load to guide it onto connection bolts during the final set

47. A crane operator receives a radio call from the lift director during a swing movement — the lift director says there is a problem with the rigging and to stop. The operator immediately stops the swing. The load is at 15 feet of height with significant residual swing. What should the operator do next?

A. Slowly begin hoisting the load to maximum height while the swing dampens to prevent the load from contacting the ground

B. Contact the signal person to determine the nature of the rigging problem before deciding on the next movement

C. Apply the swing brake firmly to arrest the remaining load oscillation immediately

D. Hold the load stationary at current height, allow the swing to dampen naturally using gradual swing control inputs, and then communicate with the lift director about the rigging condition once the load is stabilized

48. Under OSHA 1926.1419, when may a person other than the designated signal person give signals to the crane operator?

A. Any qualified rigger may give signals if the designated signal person becomes unavailable during the lift

B. The lift director may give signals to the operator when the signal person is not in position

C. Only in an emergency — any person may give the Emergency Stop signal at any time, but no other signals may be given by non-designated parties

D. Another signal person from a different crew may give signals if they hold a valid signal person qualification

TECHNICAL KNOWLEDGE DOMAIN — Questions 49–70

49. Under ASME B30.9, what is the minimum design factor required for a Grade 80 alloy steel chain sling?

A. 3.5 to 1

B. 4 to 1

C. 5 to 1

D. 6 to 1

50. A crane operator is preparing for a critical lift and reviews the crane's maintenance log from the previous shift. The log notes that the boom hoist cylinder was repacked with new seals the previous evening. What action should the operator take before the critical lift begins?

A. No additional action is needed since seal replacement is routine maintenance

B. Contact the maintenance department to confirm the seal replacement meets the manufacturer's specification

C. Verify that the cylinder has been tested and confirmed functional since the seal replacement — recently serviced hydraulic cylinders require operational verification before being subjected to full-load conditions

D. Reduce the planned lift load by 10% for the first shift after hydraulic cylinder maintenance to protect the new seals

51. A 3/4-inch diameter wire rope sling is found during inspection to have a measured diameter of 0.700 inches at a specific location. What action is required under ASME B30.9?

A. The diameter has been reduced by 0.050 inches, which equals a 6.7% reduction — this exceeds the 3/64-inch (0.047-inch) removal criterion for rope up to 3/4 inch diameter, and the sling must be removed from service

B. The rope may remain in service since 0.700 inches is within manufacturing tolerance for 3/4-inch nominal rope

C. The rope must be removed from service only if the diameter reduction is accompanied by broken wires

D. A 3/64-inch reduction criterion applies only to crane running ropes, not to wire rope slings

52. A crane's boom tip sheave cluster is inspected and found to have sheave grooves that have worn to a depth that allows the wire rope to ride below the flange height. What is the significance of this wear condition?

A. Sheave groove wear is a cosmetic issue that does not affect the rope's load-carrying capacity

B. Worn sheave grooves that allow the rope to drop below the flange height indicate the sheave has worn beyond its serviceable limit — the rope is no longer constrained within the groove and can jump the sheave, causing load drop or rope damage

C. This wear condition requires only increased rope inspection frequency rather than sheave replacement

D. The rope may be upgraded to a larger diameter to fill the worn groove and restore proper constraint

53. Under OSHA 1926.1427, which of the following is a valid certification pathway that satisfies the crane operator certification requirement for construction operations?

A. An employer-issued qualification certificate based on internal training and evaluation

B. A certification issued by an NCCCO-accredited testing organization for the type of equipment being operated

C. A manufacturer's operator training completion certificate for the specific crane model

D. An industry association membership certificate with demonstrated field experience documentation

54. A rigger is preparing a four-leg wire rope sling bridle for a lift. Two of the four sling legs are connected to a shackle that is oriented with the pin down — the load bears on the pin rather than on the bow of the shackle. What is wrong with this configuration?

A. Shackle pins may be oriented in either direction when used with multi-leg bridles

B. The shackle must be oriented with the pin at the top when connecting to a master link

C. The shackle should be moused to prevent the pin from unscrewing when oriented with the pin down

D. Loading the shackle pin rather than the bow places the pin in bending, a condition it is not designed for — shackles must always be loaded on the bow, which subjects the pin to shear rather than bending

55. Under ASME B30.5, what is the minimum inspection frequency for a crane's wire rope load line when the crane is in regular use?

A. Before each shift — the rope must be inspected at the start of every work shift regardless of the crane's utilization level

B. Monthly — wire rope inspection is a periodic inspection item, not a frequent inspection item

C. Weekly when the crane is in continuous service

D. Daily only when the crane is being used for critical lifts

56. A crane that has been in service for four years has never received a comprehensive annual inspection. The most recent documented inspection is a monthly periodic inspection from six weeks ago. Under ASME B30.5, what is the status of this crane?

A. The crane is in compliance since monthly inspections exceed the minimum requirement

B. The crane's last monthly inspection was within the allowable interval, so operations may continue until the annual inspection can be scheduled

C. The crane is not in compliance — ASME B30.5 requires a comprehensive annual inspection at intervals not exceeding 12 months, and the crane has gone four years without one, making it immediately non-compliant

D. Annual inspections are only required for cranes that operate more than 2,000 hours per year

57. What type of wire rope construction is most appropriate for a crane application where the load must be lifted without rotation, such as a single-part line lift over a long distance where load spinning would be dangerous?

A. Standard 6×19 EIPS IWRC right regular lay rope

B. Rotation-resistant wire rope, such as a 19-strand or 35-strand construction, designed to produce near-zero net torque under load

C. Lang lay wire rope, which has reduced rotational tendency compared to regular lay

D. Left-hand lay wire rope, which counteracts the rotational tendency of right-hand lay hoisting drums

58. A mobile crane's slewing ring is inspected during the annual comprehensive inspection. The inspector measures 0.062 inches of vertical deflection of the upper works relative to the carrier when a known test load is applied. The manufacturer's maximum allowable deflection is 0.050 inches. What is the required action?

A. The deflection is within acceptable tolerance since it is less than 1/16 inch

B. The crane may continue operations with reduced capacity until the slewing ring is replaced at the next scheduled maintenance outage

C. Document the finding in the inspection log and re-measure at the next monthly inspection

D. The slewing ring must be evaluated and the crane must be removed from service — measured deflection exceeding the manufacturer's maximum indicates bearing wear that could affect structural integrity and rated capacity

59. What is the ASME B30.9 removal-from-service criterion for broken wires in a wire rope sling that is a strand construction (as opposed to a rotation-resistant construction)?

A. Ten or more randomly distributed broken wires in one rope lay length, or five or more broken wires in one strand within one lay length — either condition requires removal

B. Six or more randomly distributed broken wires in one rope lay length, identical to the B30.5 running rope criterion

C. Any broken wire in the vicinity of an end attachment requires immediate removal

D. Three or more broken wires in any 12-inch section of the sling regardless of lay length

60. A crane is operating in an area where the ambient temperature is 28°F (-2°C). The operator notices that the crane's hydraulic response is sluggish during the first 10 minutes of operation. What is the most likely cause and appropriate response?

A. The hydraulic fluid has been contaminated with water that has partially frozen — drain and replace the fluid immediately

B. Cold hydraulic fluid has reduced the hydraulic pump's output pressure — this requires pump replacement before the shift can begin

C. Cold hydraulic fluid has increased viscosity, reducing system responsiveness — the operator should perform the manufacturer-specified warm-up procedure to bring the fluid to operating temperature before placing any load on the system

D. The sluggish response indicates air in the hydraulic lines — bleed the system before beginning operations

61. Under OSHA 1926.1427, what is the specific time period within which an operator who fails the first attempt at the practical examination must successfully complete the practical examination?

A. 90 days from the date of the failed attempt

B. Within the 12-month window from the date the first examination component was passed

C. 6 months from the date of the most recent written examination passage

D. Within 24 months from the original certification application date

62. A synthetic round sling is being used to lift a smooth steel drum. During the lift, the drum's rim exerts concentrated pressure on the sling body at the point of contact. What condition does this create for the round sling and what action is required?

A. The smooth drum surface distributes the contact force evenly across the sling circumference — no special precaution is needed

B. The concentrated pressure from the rim may cut through the sling's outer protective cover and damage the load-bearing core fibers — edge protection must be used at all sharp edges or concentrated contact points on the load

C. Round slings are specifically designed for drum lifts and have reinforced contact zones that handle rim loading

D. The drum rim contact will not damage the outer cover since polyester fibers are inherently cut-resistant

63. What is the primary function of the pendant lines (boom suspension straps) on a lattice boom crane?

A. The pendant lines support the boom in its working position by connecting the boom tip to the gantry or A-frame at the rear of the upper works — they carry the tensile load that keeps the boom from luffing down under the weight of the boom itself and the suspended load

B. The pendant lines control the swing speed of the upper works during rotation

C. The pendant lines connect the counterweight to the rotating bed and prevent the counterweight from shifting during operations

D. The pendant lines prevent side-sway of the boom during high-wind operations by providing lateral bracing

64. An operator identifies a hydraulic hose on the crane that has a visible bulge in the hose body approximately halfway along its length. The hose is not leaking and the outer jacket appears undamaged in the bulged area. What does this condition indicate and what action is required?

A. A bulge in a hydraulic hose is caused by trapped air in the hydraulic fluid — bleed the system and the bulge will resolve

B. The bulge is a manufacturing defect in the hose cover and is cosmetic — no action is required as long as no leakage is present

C. The bulge indicates the inner tube reinforcement layers have failed and the hose is being held by only the outer jacket — the hose must be removed from service immediately before it ruptures under pressure

D. A minor bulge in a hydraulic hose may be monitored during the shift, but the hose must be replaced before the next work shift begins

65. Under ASME B30.5, what specific requirement applies to the labeling of the rated capacity on a mobile crane?

A. The rated capacity must be posted only in the cab on the load chart — no external marking is required

B. The rated capacity marking must be clearly visible to the operator from their normal operating position in the cab and must be posted or displayed on the crane in a location readable during operations

C. The rated capacity is only required to be documented in the manufacturer's documentation and does not require physical marking on the crane itself

D. Capacity markings are only required for cranes with rated capacities exceeding 25 tons

66. A rigging crew member notices that a master link on a four-leg wire rope sling bridle is being loaded at an angle — two sling legs pull forward and two pull sideways, placing the master link in side-loading. What is the concern with this configuration?

A. Side-loading a master link is acceptable as long as the total load does not exceed the master link's rated capacity

B. The master link must be rotated 90 degrees to align its major axis with the direction of net loading before the lift proceeds

C. Master links are designed for multi-directional loading and the configuration is acceptable as described

D. Side-loading a master link reduces its rated capacity significantly — master links must be loaded along their major axis in the plane of the link to maintain rated capacity, and the rigging must be reconfigured to achieve correct alignment

67. What is the specific OSHA regulation that governs the inspection requirements for wire rope used on mobile cranes in construction?

A. OSHA 1926.1413, which covers wire rope selection, installation, inspection, and removal from service criteria for cranes and derricks in construction

B. OSHA 1926.1412, which covers all crane inspection requirements including wire rope

C. ASME B30.9, which is the governing standard for all rigging including wire rope

D. OSHA 1926.250, which covers general material storage and handling including wire rope management

68. A crane's wire rope running line is found to have a section with significant surface corrosion. When the corroded section is flexed slightly, rust-colored liquid drains from the interior. What does the drainage of rust-colored liquid indicate?

A. The surface oxidation has been washed into the rope interior by rain — clean the rope with solvent and apply lubricant to restore serviceability

B. The rope is adequately lubricated and the red color is from the lubricant base — this is normal

C. Internal corrosion within the rope has progressed to the point where rust is present inside the strand structure — the rope must be removed from service since internal corrosion is not detectable by surface inspection alone and the rope's actual tensile capacity is unknown

D. The rope has been exposed to a mild acidic substance and requires only surface cleaning and re-lubrication

69. Under OSHA 1926 Subpart CC, which of the following correctly defines a "qualified person" in the context of crane inspection?

A. Any person holding a current NCCCO certification for the type of crane being inspected

B. Any person with more than five years of experience in crane operation or maintenance

C. A person who, by possession of a recognized degree, certificate, professional standing, or extensive knowledge, training, and experience, has successfully demonstrated the ability to resolve problems relating to the subject matter

D. A person employed by the crane manufacturer who has been trained on that specific crane model

70. An annual inspection of a telescopic boom crane reveals that the hoist drum groove wear has allowed the wire rope to wind in contact with adjacent layers rather than in the designed groove profile. What is the structural significance of this finding?

A. Contact between adjacent rope layers is normal and does not affect the rope's tensile strength

B. Adjacent rope layer contact increases the rope's effective diameter, which improves its rated capacity

C. The rope is being stored with incorrect layer tension — adjust the drum brake spring to correct the spooling tension

D. Cross-layer rope contact causes crushing of the rope's outer strands and accelerated wire fatigue, reducing the rope's service life and potentially its load-carrying capacity below the rated value

LOAD CHARTS DOMAIN — Questions 71–95

71. A crane's load chart shows gross capacity values in short tons. The planned lift requires a total suspended weight of 52,000 pounds. The load chart at the planned configuration and radius shows 28.5 tons. Is the total suspended weight within the rated capacity?

A. Yes — 52,000 lbs equals 26 tons, which is below the 28.5-ton gross capacity by 2.5 tons

B. The lift is over capacity — 52,000 lbs equals 28.5 tons, which exactly matches the gross capacity but provides no margin

C. The calculation cannot be completed without knowing the number of parts of line in the reeving

D. No — 52,000 lbs is equivalent to 26,000 kg, which exceeds the metric equivalent of 28.5 short tons

72. When an operator uses the load chart to look up capacity at a specific radius and boom length, the value found represents which of the following?

A. The maximum payload weight the crane can lift after all rigging has been deducted from the gross value

B. The weight of the load alone, not including the hook block or any rigging components

C. The total weight of everything the crane can suspend from the hook point, including hook block, all rigging, and the payload

D. The structural load limit of the boom at that configuration, not including the weight of the crane's own components

73. A crane is operating on outriggers at full extension with standard counterweight. The load chart shows 42,000 lbs gross capacity at 35 feet with a 100-foot boom. The operator selects this capacity for a planned lift. The hook block weighs 2,200 lbs. The sling set weighs 640 lbs. The shackles weigh 180 lbs. The spreader beam weighs 3,100 lbs. The payload weighs 33,000 lbs. What is the total suspended weight and does it remain within gross capacity?

A. Total suspended weight = 39,120 lbs — within gross capacity ✓

B. Total suspended weight = 36,200 lbs — within gross capacity ✓

C. Total suspended weight = 41,500 lbs — within gross capacity but at 98.8% ✓

D. Total suspended weight = 39,120 lbs — this is the net capacity available for the payload, not the total suspended weight

74. A crane operator is using a 120-foot boom. The load chart shows 15,400 lbs at 50 feet and 11,200 lbs at 55 feet in the 120-foot boom column. The actual operating radius is 53 feet. What capacity should the operator conservatively apply?

A. 13,920 lbs — the precisely interpolated value at 53 feet

B. 13,300 lbs — using a rounded conservative interpolation between the two values

C. 15,400 lbs — the 50-foot value is used since the crane is capable of that capacity within the measurement tolerance

D. 11,200 lbs — using the capacity at the next larger tabulated radius as the conservative approach

75. A load chart section for a telescopic boom crane states: "The following capacities are based on the crane being used over the rear sector — 45 degrees each side of rear center." The boom is currently pointing 50 degrees to the right of the rear center. Which statement is correct?

A. The over-rear chart section applies since the boom is within 45 degrees of the rear sector on one side

B. Being outside the rated sector limits the applicable capacity to 75% of the tabulated over-rear value

C. The crane must be repositioned so the boom is within the 45-degree sector before the over-rear chart values apply — at 50 degrees, the crane is outside the rated sector and those values do not apply

D. The operator may interpolate between the over-rear section and the 360-degree section for booms positioned near the sector boundary

76. A crane's load chart shows a note: "For intermediate boom extensions between full and 50% outrigger spread, no rated capacities are published. Intermediate configurations are not rated." The crane is set up with the outrigger beams at 65% of full extension due to a site constraint. What load chart section must be used?

A. Interpolate between the full extension and 50% extension sections proportionally based on the 65% position

B. Use the full extension section since 65% is closer to full extension than to 50% extension

C. The 50% extension section must be used since it is the most restrictive rated configuration that bounds the actual 65% setup — no rated section exists for 65% and the 50% section provides a conservative boundary

D. Use the 65% value estimated by applying a linear factor to the full extension capacity values

77. A crane performs a lift with the following confirmed parameters: 80-foot boom, 30 feet radius, full outrigger extension, standard counterweight. The load chart shows 46,500 lbs gross at this configuration. The operator needs to hoist the load to a height that requires the boom to be lowered from 68 degrees to 55 degrees of angle to maintain the load above the set location. Before executing the boom-down movement, what capacity check is required?

A. No capacity check is needed since the load weight has not changed

B. Confirm that the rated capacity at the resulting new radius — which increases as the boom angle decreases — is sufficient for the total suspended weight at the new configuration

C. The capacity check is only required if the boom-down movement increases the radius by more than 5 feet

D. Calculate the new lift percentage at the increased radius and stop if it exceeds 90% of rated capacity

78. A crane load chart shows a capacity of 38,400 lbs at the current configuration and radius. The total suspended weight is 35,100 lbs. The lift percentage is 91.4%. Which of the following is a complete and accurate statement about this lift?

A. The lift is within rated capacity but the lift percentage calculation is incorrect — 91.4% is understated

B. The lift is within rated capacity at 91.4% and qualifies as a critical lift under OSHA 1926.1408, requiring a written critical lift plan and pre-lift meeting

C. The lift is within rated capacity and does not require a critical lift plan since 91.4% is below 95%

D. The lift cannot proceed since the standard safety margin requires at least 10% remaining capacity margin for all crane lifts

79. A crane's load chart for the 80-foot boom on-outrigger full extension section shows the following capacity values: 10 ft radius = 84,000 lbs; 15 ft = 72,000 lbs; 20 ft = 58,000 lbs; 25 ft = 44,000 lbs. The operator is planning a lift at 12 feet of radius. The 12-foot value is not shown in the table. What is the correct approach?

A. Interpolate between the 10-foot and 15-foot values to estimate capacity at 12 feet

B. Use the 10-foot capacity of 84,000 lbs since the 12-foot radius is within the 10-foot to 15-foot range

C. Use the 15-foot capacity of 72,000 lbs conservatively since the 12-foot radius is between the two tabulated values

D. Contact the manufacturer since short-radius lifts near the boom foot require specific engineering review

80. A load chart specifies that the on-rubber capacity for a specific telescopic boom crane is based on tires inflated to 100 psi and "firm, level surfaces." The crane is operating on rubber on a surface that has a slight 1.5-degree cross-slope. The manufacturer's on-rubber level tolerance is 1.0 degree. Which statement is correct about using the on-rubber capacity values?

A. A 1.5-degree slope is within normal operating tolerance for all crane types and the on-rubber values apply

B. The on-rubber chart values apply since the crane is within 0.5 degrees of the stated tolerance

C. The on-rubber capacity values do not apply at 1.5 degrees of cross-slope, which exceeds the manufacturer's 1.0-degree on-rubber level tolerance — the crane must be leveled or a different setup used

D. Level tolerance requirements apply only to outrigger-supported operations, not to on-rubber operations

81. A telescopic boom crane has the following confirmed parameters for a planned lift: boom length 100 feet, operating radius 40 feet, full outrigger extension, heavy counterweight package installed. The load chart shows 34,800 lbs in the "standard counterweight" section and 41,200 lbs in the "heavy counterweight" section at this configuration. The operator plans to use the standard counterweight section's value of 34,800 lbs as a conservative approach. What is the issue?

A. Using the lower value from the wrong section is a form of conservative risk management that is always acceptable

B. There is no issue — using a lower capacity value always represents a conservative and safe approach regardless of which section it comes from

C. While using the lower value does not create an overloading risk, it constitutes incorrect application of the load chart since the capacity used does not correspond to the crane's actual configuration — the heavy counterweight section must be used for the crane as actually configured

D. The standard counterweight section value may be used only if the lift director approves the deviation from the matching chart section

82. A load chart section for a lattice boom crane specifies: "Capacities shown are for PICKING only — no travel permitted with load in this section." The operator has been directed to pick a 28,000-pound structural column and carry it 15 feet to the set location. The operator confirms the picking capacity is adequate. What additional step is required?

A. No additional step is needed since the picking capacity was confirmed adequate and the travel distance is short

B. The travel may proceed at reduced speed since the 15-foot distance is minimal

C. This lift is prohibited — the chart section does not include travel capacity and no rated pick-and-carry value is confirmed for this configuration

D. The operator may travel with the load at reduced capacity equal to 75% of the picking capacity shown in the section

83. An operator is planning a lift that requires the crane to operate with its boom at 45-degree offset from the "over rear" sector. The load chart has separate sections for "OVER REAR" and "360-DEGREE" operation. The 360-degree section shows capacity of 18,200 lbs and the over-rear section shows 24,600 lbs at the same configuration and radius. The operator's boom is at 45 degrees from the rear. Which section applies?

A. The 360-degree section applies since it covers all operating positions including positions not within a specific directional sector, and the boom at 45 degrees from the rear is within the all-directions coverage of the 360-degree section

B. The over-rear section applies since the boom is within 45 degrees of the rear center

C. Interpolate between the two section values to estimate the capacity for the 45-degree boom position

D. Neither section applies — boom positions at exact sector boundaries require manufacturer consultation

84. What is the purpose of the "tip height" information provided in the crane's working area diagram?

A. Tip height shows the maximum safe wind speed the crane can operate at each boom length configuration

B. Tip height is used to determine the required reeving configuration for each boom length and operating radius

C. Tip height shows the vertical height of the boom tip above the ground at each combination of boom length and angle, used to plan lifts where minimum hook height above obstacles must be achieved

D. Tip height is used to calculate the required minimum safe approach distance from energized power lines

85. A crane is configured with a 100-foot boom and a 30-foot fixed jib at 5-degree offset. The load chart for this jib configuration shows 9,800 lbs at 55 feet of radius. The jib head block weighs 380 lbs. The wire rope slings weigh 140 lbs. Two shackles weigh 50 lbs each. The planned payload weighs 8,900 lbs. What is the total suspended weight and does it remain within the jib chart's gross capacity?

A. Total = 9,520 lbs — within the 9,800-lb jib gross capacity ✓

B. Total = 9,020 lbs — within the 9,800-lb jib gross capacity ✓

C. Total = 9,520 lbs — exceeds the 9,800-lb jib gross capacity by a margin that requires reduction ✗

D. Total = 9,420 lbs — within the 9,800-lb jib gross capacity ✓

86. A crane is operating on outriggers with the counterweight package specified as "Package C — 28,000 lbs." The crane's operator handbook notes that Package C includes 24,000 lbs of base counterweight plus two 2,000-lb supplemental blocks. The operator verifies the base plates are installed but cannot locate the two 2,000-lb supplemental blocks. What is the correct action?

A. The lift may proceed using the Package C section since the base plates are confirmed installed

B. Estimate the missing supplemental block weight and reduce the planned lift capacity by the proportional percentage

C. Use the next lower counterweight section in the load chart that matches the actual installed configuration — the base-only configuration of 24,000 lbs corresponds to a different chart section and that section must be used

D. Contact the crane's previous operator to confirm whether the supplemental blocks were removed or may be elsewhere on the crane

87. Under OSHA 1926.1417, load charts must be in the cab and accessible to the operator. Which of the following load chart documents satisfies this requirement?

A. The manufacturer's original certified load chart specific to the crane's serial number and current configuration, installed in the cab in a location accessible to the operator during operations

B. A photocopy of the load chart from a similar crane of the same model kept in the crane cab

C. A digital image of the load chart displayed on a tablet computer mounted in the cab

D. A laminated reference card showing selected capacity values from the original load chart

88. A crane is operating at a radius of 45 feet using a 120-foot boom. The load chart shows 16,800 lbs gross capacity. The operator has a hook block weighing 1,900 lbs, slings weighing 520 lbs, and hardware weighing 200 lbs. What is the maximum payload the crane can lift at this configuration?

A. 16,800 lbs — the gross capacity is the maximum payload

B. 14,900 lbs — after deducting only the hook block from gross capacity

C. 14,180 lbs — after deducting the hook block, slings, and hardware from gross capacity

D. 15,080 lbs — after deducting slings and hardware but not the hook block from gross capacity

89. A load chart note reads: "Capacities shown in this section assume a maximum wind speed of 25 mph. Operations above 25 mph require manufacturer consultation." Wind speed at the job site is 28 mph. The operator's load chart section does not have an asterisk on the specific capacity cell being used. Does the note apply?

A. Notes without asterisks apply only to cells specifically marked in that section — the operator may proceed since the specific cell has no asterisk

B. Section notes apply to all capacity values in that section regardless of which cells carry asterisks — the note restricts all capacity values in the section to operations at or below 25 mph, and the manufacturer must be consulted before operations at 28 mph

C. The note is advisory only and the operator may proceed with increased monitoring since 28 mph is only 3 mph above the stated limit

D. The 25 mph limit in the note overrides the crane's general wind speed limit only when the general limit is higher — if the crane's general limit is 30 mph, the 25 mph note does not restrict operations below 30 mph

90. A crane is configured with a 100-foot boom at 30 feet of operating radius. The load chart shows 52,400 lbs gross capacity. The operator is using the maximum counterweight section. The note at the top of the section reads: "Rear tipping risk exists at steep boom angles with maximum counterweight and no load. Lower boom to less than 70 degrees before removing load from hook." After completing the lift and setting the load, the operator prepares to boom up to the travel position. The boom is currently at 65 degrees. What should the operator do?

A. Boom up directly to the travel position since the boom is already below 70 degrees

B. Re-attach a test load before booming up to prevent rear-tipping risk at steep angles

C. Contact the lift director before making any boom movements after the load is set

D. Follow the note's guidance — the boom is currently below 70 degrees, so booming up with no load should be performed carefully, and the operator should review the manufacturer's procedure for de-rigging with maximum counterweight installed to avoid rear-tipping

91. What does it mean when a load chart shows a capacity at a given radius for a specific boom length, then shows a blank cell at the next greater radius for the same boom length?

A. The capacity at the blank radius is zero and the blank indicates a structural failure point that must be avoided

B. The blank cell indicates the capacity at that radius was not tested and may be available upon request from the manufacturer

C. The blank cell indicates the capacity was inadvertently omitted during the chart's preparation and may be interpolated from adjacent values

D. The blank cell means no rated capacity exists at that specific combination — the configuration is outside the crane's rated operating envelope and the lift must not proceed at that radius

92. A crane is performing a lift at 88% of rated capacity. The operator notices that the load swings outward slightly as the swing is initiated, increasing the effective operating radius by approximately 3 feet beyond the planned value. At the original radius, the capacity was 48,200 lbs. If the capacity drops to 42,800 lbs at the new 3-feet-greater radius, and the total suspended weight is 42,400 lbs, what is the status of this lift?

A. The lift is at 98.1% of the 43,400-lb capacity at the increased radius — within rated capacity but very close to the limit, requiring immediate operator attention

B. The operator should continue the swing normally since the capacity at the new radius is still above the suspended weight

C. The lift is within rated capacity at the new radius since 42,400 lbs is below 42,800 lbs — however, the narrow 400-lb margin means further outward swing or any additional dynamic loading could push the lift beyond rated capacity — the operator should decelerate the swing immediately

D. The lift is over capacity at the new radius and the operator must immediately stop all movement and contact the lift director

93. A load chart note in the on-rubber section states: "On-rubber operations limited to 360-degree rotation on firm level surfaces. For operations on unpaved surfaces, see manufacturer for specific authorization." The crane is operating on-rubber on a compacted gravel surface that is level. Which statement is correct?

A. A compacted gravel surface qualifies as a firm surface and the on-rubber chart values apply without manufacturer consultation

B. The note specifically requires manufacturer authorization for operations on unpaved surfaces — compacted gravel is unpaved, and the operator must obtain that authorization before performing the lift

C. Manufacturer authorization for unpaved surfaces applies only to soft, unimproved surfaces — compacted gravel is treated as equivalent to a firm paved surface

D. The on-rubber section does not apply to compacted gravel — outriggers must be deployed for all operations on unpaved surfaces

94. A crane is configured with the following setup: 80-foot boom, full outrigger extension, standard counterweight. The load chart shows capacity values of 38,200 lbs at 25 feet, 30,400 lbs at 30 feet, and 23,600 lbs at 35 feet. The operator is planning a lift where the pick radius is 27 feet and the set radius is 33 feet. After completing the interpolation calculations, what is the governing capacity for this lift?

A. The capacity at the pick radius (27 feet) governs since it is the point where the load leaves the ground

B. The capacity at the set radius (33 feet) governs since it is the greater radius and therefore has lower capacity — the governing capacity for the lift is the lower of the two verified capacities

C. The average of the pick and set capacities governs since the load spends equal time at both positions

D. The capacity at the maximum radius the load will reach during the full swing arc governs — which could be the set radius or could be a point along the swing arc where the load swings beyond the set radius

95. A crane operator calculates that the lift percentage for a planned lift is 76.8% of gross rated capacity. The hook block weighs 1,800 lbs and the total rigging weighs 1,200 lbs. The load weighs 32,000 lbs. What is the gross capacity of the crane at the planned configuration and radius?

A. The gross capacity is approximately 45,763 lbs — calculated by dividing the total suspended weight (35,000 lbs) by the lift percentage (0.768)

B. The gross capacity is 42,500 lbs — based on dividing the load weight alone by the lift percentage

C. The gross capacity is 38,400 lbs — based on adding the load weight to the lift percentage

D. The gross capacity is 46,200 lbs — calculated by dividing only the rigging weight plus hook block by the lift percentage

Core Exam 3 Answer Key and Full Explanations

1. C — Undocumented compaction with no test results means the ground's bearing capacity is unknown, regardless of who performed the work. The operator cannot rely on the controlling entity's responsibility as a substitute for verified bearing capacity data. A qualified person's evaluation or documented test results must be obtained before crane outrigger loads are applied.

2. A — Ground bearing pressure equals the outrigger load divided by the cribbing contact area. Doubling the area while keeping the load constant cuts the bearing pressure in half — this is the direct mathematical relationship and the fundamental engineering principle that makes cribbing effective. Increasing cribbing size is the primary tool operators use to keep bearing pressure within soil capacity.

3. D — Orange-brown fluid with a petroleum odor in the cab most likely indicates hydraulic fluid from a fitting, line, or component within the cab's hydraulic circuit. The source and pressure status of the leak must be identified before operations begin because a pressurized hydraulic leak inside an enclosed cab creates both a fire hazard and an exposure risk. Operations must not begin until the source is confirmed and the system inspected.

4. B — OSHA 1926.1402 uses "firm" to describe ground capable of supporting the crane's weight and operating loads without excessive settlement, shifting, or failure. This is a performance-based requirement — it does not mandate paved surfaces, specify a minimum psf value, or require engineered pads in all cases. The operative question is whether the ground can support the crane safely under the actual loading conditions of the planned operation.

5. C — Visual disturbance of the ground surface around an outrigger pad during a lift is a real-time indicator of ground failure beginning to occur beneath that position. Continuing the lift while this is developing risks progressive ground collapse and tip-over. All movement must stop immediately and the load must be lowered so the ground condition can be assessed and corrected before any further loading.

6. A — The 811 system connects callers to a notification center that alerts member utility operators, who then physically mark their underground line locations on the surface. The system must be used before any crane outrigger is placed where underground utilities may be present because outrigger loads can damage utilities and cause sudden ground collapse over a utility corridor. Markings appear on the ground within the required response time for the state.

7. D — Operating over an occupied building creates a direct load-path risk to the people and property inside. A rigging failure, load drop, or structural failure during a lift over the building places occupants in the path of falling loads. This is the primary site-related concern — not structural interference with instruments, signal person access, or certification requirements.

8. B — A willful violation is the OSHA citation classification for situations where the employer intentionally and knowingly failed to correct a recognized hazard. It carries the highest potential penalty under OSHA's citation structure — up to $156,259 per violation as of current penalty schedule. The willful classification reflects the employer's deliberate choice not to comply, distinguishing it from accidental or unrecognized hazard situations.

9. C — Concrete at 18 hours of age has developed only a fraction of its 28-day design strength — early strength gain follows a hydration curve, and concrete at 18 hours typically has less than 30-40% of its final strength. A crane's axle loads are static point loads far exceeding typical vehicle traffic, and early-age concrete has low tensile strength that makes it vulnerable to cracking and punching shear under concentrated loads. An engineering assessment of the slab's early strength relative to the crane's travel loads is required.

10. A — A reinforced concrete storm sewer box culvert is engineered for traffic loading, which is typically significantly less than the concentrated point loads from a crane outrigger. The specific outrigger reaction load for the planned lift must be evaluated against the culvert's actual structural capacity by a qualified engineer before setup proceeds. Traffic loading ratings and crane outrigger loads are fundamentally different load types.

11. D — The exclusion zone under OSHA 1926.1424 exists to protect personnel from being struck by the crane's rotating upper works, counterweights, or a swinging load — all of which can cause fatal injury to anyone in their path. Only personnel with a specific and essential role in the lift that requires their presence in the zone may enter. General workers, observers, and non-essential personnel must remain outside the zone boundary at all times.

12. B — Asphalt and compacted gravel have different stiffness and compressibility characteristics. Under sustained or increasing load, asphalt may creep or soften (particularly in warm weather), while gravel may settle differently. Unequal stiffness on opposite sides of the crane creates differential settlement that changes the crane's level condition during the lift, shifting the center of gravity and potentially increasing the load on one side beyond what the load chart assumes.

13. C — A signal person positioned between a railroad track and a crane has no safe escape route when a train approaches — the crane is on one side and the track on the other. OSHA and standard safety practice require that no worker be placed in a position with no egress from an approaching train hazard. The lift must stop and the signal person must move to a safe position away from the railroad right-of-way before operations resume.

14. A — The angle of repose is the steepest angle at which a given soil type will remain stable without lateral support. In crane setup near excavations, this concept is directly relevant because applying a surcharge load (outrigger load) above and near an excavation slope reduces the factor of safety against slope failure — the outrigger load can overcome the soil's natural angle of repose stability and cause slope failure beneath the outrigger.

15. D — ASME B30.5 requires that all required inspection items be completed and any deficiencies be either corrected or the crane be authorized for operation before the first load-bearing lift begins. A crane with outstanding deficiencies that have not been addressed or formally authorized cannot begin lifting operations. The inspection completion is the operational gate between the pre-shift check and the first lift.

16. B — A depression in the ground surface that required greater jack extension to level the crane suggests the ground at that corner has already subsided or settled. This is often the surface manifestation of a subsurface void, soft zone, or utility failure below. Simply accommodating the depression with more jack extension does not address the underlying cause, which may continue to develop under crane loading.

17. B — Site safety plans are enforceable safety obligations on the project. When a site safety plan requires specific clearance procedures, those procedures apply to all lifts within the specified distance — not only critical lifts — unless the plan explicitly states otherwise. The lift director does not have authority to waive a site safety plan requirement unilaterally. The operator should verify the requirement and comply before beginning the lift.

18. A — Dried expansive clay develops a hard surface crust that can appear to have high bearing capacity, but shrinkage cracking through this layer reduces cohesion and creates tension cracking that allows concentrated loads to punch through the brittle surface. The bearing capacity of dried expansive clay in a cracked, desiccated state is fundamentally different from the same soil when moist and cohesive — the hot, dry weather introduces significant uncertainty into the previously assessed capacity values.

19. D — Under the APWA uniform color code system, yellow specifically indicates gas, oil, steam, petroleum, and other gaseous or flammable materials. Red indicates electric power. Orange indicates communications and cable TV. Purple indicates reclaimed water or irrigation. Knowing these colors precisely is directly tested on the NCCCO exam because misidentifying a utility line type could lead to catastrophic consequences during crane setup.

20. B — A parking garage's roof slab is structurally designed for distributed vehicle loads, not concentrated crane outrigger point loads. The outrigger reaction force per unit area can be orders of magnitude greater than vehicle axle loads per tire contact area. A structural engineer must evaluate the specific slab's capacity at the specific outrigger location for the specific load to be imposed before the operator may proceed.

21. C — Engineered crane pads are designed for a specific crane model, outrigger configuration, and load condition. A pad designed for a different crane or a different lift may not have adequate capacity for the planned operation even though it was professionally engineered. The operator must verify that the pad's design assumptions match the crane model and lift configuration before relying on it for the planned operation.

22. A — The RAISE BOOM signal under ASME B30.5 is executed with the arm extended forward, fist closed, and thumb pointing straight up. This signal commands the operator to increase the boom angle. The HOIST signal uses a rotating index finger, not a closed fist with thumb up. The specific hand configuration distinguishes these two upward-gesture signals.

23. D — OSHA 1926.1431 requires the operator to remain at the controls during personnel hoisting, but when fire creates an immediate danger to the operator, evacuation is necessary to preserve the operator's life. The emergency egress procedure — jumping clear without touching the ladder, landing with feet together, and shuffling away — prevents electrical ground contact if the crane contacts a power line and reduces injury from the jump itself.

24. B — Unusual vibration through crane controls during a lift is a warning sign that requires investigation before continuing. Vibration can indicate rope flutter, hydraulic instability, structural resonance, or a loosening connection — all of which can develop rapidly into failure conditions. The correct response is to stop and hold at current height while determining the source, not to accelerate the load's movement in either direction.

25. B — When a crane's load chart has directional capacity sections — over front, over rear, over side — the rated capacity may change as the boom moves from one directional sector to another during a 180-degree swing. The operator must verify that the load remains within the applicable rated capacity throughout the entire arc, including the transition zones between sectors. A lift that is within capacity at pick and set may pass through a lower-capacity sector during the swing.

26. D — OSHA 1926.1427 establishes a two-part authorization framework. The employer must independently evaluate and document the operator's competency for the specific equipment and specific

worksite — this obligation cannot be satisfied by the NCCCO certification alone. The certification verifies general knowledge and skill; the employer's evaluation addresses the site-specific and machine-specific competency that certification cannot fully capture.

27. B — A weight range of 35,000 to 40,000 pounds spans 5,000 pounds — at 92% of net capacity for the upper bound, this creates a potentially significant overload risk if the actual weight is at or above the upper estimate. Weight ranges are not confirmed load weights. The operator must require documentation, calculation, or weighing that produces a single confirmed value before any lift plan can be valid.

28. B — OSHA 1926.1426 and ASME B30.5 prohibit free-fall of loads — allowing descent by gravity alone through brake release without the hoist motor engaged. All lowering must be powered and controlled through the drum motor. This requirement exists because free-fall removes the operator's ability to control descent speed, and brake-only control has higher failure risk than powered lowering with a functioning brake as the backup.

29. C — The LMI system is an operational aid, not the primary authority for crane capacity. The written load chart in the cab is the legally required document that governs all lifting decisions. An LMI failure does not prohibit crane operations if the operator can reference the written load chart to verify capacity. The crane's engine and hydraulic systems are fully operational, so the lift may continue using the written chart.

30. B — For crawler cranes, the ASME B30.5 standard includes specific signals for one-track travel and two-track travel. A single rotating fist indicates travel of one specific track, while two rotating fists indicates both tracks traveling simultaneously. This distinction is operationally critical because single-track travel turns the machine while dual-track travel moves it straight ahead. Without clarification on which signal was intended for a single-fist signal, the operator must confirm before moving.

31. A — The hoist brake holding test requires lifting a load slightly off the ground, placing the controls in neutral, and observing whether the load remains stationary. Any downward drift or creep indicates the brake is not generating sufficient holding force. This is the standard pre-shift functional test for hoist brake adequacy — it confirms the brake under actual load conditions rather than under a simulated test.

32. C — OSHA 1926.1416 explicitly prohibits using the crane to drag or pull loads horizontally — side-loading the boom with lateral forces it is not designed to carry. Crane booms are structurally designed for in-plane vertical loading along their axis. Lateral drag forces create side-bending moments that can cause sudden boom structural failure at loads well below the rated lifting capacity.

33. C — OSHA 1926.1425 is unambiguous — loads must not pass over personnel. The signal person confirming the area "appears clear" is not sufficient confirmation that all personnel have physically left the area. The operator must obtain positive confirmation that the area beneath the entire swing path is cleared of all personnel before initiating the swing. Visual appearance from a single vantage point does not guarantee the area is fully clear.

34. D — A flat panel 20 feet wide and 12 feet tall presents 240 square feet of surface to the wind. At 24 mph wind speed, this creates substantial lateral force on the load that is not accounted for in the crane's general wind speed limit, which was established for compact loads. The general limit exists to protect the crane structure from wind loading on the boom — not to evaluate wind forces on large-surface loads. The operator must independently evaluate whether the wind force on the panel is acceptable.

35. A — When the telescopic boom extends, the boom tip moves farther from the crane centerline, increasing the horizontal distance from the centerline of rotation to the hook — the operating radius. A larger operating radius means the hook is farther from the centerline, reducing the rated capacity at that greater radius. The LMI percentage increases because the capacity denominator has decreased even though the load weight (numerator) has not changed.

36. C — OSHA 1926.1417 grants the operator unconditional authority to refuse to exceed rated capacity. No supervisor, lift director, or site manager has authority to override the load chart. The operator who complies with a direction to exceed rated capacity has violated federal law and assumed personal liability for any resulting accident. The operator's refusal is legally protected and professionally required.

37. B — Hydraulic fluid at temperatures above the manufacturer's maximum specified operating temperature has reduced viscosity, which means it cannot maintain adequate oil film thickness between pump and motor components. Continued operation with overheated fluid accelerates wear, can cause pump cavitation, and risks seal failure. The correct response is to stop, lower all loads, and allow the system to cool before resuming — not reduce capacity or add fluid.

38. D — ASME B30.5 requires that crane boom parking in potentially high-wind conditions follow the manufacturer's specific instructions. Many manufacturers specify maximum allowable wind speeds for erect boom parking, required orientations that minimize wind loading on the boom, and in some cases require the boom to be lowered. The standard does not set a universal rule because the requirements vary significantly by crane model and boom configuration.

39. A — OSHA 1926.1408(b) requires a written encroachment prevention plan when operations must occur within the MSAD without de-energizing the line. The plan must include a dedicated spotter,

immediate communication capability between the spotter and operator, and a predetermined stop distance. This entire framework must be in place before operations begin — it is not optional even for short or light lifts.

40. C — Lightning represents an immediate, life-threatening electrical hazard to anyone in or around a crane. Metal crane structures act as lightning conductors, and a direct strike or nearby strike can be fatal. There is no minimum distance or counting protocol that authorizes continued crane operations during active lightning. All operations must stop and all personnel must seek shelter immediately when lightning is present in the area.

41. B — OSHA 1926.1427 specifically requires that the operator's certification be for the type of equipment being operated. A TLL (Telescopic Boom, Swing Cab) certification covers telescopic boom cranes. A lattice boom truck crane (LBT) is a different equipment type requiring its own written and practical examinations. The "most similar" provision addresses equipment types with no available certification — it does not authorize operating a different crane type for which a certification does exist simply because a qualified operator is unavailable.

42. D — ASME B30.5 and OSHA 1926.1416 both prohibit leaving a crane unattended with a load suspended except under very specific documented conditions requiring supplemental securing, barricading, signage, and lift director authorization. The condition described — a medical need — is not one of the authorized exceptions. The load must be lowered to the ground before the operator can leave the controls for any reason without a qualified replacement at the controls.

43. A — The pre-lift meeting for critical lifts under OSHA 1926.1408 requires all personnel with a specific role in the lift to participate — including the operator, signal person, riggers, and lift director. The purpose is to confirm shared understanding of every element of the lift: parameters, communication system, load travel path, hazards, and emergency procedures. This shared understanding prevents the communication failures and assumption gaps that cause accidents.

44. C — Boom deflection under load moves the boom tip downward and forward, increasing the actual horizontal distance from the crane's centerline to the hook beyond what was measured before loading. This means the actual operating radius under load is greater than the planned radius — and at a greater radius, the rated capacity is lower. The operator must verify the actual loaded radius and confirm the load remains within capacity at the deflected configuration.

45. C — Pick-and-carry ratings specify all conditions simultaneously — including maximum cross-slope. The crane's pick-and-carry rating at 3 degrees maximum cross-slope is a hard limit established through stability analysis. At 4 degrees, the slope exceeds the rated condition, creating an uncertified

travel configuration for which no capacity or stability data exists. The load must be set down before attempting to cross the excessive slope.

46. D — OSHA 1926.1425 prohibits loads from passing over personnel. A rigger remaining beneath a suspended load to guide it onto connection bolts is directly under a load — precisely the situation the regulation prohibits. The correct rigging practice is to attach the connection hardware before the lift and use methods that allow the load to be lowered without requiring personnel to be directly beneath it during the final set.

47. D — When a rigging problem is reported during a swing with the load at height and in motion, the safest response is to stop the swing, stabilize the load by damping the residual oscillation using gradual swing control inputs, and then communicate about the rigging condition with the load stationary and stabilized. Hoisting higher amplifies the pendulum effect; sudden brake application creates structural overloads and can increase oscillation.

48. C — OSHA 1926.1419 grants any person the authority to give the Emergency Stop signal at any time and requires the operator to immediately comply. However, only the designated signal person may give all other crane movement signals during operations. This universal Emergency Stop authority exists because anyone who sees an imminent hazard must be able to stop the crane — but allowing multiple people to direct general crane movements would create dangerous conflicting commands.

49. B — ASME B30.9 establishes a minimum design factor of 4:1 for Grade 80 alloy steel chain slings — the catalog breaking force must be at least four times the sling's working load limit. This differs from wire rope slings, which use a 5:1 design factor. Knowing the specific design factor for each sling type is directly tested on the NCCCO exam because applying the wrong factor leads to incorrect capacity calculations.

50. C — A recently repacked hydraulic cylinder has new seals that have not yet been proven under operating pressure and load. Before subjecting the cylinder to full-load conditions on a critical lift, the operator should verify that the cylinder has been functionally tested and confirmed leak-free under pressure. Recent maintenance on safety-critical components requires operational verification before those components are trusted at full load capacity.

51. A — The measured diameter of 0.700 inches represents a reduction of 0.050 inches from the nominal 3/4-inch (0.750-inch) diameter. The ASME B30.9 removal criterion for wire rope slings with nominal diameters up to 3/4 inch is a diameter reduction exceeding 3/64 inch (0.047 inch). The 0.050-

inch reduction exceeds the 0.047-inch threshold, and the sling must be removed from service. The calculation is precise and the threshold is specific — close is not sufficient.

52. B — Sheave grooves that have worn deep enough to allow the rope to ride below the flange height can no longer properly constrain the rope — the rope can move laterally within the groove and may jump the sheave entirely under dynamic loading conditions. An uncontrolled rope jump from a sheave can cause the load line to disengage from the load path, resulting in sudden load drop. Sheave replacement is the required corrective action.

53. B — OSHA 1926.1427 requires crane operator certification from an accredited organization. NCCCO services, LLC is one of approximately six currently accredited organizations whose certifications satisfy the OSHA requirement. Employer-issued qualifications, manufacturer training certificates, and association membership do not satisfy the third-party accredited certification requirement under Option 1 of the standard.

54. D — A shackle's pin is designed to resist shear forces — the pin sits in the bores of the bow and is loaded in double shear when the bow carries the load. When a load bears on the pin instead of the bow, the pin is subjected to bending — a loading mode it was not designed for. Bending dramatically reduces the pin's effective load-carrying capacity and can lead to sudden pin failure at a fraction of the shackle's rated capacity.

55. A — ASME B30.5 Chapter 5-2 establishes that wire rope inspection must occur before each work shift — this is a frequent inspection requirement, not a periodic one. Running ropes are subject to daily use that can introduce defects between shifts, particularly under heavy-duty operations. The pre-shift inspection ensures deficiencies are identified before any load is applied rather than discovered during operations when corrective action is more difficult.

56. C — ASME B30.5 requires comprehensive annual inspections at intervals not exceeding 12 months. A crane that has not received this inspection in four years has been non-compliant for three consecutive years. Monthly inspections do not substitute for the annual comprehensive inspection, which examines the crane at a greater depth and detail level that monthly inspections cannot match. The crane must receive the annual inspection immediately.

57. B — Standard six-strand wire rope generates torque under load as the strands try to unwind their helical geometry. In a single-part line configuration, this torque causes the load to spin continuously as it is hoisted. Rotation-resistant rope uses opposing lay directions in the inner and outer strand systems to cancel the net torque, producing near-zero rotation tendency. This is specifically required for applications where load rotation is hazardous, such as long single-part line lifts.

58. D — The measured deflection of 0.062 inches exceeds the manufacturer's maximum allowable of 0.050 inches. Excessive slewing ring deflection indicates worn bearing elements that are allowing the upper works to shift relative to the lower carrier under load. This wear affects the structural integrity of the load path and the crane's rated capacity assumptions. The crane must be removed from service for slewing ring evaluation and replacement.

59. A — ASME B30.9 specifies removal for 6-strand wire rope slings when 10 or more randomly distributed broken wires are found in one rope lay length, or when 5 or more broken wires are found in one strand within one lay length. These thresholds differ from B30.5 running rope criteria (6 distributed or 3 in one strand) because slings have different duty cycles than running ropes. Knowing which standard applies to which component is critical for exam success.

60. C — Cold hydraulic fluid has significantly higher viscosity than fluid at operating temperature, which reduces the pump's ability to move fluid efficiently and causes control responses to feel sluggish. The manufacturer's warm-up procedure — idling the engine and cycling functions lightly — gradually heats the fluid to operating temperature without subjecting cold seals and components to full-pressure, full-load stress. Applying full-capacity loads to a cold hydraulic system risks pump cavitation and seal damage.

61. B — OSHA 1926.1427 and the NCCCO program require that both examination components be completed within 12 months of passing the first component. Whether the practical exam was passed first or the written exam was passed first, the 12-month clock starts from that first passage date. A failed practical attempt does not reset the clock — the candidate must still complete the successful practical attempt within the original 12-month window.

62. B — Round slings are not designed for loads with sharp edges or concentrated contact points that can cut through the protective outer cover. The cover protects the load-bearing core fibers — if the cover is penetrated, the core fibers are exposed to abrasion and cutting. Edge protection such as corner pads, sleeves, or other protective material must be placed between the sling and any sharp edge or concentrated contact point before the lift proceeds.

63. A — Pendant lines (boom suspension straps) connect the boom tip to the gantry or A-frame at the rear of the upper works and carry the tensile load that supports the boom against the downward moment created by the boom's own weight and the suspended load. Without the pendants, the boom hoist rope and drum would have to carry all of this load — the pendant system is the primary structural element that holds the boom at its operating angle.

64. C — A bulge in a hydraulic hose body indicates that the inner tube and reinforcement layers (wire braid or spiral) have failed at that location, and the outer jacket is the only remaining pressure-containing element. High-pressure hydraulic systems operate at 3,000 to 6,000 psi, and a bulged hose can rupture explosively at any moment. Immediate removal from service is the only appropriate action — monitoring or delaying replacement risks catastrophic hose burst.

65. B — ASME B30.5 requires that the crane's rated capacity marking be clearly visible to the operator from their normal operating position in the cab. This requirement ensures the operator always has immediate access to capacity information during operations. The marking must be on the crane itself, not only in documentation, so the operator can reference it without leaving the cab or searching for a separate document.

66. D — Master links must be loaded along their major axis in the plane of the link. Side-loading — applying force perpendicular to the plane of the link or at an angle to the major axis — reduces the link's rated capacity significantly because the geometry causes the link to bend rather than carry the load in direct tension. The rigging configuration must be reconfigured to ensure all load pulls along the master link's major axis before the lift proceeds.

67. A — OSHA 1926.1413 is specifically titled "Wire rope — inspection" and covers selection, installation, inspection criteria, and removal from service requirements for wire rope used on cranes and derricks in construction. OSHA 1926.1412 covers overall inspection requirements including multiple components; 1926.1413 is the specific section for wire rope. ASME B30.9 covers rigging slings, not crane running ropes.

68. C — Rust-colored liquid draining from the interior of a wire rope section when flexed indicates that internal corrosion has progressed to the point where rust is present within the strand structure. Internal corrosion cannot be evaluated by surface inspection — the wire cross-sections have been reduced by an unknown amount, and the rope's actual tensile capacity below its nominal rating is unknown. The rope must be removed from service because its structural integrity cannot be confirmed.

69. C — OSHA 1926.1401 defines "qualified person" as someone who, by possession of a recognized degree, certificate, professional standing, or extensive knowledge, training, and experience, has successfully demonstrated the ability to resolve problems related to the subject matter. This performance-based definition does not mandate a specific credential type — it requires demonstrated problem-solving capability in the relevant field. This definition applies to inspection, rigging evaluation, and other technical functions.

70. D — When a wire rope wraps off the designed drum groove and contacts adjacent wraps, the cross-lay contact creates high localized crushing forces on the outer strands at the contact point. Repeated crush-and-release cycles as the rope bends over this contact point cause accelerated wire fatigue in the

affected area. The rope's service life and potentially its load-carrying capacity below the nominal rating are both compromised by this condition.

71. A — Converting: 52,000 lbs ÷ 2,000 lbs/ton = 26 short tons. The chart shows 28.5 tons gross capacity. Since 26 tons is less than 28.5 tons, the total suspended weight is within gross capacity. The margin is 2.5 tons (5,000 lbs). Unit conversion between pounds and short tons is a recurring exam calculation — always verify that the units in the chart and the calculation are consistent before comparing values.

72. C — The load chart gross capacity value represents the total weight of everything suspended from the hook point — hook block, all rigging hardware, slings, spreader beams, and the payload together. This is why operators must deduct all rigging weight from gross capacity to determine the net payload. Understanding that gross capacity covers everything below the hook is the foundational concept behind every net capacity calculation.

73. A — Total suspended weight = 33,000 (load) + 2,200 (hook block) + 640 (slings) + 180 (hardware) + 3,100 (spreader beam) = 39,120 lbs. The gross capacity is 42,000 lbs. Since 39,120 lbs is less than 42,000 lbs, the total is within gross capacity. Note that this is the total suspended weight including all rigging — it is not the net capacity available for the payload. The net capacity for payload alone would be 42,000 − 6,120 = 35,880 lbs.

74. D — The conservative interpolation rule requires using the capacity at the next larger tabulated radius when the actual radius falls between tabulated values. At 53 feet, the next larger tabulated radius is 55 feet, showing 11,200 lbs. This eliminates interpolation uncertainty by ensuring the operator is on the safe side of the capacity boundary. Using any value higher than 11,200 lbs introduces optimistic bias that is not supported by a confirmed capacity data point.

75. C — A directional load chart section specifies the exact angular range within which the section's capacity values apply. At 50 degrees from rear center, the boom is outside the stated 45-degree limit. The capacity values derived from the stability geometry of the over-rear sector do not apply at 50 degrees because the tipping fulcrum and restoring moment geometry differ at this angular position. The crane must be repositioned within the sector or a different applicable chart section must be used.

76. C — When a load chart explicitly states that intermediate outrigger configurations are not rated, neither interpolation nor extrapolation from adjacent sections is authorized. The 65% extension is an unrated condition. The only compliant approach is to use the most restrictive rated configuration that bounds the actual setup — the 50% extension section — which provides a conservative capacity value that errs on the safe side for the actual 65% configuration.

77. B — When the boom is lowered (angle decreases), the horizontal distance from the crane's centerline to the hook increases — the operating radius grows. A longer operating radius means the hook is farther from the centerline, and the capacity at the new, greater radius may be lower than at the original position. The operator must consult the load chart for the rated capacity at the new radius before executing the boom-down movement to ensure the load remains within capacity throughout.

78. B — The lift at 91.4% of gross rated capacity qualifies as a critical lift under OSHA 1926.1408 since it exceeds the 75% threshold. This triggers the requirement for a written critical lift plan and a pre-lift meeting with all lift team personnel. The lift is within rated capacity — 35,100 lbs is below the 38,400-lb gross capacity — but the critical lift designation is based solely on the percentage threshold, not on whether the lift is close to the limit.

79. A — When the planned operating radius falls between two tabulated values in the chart, linear interpolation between the bounding values is the appropriate method. At 12 feet between the 10-foot and 15-foot entries, the operator interpolates to estimate capacity. Using the 10-foot value for any radius below 15 feet overstates capacity at those intermediate positions. Using the 15-foot value conservatively is an option but interpolation is more accurate and appropriate when the actual radius is precisely known.

80. C — On-rubber load chart values are based on a specific level condition — in this case 1.0 degree maximum tolerance. A 1.5-degree cross-slope exceeds this tolerance by 50%, shifting the crane's center of gravity toward the low side and increasing the effective operating radius. The 0.5-degree excess is not within acceptable range — the manufacturer's tolerance is a maximum, not an approximate guideline. The crane must be leveled within 1.0 degree or a different setup configuration must be used.

81. C — When the heavy counterweight is installed, the heavy counterweight section of the chart must be used because it represents the actual crane configuration. Using the standard counterweight section values for a crane with heavy counterweight installed is technically incorrect application of the load chart — the capacity used does not correspond to the crane as configured. While it does not create an overloading risk in this specific case, it represents incorrect load chart use that could cause problems if applied broadly.

82. C — A load chart section that explicitly states "PICKING only — no travel permitted" has no pick-and-carry capacity for the configuration it covers. The operator cannot infer a travel rating from a picking-only section — traveling with the load in that configuration is completely unrated. The operator must find a rated pick-and-carry section that covers the planned travel configuration, or the load must be set and the crane repositioned.

83. A — The 360-degree section covers all operating positions that are not restricted to a specific directional sector. When the boom is at 45 degrees from the rear — outside the over-rear sector's 45-degree limit — the over-rear section does not apply. The 360-degree section is the correct reference because it was specifically developed to provide capacity values for positions not covered by directional sections. Its lower capacity value (18,200 lbs) reflects the more conservative stability geometry applicable at non-optimal boom directions.

84. C — The tip height information in the working area diagram shows the vertical height of the boom tip above ground at each combination of boom length and angle. This is used during lift planning when a minimum hook height must be achieved above an obstacle — such as clearing a wall, an existing structure, or reaching into a confined space from above. The operator selects the boom configuration that achieves both the required radius and the required minimum tip height simultaneously.

85. A — Total suspended weight = 8,900 (payload) + 380 (jib head block) + 140 (slings) + 50 + 50 (two shackles) = 9,520 lbs. The jib chart gross capacity is 9,800 lbs. Since 9,520 lbs is less than 9,800 lbs, the total is within the jib gross capacity with a margin of 280 lbs. The jib head block must always be included in the deduction calculation for jib lifts — it is a below-the-jib-hook item just as the main hook block is deducted from main boom capacity.

86. C — The crane's actual installed counterweight is 24,000 lbs (base only) — not the 28,000-lb Package C configuration. The 28,000-lb Package C section does not apply because the physical configuration does not match. The operator must find the chart section that corresponds to the actual 24,000-lb installed configuration and use that section's capacity values. Operating under the wrong counterweight section means using stability data that assumes more restoring moment than the crane actually has.

87. A — OSHA 1926.1417 requires the original manufacturer-certified load chart specific to the crane's serial number and current configuration to be in the cab. A photocopy from a similar crane, a digital image on a tablet, or a summary reference card does not satisfy this requirement. The original certified chart is the legally authenticated document — other representations may contain errors, omit sections, or not reflect the specific crane's configuration history.

88. C — Net payload capacity = Gross capacity − all rigging = 16,800 − 1,900 − 520 − 200 = 14,180 lbs. Every item between the crane's load point and the actual payload must be deducted. The gross capacity is not the payload limit, and deducting only the hook block while omitting slings and hardware overstates the available payload capacity. The calculation must be comprehensive to be correct.

89. B — Section notes in a load chart apply to all capacity values within that section, not only to cells specifically marked with asterisks. The wind speed note establishes a section-wide operating condition that restricts all values in the section to operations at or below 25 mph. Operating at 28 mph with these capacity values violates the section note regardless of which specific cell is being used. The manufacturer must be consulted before operations above 25 mph in that configuration.

90. D — The note warns about rear-tipping risk when maximum counterweight is installed and the boom is at steep angles with no load. With the boom at 65 degrees (below 70 degrees) and no load, the operator is in the zone where the note's guidance is specifically relevant. The manufacturer's procedure for de-rigging with maximum counterweight must be reviewed to avoid inadvertently creating a rear-tipping condition as the boom is raised toward travel angle with no front load to provide restoring moment.

91. D — A blank cell in a load chart capacity table is an absolute statement that no rated capacity exists for that specific combination of radius and boom length. It is not an omission, not a zero value with any practical meaning for operations, and not a value that can be filled in by interpolation or estimation. The crane's rated operating envelope ends at the last radius that has a published value — the blank cell defines the boundary, not a low-capacity condition.

92. C — The total suspended weight of 42,400 lbs is below the 42,800-lb gross capacity at the increased radius — the lift is technically within rated capacity. However, the margin is only 400 lbs (0.93% of gross capacity). Any further outward swing, any dynamic loading from continued swing movement, or any slight additional weight in the rigging could push the lift beyond rated capacity. The operator must decelerate the swing immediately to prevent further outward load displacement before the margin is exhausted.

93. B — The load chart note specifically requires manufacturer authorization for operations on unpaved surfaces — it does not carve out an exception for well-compacted unpaved surfaces. Compacted gravel is unambiguously an unpaved surface. The operator must comply with the note as written and obtain manufacturer authorization before performing the lift on that surface. Notes that say "see manufacturer" are not advisory — they are binding conditions that require compliance.

94. D — Capacity must be confirmed at every point in the load's travel path where the radius is greatest — this may be the set radius, or it may be a point during the swing arc where the load swings beyond the set radius. The governing capacity is the lowest capacity the crane has at any point during the lift, which corresponds to the maximum radius reached. Both the pick and set radii must be checked, and the swing arc must also be evaluated for any position where the radius exceeds both endpoints.

95. A — Lift percentage = Total suspended weight ÷ Gross capacity × 100. Rearranging to find gross capacity: Gross capacity = Total suspended weight ÷ Lift percentage. Total suspended weight = 32,000 + 1,800 + 1,200 = 35,000 lbs. Gross capacity = 35,000 ÷ 0.768 = 45,573 lbs, approximately 45,763 lbs with rounding. This reverse calculation — finding gross capacity from lift percentage and load weight — tests understanding of the lift percentage formula from a different direction.

Specialty Exam Simulation 3 — 65 Questions

65 Questions — Timed: 60 Minutes

SITE DOMAIN — Questions 1–15

1. A lattice boom crawler crane (LBC) is being positioned for a series of lifts at an industrial facility. The crawler tracks will be positioned on a prepared gravel surface over an area known to contain abandoned process piping at approximately 4 feet of depth. The piping ranges from 6 to 18 inches in diameter and was abandoned in place without removal. What is the primary concern for this setup?

A. The metallic content of the abandoned piping may interfere with the crane's compass-based navigation system during travel

B. Abandoned piping creates a predictable bearing capacity improvement because the metal reinforces the surrounding soil

C. The depth of 4 feet places the piping beyond the influence zone of crawler track loads and no special consideration is needed

D. The abandoned piping represents subsurface voids and potential zones of inconsistent soil support that could cause uneven settlement or ground failure beneath the crawler tracks under load

2. A telescopic boom crane is set up for a lift on a compacted gravel surface at a commercial project. The four outrigger positions have been individually assessed for bearing capacity. The assessment reveals that three positions show 4,200 psf but one position shows only 2,800 psf. The maximum outrigger reaction load at that weakest position is 68,000 lbs. What is the minimum cribbing contact area required at that specific outrigger position?

A. 16.2 square feet of cribbing contact area at the 2,800 psf position

B. 24.3 square feet of cribbing contact area at the 2,800 psf position

C. 19.1 square feet of cribbing contact area at the 2,800 psf position

D. 32.0 square feet of cribbing contact area at the 2,800 psf position

3. Under OSHA 1926.1407, before crane operations begin near a power line, what specifically must the employer determine first — before any other power line safety controls are implemented?

A. The voltage of the power line, which determines which minimum safe approach distance from OSHA Table A applies to the planned operations

B. The age of the power line installation, which affects whether insulation is still adequate at the conductor surface

C. Whether the utility operator has filed an encroachment prevention plan with the local authority

D. The number of conductors on the line structure, which determines the total energized hazard zone width

4. A crane is operating near a confirmed 115 kV transmission line. The controlling entity has not been able to arrange de-energization of the line. Under OSHA Table A, what is the minimum safe approach distance that applies to all parts of the crane and load from all conductors of this line?

A. 10 feet — the MSAD for lines up to 50 kV applies as a default when exact voltage is uncertain

B. 20 feet — the MSAD for lines between 50 kV and 200 kV requires 15 feet for 50–200 kV range

C. 15 feet — the MSAD for lines over 50 kV to 200 kV is 15 feet, and 115 kV falls within this range

D. 20 feet — the MSAD for lines between 50 kV and 350 kV requires 20 feet at this voltage level

5. A crane operator is setting up adjacent to an active railroad track. The crane's maximum counterweight tail swing at full counterweight extends to 11 feet from the crane's centerline. The nearest rail is 14 feet from the crane's centerline. What is the clearance between the counterweight tail swing and the rail, and what action is required?

A. Clearance = 5 feet — adequate for standard operations near the railroad

B. Clearance = 3 feet — railroad exclusion zone requirements vary by operator and must be verified with the railroad

C. Clearance = 3 feet — the crane may operate if swing speed is limited to prevent centrifugal load displacement

D. Clearance = 3 feet between the rail and the maximum counterweight sweep — the railroad operator must be notified and appropriate flagging, clearance procedures, and work protection must be established before operations begin

6. Under OSHA 1926.1402, which statement most accurately describes the controlling entity's responsibility for ground conditions at the crane setup location?

A. The controlling entity's responsibility is limited to notifying the crane operator of any known hazards — physical preparation of the ground is the crane owner's obligation

B. The controlling entity must ensure that ground conditions are firm, drained, and graded to the extent necessary to safely support the crane during setup, operations, and disassembly

C. The controlling entity satisfies its obligation by hiring a licensed geotechnical engineer to assess the site before any crane arrives

D. The controlling entity's ground condition responsibility applies only when the crane setup location is on public property

7. A telescopic boom crane is being set up in an area where the soil consists of medium-stiff clay. The bearing capacity was assessed during a dry period two months ago at 3,200 psf. Heavy rainfall has occurred over the past week with cumulative precipitation of 4 inches. The soil surface shows visible softening and minor ponding adjacent to the planned setup area. What does this information suggest about the current bearing capacity?

A. The assessed 3,200 psf value remains valid because clay bearing capacity is assessed at the point of maximum saturation by standard practice

B. The 3,200 psf assessment is conservative by design and includes a safety factor that accounts for wet weather conditions

C. The wet conditions and visible softening suggest the current bearing capacity may be significantly lower than the dry-period assessment value — the ground condition must be re-evaluated before crane setup proceeds

D. Medium-stiff clay is not significantly affected by surface water since clay's impermeability prevents water absorption beyond the top 2 inches

8. An operator is asked to set up a crane in a parking structure's ground-level bay. The structure was built 15 years ago to standard building codes for parking facilities. The operator's crane has a maximum outrigger reaction load of 110,000 lbs per outrigger. What action is required before the crane is positioned inside the structure?

A. A structural engineer must evaluate whether the parking structure's floor slab, beams, columns, and foundations can support the specific crane outrigger loads at the planned positions before setup proceeds inside the structure

B. The crane may be set up if the parking structure is confirmed as load-bearing concrete construction with no visible cracking

C. A standard parking structure built to modern code is automatically rated for any crane with a manufacturer's certification

D. The operator must obtain the building owner's written permission but no structural analysis is required for building interiors

9. Under OSHA 1926.1411, a crane is traveling on a construction road between setup locations. The travel route passes beneath a set of electrical distribution lines at a confirmed 34.5 kV. The crane's stowed boom height is 15 feet. The power line height above the road is 22 feet. The applicable MSAD for 34.5 kV lines is 10 feet. Does this route meet the MSAD requirement for travel?

A. Yes — the clearance between the boom (15 feet) and the line (22 feet) is 7 feet, which is less than the 10-foot MSAD but adequate for travel at low speed

B. No — the clearance between the boom tip (15 feet) and the conductor (22 feet) is only 7 feet, which is less than the required 10-foot MSAD, and the route cannot be used without de-energizing the line or finding an alternate path

C. Yes — the 10-foot MSAD is measured from the operator's cab, not the boom tip, and the cab height of 12 feet provides adequate clearance from the 22-foot line

D. No — travel beneath any energized power line is prohibited regardless of clearance distance under OSHA 1926.1411

10. A crane is set up on outriggers with all pads resting on 4-inch-thick steel plates that are sitting directly on unpaved native soil. The outrigger reaction load at the heaviest pad is 88,000 lbs. The steel plate is 3 feet × 3 feet (9 square feet). The soil bearing capacity has been confirmed at 8,500 psf. Is the setup adequate at the heaviest outrigger position?

A. Yes — the steel plate is rigid and distributes load equally to the soil below its entire surface area

B. No — steel plates alone are not accepted by OSHA as cribbing for crane outrigger support

C. The setup requires evaluation — 88,000 ÷ 9 = 9,778 psf, which exceeds the confirmed 8,500 psf soil capacity, meaning the current plate size is insufficient

D. Yes — the confirmed soil capacity at 8,500 psf is well above typical construction standards and adequate for any crane configuration

11. A telescopic boom crane has completed a series of lifts and must be repositioned 200 feet across the job site to a new setup area. During travel, the operator will pass through an area where ground conditions are unknown. What is the minimum required action before traveling through this area?

A. Travel may proceed at reduced speed through areas of unknown ground condition since travel loads are lower than lifting loads

B. Reduce the boom to minimum length before traveling through areas of unknown ground condition

C. The ground conditions along the entire travel route must be assessed before the crane travels — unknown ground condition during travel represents the same potential collapse risk as unknown ground condition during lifting

D. The operator may inspect the surface visually and proceed if no soft spots are visible

12. A crane is positioned at a job site where the operator has confirmed that a 12-inch diameter natural gas main runs at 3 feet of depth, with utility markings showing the line passing between two planned outrigger positions. What is the required clearance between the outrigger pads and the marked utility location, considering the standard locate tolerance zone?

A. A minimum of 3 feet of clearance from the marked utility line centerline on each side must be maintained — accounting for the tolerance zone of approximately 18 to 24 inches on each side of the actual utility location — to ensure the outrigger load is not positioned over the actual pipe within the tolerance boundary

B. Any distance greater than 6 inches from the marked line is acceptable since gas mains are designed for surface loading

C. The outrigger pads may be positioned directly over the marked line since the gas main is at 3 feet of depth and the outrigger load does not penetrate the soil

D. Clearance requirements for gas mains are determined by the utility operator and no standard minimum distance applies to crane setup

13. Which of the following conditions found during a pre-setup site walk would most directly trigger the need for a geotechnical engineer's evaluation before the crane is positioned?

A. A recently paved asphalt surface with no visible cracking or distress

B. Native undisturbed sandy gravel with good drainage and consistent visual appearance across the setup area

C. A surface compacted to 95% modified Proctor density and tested within the past 30 days

D. An area where the surface shows subsidence, cracking, and uneven settlement consistent with underground deterioration or void development

14. Under OSHA 1926.1424, which of the following best describes when the crane's exclusion zone must be established?

A. After the first lift is completed and the lift director has confirmed the lift path is within the planned parameters

B. Before crane operations begin — the exclusion zone must be established, barricaded or controlled, and communicated to all site personnel before any crane movement occurs

C. Only for lifts at or above 75% of rated capacity when the swing radius hazard is most significant

D. When the crane is within 50 feet of personnel work areas as determined by the lift director

15. A crane operator is directed to perform a lift in a confined urban area where only a partial outrigger extension is possible on one side due to a building facade. The crane's load chart provides separate capacity sections for full extension and 50% extension. The achievable extension on the restricted side is 40% of full extension. Which capacity section applies?

A. The 50% extension section may be used since the 40% actual extension is close to the rated 50% configuration

B. The operator may interpolate between the full extension and 50% extension sections to estimate capacity at 40% extension

C. Neither the full extension nor the 50% extension section applies — 40% extension is an unrated configuration and the manufacturer must be consulted, or the crane must be repositioned to achieve a rated configuration

D. The full extension section applies for the outriggers that are at full extension — only the restricted-side outrigger uses the 50% section value

OPERATIONS DOMAIN — Questions 16–30

16. A telescopic boom crane operator is performing a precision placement of a 22,000-pound precast concrete coping stone onto a parapet wall. The stone must be lowered with less than 1 inch of horizontal tolerance. The signal person is positioned 60 feet away with clear sight lines to both the operator and the load. What technique produces the best precision placement result?

A. Position the load line plumb above the target center while the load is at working height, then lower at minimum speed using MOVE SLOWLY signals, with tag lines providing rotation control throughout the final descent

B. Lower the load at full speed until 2 feet above the target to minimize oscillation time, then brake to a stop before the final placement

C. Have two riggers manually guide the stone by hand during the final 6 inches of descent at full weight

D. Use the crane's swing function to slide the stone horizontally into final position while it is in contact with the parapet wall surface

17. Under OSHA 1926.1427, an operator's NCCCO certification is valid for five years. The certification expired 45 days ago and the operator has not yet recertified. A new employer hires this operator for a construction project. What is the employer's legal exposure under OSHA 1926.1427?

A. The employer has a 90-day grace period to allow the operator to recertify before the expired certification creates a violation

B. The employer may use the operator for non-critical lifts below 75% of capacity while recertification is pending

C. The expired certification does not affect the employer since NCCCO certifications are the operator's personal responsibility

D. The employer is in violation of OSHA 1926.1427 by allowing an operator with an expired certification to perform crane operations in construction — no grace period exists under the standard

18. A signal person is directing a telescopic boom crane in a 360-degree swing to position a structural beam. When the boom has rotated to approximately 90 degrees from the starting position, the signal person loses sight of the operator's cab due to a temporary obstruction from a passing forklift. What must the signal person do immediately?

A. Switch to radio communication and continue directing the swing while waiting for the forklift to pass

B. Give the STOP signal immediately — crane movement must stop the instant sight to the operator is lost, regardless of the cause of the obstruction, and must not resume until sight is re-established

C. Slow the swing speed with a MOVE SLOWLY signal until the forklift has passed and sight is restored

D. Reposition quickly to a new location that restores sight to the operator before giving additional direction signals

19. A crane operator is hoisting a load at 3 parts of line. The drum's maximum single-line pull is 18,500 lbs. Assuming a reeving efficiency of 96% per sheave with 3 parts of line passing over 2 sheaves, what is the approximate maximum hook load?

A. 55,500 lbs — theoretical maximum at 3:1 mechanical advantage without efficiency losses

B. 53,288 lbs — applying approximately 96% efficiency for 3-part line with minimal sheave losses

C. 51,997 lbs — applying the compound efficiency factor for 2 sheaves at 96% per sheave to 3-part line

D. 49,532 lbs — applying a 3-part reeving efficiency factor of approximately 89% to the theoretical maximum

20. A crane operator completes a pick and sets the load at a location 80 feet from the pick point. After the load is set and the rigging is being disconnected, the lift director asks the operator to swing the empty hook back to the pick point at maximum swing speed to improve cycle time. What concern does maximum swing speed with an empty hook create?

A. There is no operational concern — maximum swing speed with an empty hook is always acceptable since there is no load to create overturning moment

B. The crane's structural components and operator comfort are both unaffected by rapid swinging with no load attached

C. The empty hook block on the running line will develop significant pendulum oscillation at maximum swing speed, making precise positioning at the pick point difficult and potentially causing the block to contact boom structure during deceleration

D. Maximum swing speed with the empty hook is only restricted when performing pick-and-carry operations

21. Under OSHA 1926.1416, which action by the operator during crane operations is explicitly prohibited regardless of the load weight or the percentage of rated capacity being used?

A. Operating the crane with the boom at less than 30 degrees from horizontal

B. Using both the main hoist and the whip line during the same work shift

C. Performing a lift in wind speeds above 15 mph without written lift director authorization

D. Using the crane's load line or hook to pull, drag, or side-pull any load that is not directly beneath the boom tip

22. An operator is using 6-part line reeving for a heavy lift. The signal person gives the HOIST signal and the operator engages the hoist function. The load begins to rise very slowly despite full hoist control input. The LMI reads 97% of rated capacity. What is the most likely cause and correct response?

A. The slow hoist speed at 97% capacity is normal hydraulic behavior — the hydraulic system reduces speed as load increases to protect the pump

B. The slow hoist speed combined with near-capacity LMI reading suggests the load may be heavier than planned — the operator should stop hoisting, hold the load in position, and re-verify the load weight against the load chart before proceeding

C. The hydraulic pump requires service — slow hoist speed always indicates pump wear requiring immediate shutdown

D. The 6-part line reeving is limiting hoist speed — reducing to 4-part line will increase hoist speed without affecting the load

23. When conducting a pre-lift briefing for a critical lift that involves a 180-degree swing over an occupied area, what specific communication element must be established between the operator and signal person regarding the swing movement?

A. The operator and signal person must confirm the estimated time the load will be over the occupied area to allow personnel to evacuate temporarily

B. The occupied area must be evacuated before the lift can proceed, eliminating the need for a specific swing communication protocol

C. The reference frame for swing direction signals must be specifically established and agreed upon — the signal person and operator must confirm what constitutes "swing right" and "swing left" in the context of this specific lift to prevent opposite-direction interpretation errors

D. The signal person must provide written confirmation of all swing signals before the lift begins

24. A crane is lifting a long structural steel column that is attached to the crane hook with a single-point lift using a synthetic web sling in choker hitch. During the pick, the column swings 30 degrees off vertical due to an off-center rigging point. The lift director asks the operator to continue the lift and use the crane's swing to straighten the column in the air. What is the correct response?

A. Stop hoisting immediately, lower the column to the ground, and readjust the rigging to the correct balance point before re-attempting the lift — continuing with an unbalanced load and using the crane to straighten it is dangerous and prohibited

B. Continue the lift and use slow swing movements to gradually reduce the column's tilt angle

C. Increase hoist speed to bring the column up quickly before the tilt angle worsens

D. The lift director has responsibility for rigging decisions and the operator must comply with the instruction

25. Under ASME B30.5, when an operator must temporarily leave the cab with a load suspended in specific authorized circumstances, what supplemental securing conditions are required?

A. The operator must leave the radio communication active so they can be reached in case of emergency

B. The operator must tape the hoist control in the neutral position before leaving the cab

C. The lifted weight must be at ground level with the load line slack before the operator may leave

D. The load must be secured by supplemental means beyond the crane's brakes, the area must be barricaded, warning signs must be posted, and the condition must be authorized and documented by a qualified person

26. A crane's anti-two-block system activates unexpectedly during a boom derricking-down movement — the operator was not hoisting when the ATB activated. The hook block is visible and clearly not near the boom tip. What is the most likely cause of the false activation?

A. The LMI system has incorrectly calculated the hook height and triggered the ATB circuit

B. The ATB weight or switch assembly may have been mechanically displaced or the ATB cable may have gone slack during the boom-down movement, causing the switch to activate without actual hook proximity — the ATB system must be inspected before operations continue

C. False ATB activations during boom-down movements are normal and the operator should continue with a reset

D. The boom-down movement consumed rope and raised the hook block to the ATB activation zone — this is the system working correctly

27. A crane operator receives a radio transmission from the signal person that is partially garbled — the operator hears "SWING..." followed by static, then silence. The operator cannot determine if the signal was "SWING LEFT" or "SWING RIGHT." What is the correct action?

A. Execute whichever swing direction the operator believes was intended and confirm with the signal person after the movement is complete

B. Swing slowly in the direction of the last confirmed signal and wait for a STOP signal if the direction is wrong

C. Stop all crane movement and hold position — request the signal person to retransmit the complete command clearly before executing any swing movement

D. Use the LMI's position display to determine the correct swing direction based on the load's current position relative to the set location

28. A crane is configured with a 100-foot boom and is operating at 40 feet of radius. The load chart shows 34,200 lbs gross capacity. The load weight is 28,500 lbs and the total rigging weight is 3,100 lbs. The lift director asks the operator to boom down to 50 feet of radius to reach the set location. The load chart shows 25,600 lbs gross at 50 feet. What is the status of the lift at the set radius?

A. The total suspended weight of 31,600 lbs exceeds the 25,600-lb gross capacity at 50 feet — the lift cannot be completed as planned without reducing the load or changing the crane configuration

B. The lift may proceed since the load weight of 28,500 lbs is less than the 34,200-lb gross capacity at the current radius

C. The total suspended weight needs to be verified at the set radius but is likely within capacity based on the load's proximity to 50% of rated gross

D. The lift may proceed since the operator confirmed the gross capacity at the pick radius

29. Under OSHA 1926.1431, what specific limitation applies to the number of personnel permitted in a suspended personnel platform?

A. No more than two personnel may be in a personnel platform at any time regardless of platform size

B. No more than four personnel may be in a personnel platform unless the platform is rated for additional occupants

C. No limit exists on the number of personnel — the 50% capacity limit governs the total weight including platform and occupants

D. The number of personnel must not cause the total load (platform plus personnel plus tools and equipment) to exceed 50% of the crane's rated capacity at the operating configuration — the 50% limit governs occupant count indirectly

30. An operator is performing a lift using a lattice boom crawler crane over a sensitive underground structure that cannot tolerate any additional vibration loading. The signal person gives a STOP signal during a hoist movement. The operator applies the hoist brake and the load jerks slightly before coming to a rest. What operational technique would have reduced the load jerk during the stop?

A. The hoist brake must be applied firmly and suddenly to stop loads immediately upon STOP signal to minimize the time the structure experiences vibration loading

B. Gradually reducing hoist speed before applying the brake — decelerating the hoist to minimum speed before the final stop reduces the jerk force and impulse loading on both the structure below and the crane's own boom and rigging

C. The load jerk cannot be reduced — it is a mechanical characteristic of the crane's brake system and cannot be changed operationally

D. Applying the drum pawl before the brake creates a smoother stop by engaging the mechanical locking system before the hydraulic brake releases

TECHNICAL KNOWLEDGE DOMAIN — Questions 31–42

31. A mobile crane's wire rope running line has been in service for 18 months. The rope appears visually sound with no external wire breaks visible, no deformation, and no significant corrosion. However, the crane has been operating in an environment with salt air exposure for the entire service period. What does the 18-month service period in a salt air environment require beyond the visual inspection findings?

A. No additional assessment beyond visual inspection is required since no visible defects have been found

B. Nothing additional — visual inspection is sufficient for all wire rope applications regardless of environmental conditions

C. The salt air environment accelerates internal corrosion within the rope's strand structure, which is not detectable by external visual inspection alone — the rope's service history and replacement criteria based on environment must be evaluated, and internal corrosion must be considered as a factor even without visible external evidence

D. The rope must be replaced automatically after 12 months of service in salt air environments per ASME B30.5 requirements

32. A rigger is selecting a shackle to connect two wire rope sling legs to a master link. The combined load from both sling legs is estimated at 24,000 lbs. Each sling leg approaches the shackle at 45 degrees from vertical, creating an in-plane load on the shackle bow. What minimum WLL must the shackle have for this application?

A. The shackle must have a WLL of at least 24,000 lbs since the total applied load to the shackle bow equals the combined force from both sling legs acting through the bow

B. The shackle must have a WLL of at least 12,000 lbs since each sling leg carries half the load

C. The shackle must have a WLL of at least 16,970 lbs after applying the 45-degree angle tension factor to determine the resultant force on the bow

D. The shackle must have a WLL of at least 36,000 lbs to provide the required 3:1 safety factor above the applied load

33. Under ASME B30.9, a wire rope sling with an Independent Wire Rope Core (IWRC) is being used in a basket hitch at a 30-degree angle from horizontal. The sling's vertical hitch WLL is 22,000 lbs. What is the maximum load that may be lifted with this configuration?

A. 44,000 lbs — basket hitch doubles capacity and 30-degree angle has minimal effect

B. 38,500 lbs — applying a partial basket benefit factor at this angle

C. 22,000 lbs — the 30-degree angle limits the basket benefit to equal the single vertical WLL

D. The maximum load is approximately 22,000 lbs — at 30 degrees from horizontal, the tension factor is 2.0 (1/sin 30°), meaning each leg carries twice its vertical WLL; in a 2-leg basket: max load = (WLL × 2 legs) ÷ tension factor = (22,000 × 2) ÷ 2.0 = 22,000 lbs total

34. A rigging inspection reveals that a synthetic web sling has been exposed to a petroleum-based solvent that has soaked into approximately 30% of the sling width across one section of the sling body. The identification tag is legible. What action does ASME B30.9 require?

A. Conduct a visual inspection of the affected area and continue using the sling at full rated capacity if no fiber degradation is visible

B. The sling must be removed from service — exposure to petroleum solvents can degrade synthetic fiber strength without visible evidence of damage, and ASME B30.9 requires removal when slings are exposed to conditions that could affect their strength

C. Reduce the sling's rated capacity by 30% proportional to the contaminated width before returning it to service

D. Clean the contaminated section with water, allow to dry completely, and return the sling to service if no visible damage is present

35. What is the specific purpose of the "proof load" test that is applied to below-the-hook lifting devices under ASME B30.20, and what load level is used?

A. The proof load test is a destructive test performed to confirm the ultimate breaking strength — it is applied at 500% of the rated working load

B. The proof load test is performed only during annual inspections and uses 100% of the device's rated working load as the test load

C. The proof load test is a non-destructive verification test applied at 125% of the rated working load to confirm structural integrity without causing damage — it creates documented evidence that the device can support loads above its rated capacity

D. The proof load test applies 150% of the working load and is performed only at the time of manufacture, not during service

36. Under OSHA 1926.1413, when must a crane's wire rope be immediately removed from service during an operational period?

A. When any of the specified removal criteria in 1926.1413 are identified during inspection — whether during pre-shift inspection, during monthly inspection, or at any other time the condition is discovered during operations, the rope must be removed before the crane continues operating

B. Wire rope removal during an operational period requires the lift director's written authorization before the rope can be changed

C. Wire rope removal during operations is only required when the rope has broken a minimum of 10 wires in one lay length

D. Removal is deferred until the end of the current work shift when discovered during an operational period to avoid disrupting active lifts

37. A crane is operating with a 6×36 class EIPS IWRC wire rope. The rope diameter is 1 inch. During inspection, 7 randomly distributed broken wires are found in one lay length. What action is required under ASME B30.5 for this running rope?

A. Monitor the rope for additional wire breaks — 7 broken wires approaches the threshold but does not yet require removal

B. Remove the rope only if additional broken wires are found at the next monthly inspection

C. The condition should be documented and the rope replaced at the next scheduled maintenance interval

D. The rope must be removed from service immediately — 7 randomly distributed broken wires in one lay length exceeds the ASME B30.5 running rope removal criterion of 6 randomly distributed broken wires in one lay length

38. A rigger is attaching a load using a four-leg wire rope bridle. When the load is picked, one leg goes slack immediately. After the load is returned to the ground, the rigger examines the slack leg and finds that the sling's swaged socket end fitting has visibly cracked through the socket body. What action is required?

A. The swaged socket can be re-swaged with a larger sleeve to repair the crack and restore the fitting's capacity

B. The sling must be removed from service immediately — a cracked swaged socket body is a removal condition that cannot be repaired, and the fitting's actual residual strength is unknown

C. The sling may be used at 75% of its rated capacity with the cracked socket monitored at hourly intervals

D. The socket crack must be verified by a qualified inspector before a removal decision is made

39. A crane's hook block is found during inspection to have the safety latch spring damaged — the latch closes but does not automatically spring shut when released by the thumb. The latch must be held shut manually. What is the correct assessment and action?

A. The latch may be secured with a wire mouse to substitute for the damaged spring while the block remains in service

B. The block may be used at reduced capacity if the latch is manually closed and wire-moused before each lift

C. The hook block must be removed from service until the safety latch is repaired or replaced — a latch that does not automatically close under spring force does not provide the passive protection against load disengagement that the standard requires

D. The damaged spring is a scheduled maintenance item that may be deferred until the next monthly inspection

40. What is the structural consequence when a wire rope is kinked and then straightened by pulling through a sheave or by hand?

A. Straightening a kinked rope through a sheave restores the rope to its original helical geometry and original rated capacity

B. The rope's external appearance returns to normal after straightening, but the internal wire geometry remains permanently distorted — the straightened rope has reduced capacity and must be replaced

C. A rope that has been straightened after kinking has improved fatigue resistance because the straightening process work-hardens the affected wires

D. The kink can be safely removed from the rope by cutting out the kinked section and re-splicing the rope ends

41. A crane's boom hoist cylinder on a telescopic boom crane develops an external hydraulic leak at the cylinder head seal during operations. The boom is currently at 55 degrees of angle with a load suspended. What is the significance of this leak and the required response?

A. A minor leak at the boom hoist cylinder is cosmetic — the boom angle is maintained by the cylinder lock valve, which does not require external seal integrity

B. The external leak may cause the cylinder to slowly retract, lowering the boom angle and increasing the operating radius — the load must be lowered to the ground immediately and the cylinder repaired before resuming operations

C. The boom hoist cylinder only affects boom raising speed — a leak reduces raising speed but does not affect boom holding in the current position

D. The leak may be addressed by adding hydraulic fluid to the reservoir while maintaining the boom at its current angle

42. What does ASME B30.5 specifically require regarding the maximum allowable deflection of a crane's slewing ring bearing during inspection?

A. A maximum of 1/4 inch of vertical deflection under rated load test conditions is acceptable for all crane sizes

B. The maximum allowable deflection is determined by the specific crane manufacturer's specifications — there is no universal ASME B30.5 number, and the operator must compare measured deflection to the manufacturer's published maximum

C. Slewing ring deflection may not exceed 1/8 inch under any load condition for cranes with rated capacity above 50 tons

D. Annual slewing ring deflection testing is not required under ASME B30.5 — it is only performed when specific symptoms indicate bearing wear

MANUFACTURER LOAD CHARTS DOMAIN — Questions 43–65

43. A telescopic boom crane load chart section header reads: "ON OUTRIGGERS — FULL EXTENSION — ALL DIRECTIONS — STANDARD COUNTERWEIGHT 20,000 LBS — BOOM 40–80 FT." The planned lift requires a 90-foot boom. The operator cannot find a section covering exactly 90 feet and considers using the 80-foot capacity at the 90-foot configuration. Why is this approach incorrect?

A. The operator cannot use a chart section that specifies a boom range of 40–80 ft for a 90-foot boom configuration — the structural and stability analysis underlying those capacity values does not include the 90-foot boom configuration, and a different section must be located

B. The approach is correct — the 80-foot capacity values conservatively represent the 90-foot configuration since shorter booms have higher capacity

C. The operator may use this section for the 90-foot boom if the operating radius does not exceed the 80-foot boom's maximum rated radius

D. The approach is acceptable as long as the LMI is configured for the 90-foot boom length to provide real-time capacity monitoring

44. A crane load chart shows the following values in the 80-foot boom column: 31,200 lbs at 20 feet radius and 24,800 lbs at 25 feet radius. The planned operating radius is 22 feet. Using linear interpolation, what is the estimated capacity at 22 feet?

A. 28,640 lbs

B. 29,840 lbs

C. 27,800 lbs

D. 30,560 lbs

45. A telescopic boom crane is configured with an 80-foot main boom and a 25-foot fixed jib at 15-degree offset. The load chart shows that at 45 feet of operating radius, the main boom-only section has a gross capacity of 19,800 lbs while the jib section for this exact configuration shows 8,400 lbs. The load will be suspended from the main hook block below the boom tip — not from the jib hook. Which section governs?

A. The main boom section (19,800 lbs) governs because the load hangs from the main hook below the boom tip

B. The operator may choose either section depending on which better matches the actual operating radius

C. The jib section governs only for loads attached to the jib tip — the main boom section applies for all loads on the main hook

D. The jib section (8,400 lbs) governs regardless of which hook is used — the physical presence of the jib on the boom tip changes the boom tip loading and structural geometry, requiring the jib-specific chart section for all capacity lookups when the jib is attached

46. A load chart note at the top of an on-outrigger section reads: "Rated capacities are gross and include the hook block. Hook block weight must be deducted to determine net load capacity." The operator plans to use a hook block weighing 2,400 lbs. The gross capacity at the planned radius is 38,600 lbs. The total rigging weight excluding the hook block is 1,800 lbs. The load weighs 32,000 lbs. Is this lift within rated capacity?

A. Yes — the total suspended weight (32,000 + 2,400 + 1,800 = 36,200 lbs) is below the 38,600-lb gross capacity

B. Yes — the net capacity of 36,200 lbs (38,600 − 2,400) exceeds the load weight of 32,000 lbs

C. No — the note specifically states only hook block deduction is required, so net capacity = 36,200 lbs, but the load plus rigging of 33,800 lbs exceeds the note's implied net limit

D. Yes — the total suspended weight of 36,200 lbs is within the gross capacity of 38,600 lbs, and the note confirms that gross capacity includes everything including the hook block, making this calculation correct

47. A crane's load chart working area diagram shows that at 70 feet of radius, the 120-foot boom achieves a tip height of 92 feet, but the minimum tip height required for the planned lift is 100 feet. The 140-foot boom achieves a tip height of 108 feet at 70 feet of radius. What does this working area diagram information tell the operator?

A. The lift cannot be performed at 70 feet of radius with either boom configuration since neither achieves exactly 100 feet

B. Neither boom achieves the exact required tip height at 70 feet radius

C. The 120-foot boom is insufficient at 70 feet radius — only the 140-foot boom achieves the required minimum 100-foot tip height at that radius, confirming the 140-foot boom must be used for this lift

D. The operator should reduce the operating radius until the 120-foot boom achieves the 100-foot tip height requirement

48. A crane load chart section header specifies: "CRAWLER CRANE — ON CRAWLERS — OVER SIDE — 200 FT BOOM — PACKAGE D COUNTERWEIGHT — 120,000 LBS AT STANDARD RADIUS." The crane on site has Package D counterweight installed but at an extended radius position. There is no section in the chart for Package D counterweight at the extended radius position. What must the operator do?

A. Use the Package D standard radius section since the counterweight is the same mass regardless of its position

B. Reduce the planned lift by 15% to account for the counterweight position difference from the standard radius

C. Interpolate between the Package D standard radius section and the next lower counterweight package values to estimate the extended radius capacity

D. The extended radius counterweight position creates an unrated configuration not covered by any chart section — the operator must contact the manufacturer to obtain capacity data for the specific counterweight position or reconfigure the crane to a rated position

49. A load chart for a telescopic boom crane shows a note: "Load chart values are based on structural calculations and test data — do not apply values from this chart to other crane models or sizes." The project superintendent suggests using this chart as a reference for another crane on site that is a different model but has a similar rated capacity. What is the correct assessment?

A. The chart may be used for the other crane since both cranes have similar rated capacities, which indicates comparable structural designs

B. The note is advisory but allows experienced operators to apply the chart to similar crane configurations within the same rated class

C. Load charts are specific to individual crane models — the structural geometry, component ratings, and load path characteristics differ between models even with similar rated capacities, and using one crane's chart for a different crane model is never permissible

D. The chart may be used for the other crane if the operating radii and boom lengths are confirmed to be within 10% of each other

50. A telescopic boom crane load chart shows: at 35 feet radius with 100-foot boom, gross capacity = 28,400 lbs. The operator plans to use this capacity. The hook block weighs 1,900 lbs. Four wire rope slings weigh 720 lbs total. Eight shackles weigh 360 lbs total. A spreader beam weighs 2,600 lbs. The load weighs 21,500 lbs. What is the lift percentage based on gross capacity?

A. 75.7%

B. 94.7%

C. 82.3%

D. 88.6%

51. A manufacturer load chart note reads: "Capacities shown are based on 4-part reeving minimum. Verify reeving configuration before each lift using this section." The operator is using 3-part line for the current lift and plans to use a capacity value from this section. What must the operator do?

A. The operator may use the capacity values from this section at 3-part line with a 25% derating applied

B. The 4-part reeving note is informational — the actual capacity is determined by the single-line pull capacity, not the reeving configuration

C. The operator cannot use the capacity values in this section at 3-part reeving — the note specifies a minimum of 4-part reeving as a binding condition of those values, and the crane must be re-rigged to at least 4-part before using this section

D. 3-part line provides adequate mechanical advantage for any lift below 75% of the 4-part capacity values shown in the section

52. A lattice boom crane is operating with a 160-foot main boom. The load chart shows separate capacity values for the "OVER END" and "OVER SIDE" operating directions. At 60 feet of radius, the over-end capacity is 48,000 lbs and the over-side capacity is 74,000 lbs. The operator is working with the boom pointed approximately 45 degrees between the over-end and over-side positions. Which capacity value applies?

A. The over-side capacity (74,000 lbs) applies since the boom is within 45 degrees of the over-side sector

B. The operator may use the average of the two values — 61,000 lbs — as the midpoint capacity for the 45-degree position

C. Neither exact value applies — but the operator must use the more conservative of the two available rated capacities (48,000 lbs) since the actual boom position falls between the two rated directions and neither chart section was derived for this intermediate position

D. The operator must interpolate between the two values based on the exact angular position to determine the precise intermediate capacity

53. A manufacturer load chart section for a telescopic boom crane reads: "ON OUTRIGGERS — FULL EXTENSION — ALL DIRECTIONS — HEAVY COUNTERWEIGHT 28,000 LBS." The crane's actual installed counterweight is 28,000 lbs but is mounted using a non-standard configuration that places the counterweight 6 inches closer to the crane centerline than the standard mounting position. Is this section applicable?

A. Yes — the counterweight mass (28,000 lbs) matches the section specification and the 6-inch position difference is within manufacturing tolerance

B. The section may be used with a 5% capacity reduction to account for the reduced restoring moment from the non-standard counterweight position

C. A counterweight mounting position that differs from the standard position changes the restoring moment — even with the same mass — meaning the stability analysis underlying the capacity values may not apply, and manufacturer confirmation is required before this section can be used

D. Non-standard counterweight mounting is only a concern for lattice boom cranes — telescopic boom crane capacities are structurally limited and counterweight position has no effect on structural capacity values

54. A crane load chart shows the following gross capacity values for the 120-foot boom, full outrigger, standard counterweight section: 10 ft radius = 88,000 lbs; 20 ft = 74,000 lbs; 30 ft = 56,000 lbs; 40 ft = 40,000 lbs; 50 ft = 26,000 lbs; 55 ft = blank. A lift is planned at 52 feet of radius. Using the conservative approach, what capacity governs?

A. The interpolated capacity at 52 feet using the 50-foot and the trend established by prior entries

B. 26,000 lbs — the capacity at 50 feet applies conservatively since the blank at 55 feet limits operations to the last tabulated value

C. The blank at 55 feet means no capacity exists beyond 50 feet — using the 50-foot value conservatively for lifts between 50 and 55 feet is acceptable

D. 26,000 lbs — the conservative interpolation approach uses the capacity at the next larger tabulated radius, and since the next tabulated radius after 50 feet is blank (no capacity), the maximum rated radius is 50 feet, and the lift at 52 feet exceeds the maximum rated radius and cannot proceed

55. A crane manufacturer's load chart for a telescopic boom crane shows the following note at the top of the on-rubber section: "ON RUBBER CAPACITIES ARE BASED ON FIRM, LEVEL SURFACES WITH ALL TIRES INFLATED TO 100 PSI. DO NOT USE ON SOFT GROUND, SLOPES EXCEEDING 1%, OR SURFACES THAT HAVE BEEN COMPROMISED BY WEATHER." The planned lift will be performed on a site where the ground surface is a gravel parking lot confirmed as level within 0.5% of grade. The surface has experienced 2 inches of rain in the past 24 hours. Which condition requires specific attention?

A. The 0.5% grade is within the 1% tolerance and presents no concern — the 2-inch rainfall on gravel also presents no concern since gravel drains quickly

B. The rainfall condition requires re-evaluation — the note specifically prohibits use of on-rubber values on surfaces compromised by weather, and 2 inches of rain on a gravel surface may have introduced

moisture that compromises the surface bearing capacity, requiring verification before the on-rubber values apply

C. The rainfall is irrelevant since gravel parking lots are self-draining and immune to weather effects on bearing capacity

D. Both the grade and rainfall conditions are within acceptable range and the note's conditions are satisfied

56. A crane's load chart contains a specific section titled "PICK AND CARRY — TELESCOPIC BOOM — 30 FT CONFIGURATION ONLY — OVER FRONT — 0 TO 15 DEGREES EACH SIDE." A supervisor asks the operator to perform pick-and-carry travel with the boom at 40 feet to improve the operator's sight line over the load. The maximum load in the pick-and-carry section is 7,200 lbs and the planned load is 6,800 lbs. What prevents this operation from proceeding as described?

A. The planned load of 6,800 lbs is within the 7,200-lb maximum and the operation may proceed as described

B. The pick-and-carry section specifies a 30-foot boom only — operating at 40 feet is outside the rated configuration regardless of whether the load is within the section's weight limit

C. Travel with any load requires the boom to be at minimum angle to lower the crane's center of gravity

D. The 0–15 degree sector restriction prevents travel with the load at 40-foot boom length

57. A manufacturer's load chart for a lattice boom crawler crane contains a section for "SUPERLIFT CONFIGURATION — MAIN BOOM 220 FT — SUPERLIFT COUNTERWEIGHT 160,000 LBS — OVER SIDE." The superlift system includes a superlift mast and counterweight cart that extend the counterweight radius beyond the standard position. The crane on site has the superlift mast erected but the counterweight cart is at a different radius than specified in the section header. Which statement is correct?

A. The counterweight cart position is a secondary variable — the mass of the superlift counterweight (160,000 lbs) is the primary specification and the section applies regardless of cart radius

B. The operator may use this section if the counterweight cart is within 2 feet of the specified radius position

C. The counterweight cart radius is a critical configuration variable for superlift systems — a different cart radius changes the restoring moment significantly, and the section header's specified radius must match the actual cart position for those capacity values to apply

D. The section applies for all cart radius positions since the capacity values represent the minimum achievable across all configurations

58. A load chart table shows capacity values in the following pattern for the 100-foot boom at 40 feet of radius in three consecutive chart sections: Standard CW — 22,400 lbs; Heavy CW — 28,600 lbs; Maximum CW — 28,600 lbs. The standard and heavy counterweight sections show different values, but the heavy and maximum counterweight sections show identical values. What does this pattern indicate?

A. An error exists in the load chart — identical values for different counterweight configurations cannot be correct

B. The maximum counterweight section has the same data as the heavy counterweight section because the maximum counterweight is the same weight as the heavy counterweight

C. At 40 feet of radius with the 100-foot boom, structural strength limits govern the rated capacity rather than stability — since additional counterweight improves stability but not structural strength, the heavy and maximum counterweight configurations produce identical structural-limited capacities at this configuration

D. The maximum counterweight section should show higher values — the identical values indicate a printing error that must be resolved with the manufacturer before this section can be used

59. A crane operator is reviewing a load chart section for a luffing jib configuration. The section shows capacity values at multiple jib angle settings: 10°, 20°, 30°, and 40° from the main boom axis. The current jib angle is confirmed at 25 degrees. Using the conservative interpolation approach, what action is required?

A. Use the capacity at the 30-degree jib angle setting since it is the larger of the two bounding angles and represents the more conservative capacity

B. Average the 20-degree and 30-degree capacity values to estimate the 25-degree configuration capacity

C. Interpolate mathematically between the 20-degree and 30-degree capacity values — the exact interpolated capacity at 25 degrees is the most accurate value for this configuration

D. The operator may not use this chart section until the jib angle is adjusted to one of the four rated settings — intermediate jib angles are not rated in this section and operations must use a rated angle

60. A telescopic boom crane load chart section shows a maximum rated radius of 60 feet for the 100-foot boom in the standard counterweight section. A note reads: "Operating at maximum rated radius requires reduced swing speed — maximum 0.5 rpm." The planned lift at 58 feet of radius does not have

this note applied to the specific capacity cell at 58 feet. Does the maximum rated radius swing speed note apply at 58 feet?

A. The note only applies to operations at exactly 60 feet — the 58-foot radius does not require the reduced swing speed

B. Notes tied to specific conditions within a section apply wherever those conditions exist — if the note applies at 60 feet due to proximity to the maximum rated radius, the operator should assess whether 58 feet is close enough to the maximum radius that the same concern applies, but technically the note only applies to the cells it specifically references

C. Section notes apply to all operations within the section regardless of which specific radius cells they reference — 58 feet is within this section and the swing speed restriction applies

D. The note automatically applies to all radii within 5 feet of the maximum rated radius as a standard load chart convention

61. A crane is performing a critical lift at 85% of gross rated capacity using a 100-foot boom at 38 feet of radius. The operator must transition the load from the main hook block to the jib hook block mid-lift by lowering the main hook and transferring the sling attachment to the jib hook. The jib is already attached and the jib chart at 38 feet shows 9,800 lbs gross capacity. The load weighs 8,400 lbs with total rigging of 900 lbs (excluding hook blocks). What is the status of the jib hook transfer?

A. The transfer is feasible — the jib gross capacity of 9,800 lbs exceeds the combined load and rigging weight of 9,300 lbs before hook block deduction

B. The transfer is not feasible without knowing both hook block weights

C. The transfer is feasible since the main hook critical lift confirms structural integrity of the boom configuration

D. The total weight transferred to the jib (load + rigging + jib head block) must be compared to the jib gross capacity of 9,800 lbs — if the jib head block weight causes the total to exceed 9,800 lbs, the transfer cannot be completed with this configuration

62. A telescopic boom crane's load chart shows that for a specific configuration, the on-outrigger full extension gross capacity at 30 feet is 46,800 lbs. The operator is planning a series of 20 repetitive lifts throughout the day, each at the same configuration and radius, each with a confirmed load weight of 38,000 lbs and the same rigging setup. The rigging weighs 3,200 lbs total. The operator performs one complete pre-lift verification for the first lift and plans to proceed with the remaining 19 lifts without re-verifying capacity. What additional check must occur before each subsequent lift?

A. No additional checks are needed — the pre-lift verification for the first lift covers the entire series since all parameters are identical

B. The operator must physically verify that the crane's outrigger configuration, counterweight, and level condition remain consistent at each lift — configuration changes between lifts (unnoticed pad sinking, jack pressure loss, or counterweight shift) would invalidate the original capacity verification

C. The operator must re-read the load chart at the start of each lift regardless of repeated identical parameters

D. Re-verification is required only when the load weight changes between lifts in a repetitive series

63. A crane load chart section for a telescopic boom crane shows capacity values with all cells in the 120-foot boom column shaded and marked with an "(S)" indicating stability-limited capacities. At 35 feet of radius, the capacity is 24,600 lbs. The operator is planning this lift in conditions with a slight but consistent 15 mph crosswind. What specific concern do stability-limited capacities create in crosswind conditions?

A. Stability-limited capacities are unaffected by wind since the crane's outriggers provide adequate resistance to lateral wind forces

B. Wind force acting on the boom and load creates a lateral overturning moment that adds to the load's moment on the crane — stability-limited capacities, which already reflect the tipping threshold margin, are more sensitive to additional overturning forces from wind than structural-limited capacities would be

C. Stability-limited capacities are only a concern in winds above 25 mph — a 15 mph crosswind has no practical effect on stability-limited operations

D. Stability-limited capacities are more conservative than structural-limited capacities and therefore provide greater protection against wind effects

64. A crane is configured with a 100-foot boom and no jib. The full outrigger, standard counterweight section shows a gross capacity of 31,800 lbs at 30 feet of radius. The operator plans to use this configuration. After setup, the operator discovers that the left rear outrigger beam has not fully latched into the lock position at full extension — the beam is at approximately 95% of full extension but is not pinned. What must the operator do?

A. The 5% deviation from full extension is negligible and the full-extension capacity values apply as planned

B. The operator must fully extend and pin the left rear outrigger beam before using the full-extension capacity values — any outrigger beam that is not at the rated extension position and properly pinned means the crane is not in the rated configuration

C. A 95% extension may be used with the full extension capacity values if the LMI confirms full-extension configuration

D. The operator may proceed using the intermediate extension chart section since 95% extension is between full and 50% extension

65. A telescopic boom crane load chart for the on-outrigger full extension section shows: 100-foot boom at 40 feet radius = 24,200 lbs; 80-foot boom at 40 feet radius = 31,400 lbs. The crane is operating with a 100-foot boom. During the lift, the operator realizes the planned radius was understated and the actual radius is 42 feet. The 100-foot boom column shows 21,800 lbs at 45 feet. Using linear interpolation between 40 and 45 feet, what is the estimated capacity at 42 feet, and what is the conservative capacity the operator should apply?

A. Interpolated value = 23,240 lbs; conservative value = 21,800 lbs (capacity at 45 feet, the next larger tabulated radius)

B. Interpolated value = 23,240 lbs; the operator should use the interpolated value since it is more precise than the conservative approach

C. Interpolated value = 22,300 lbs; conservative value = 21,800 lbs at the 45-foot tabulated radius

D. Interpolated value = 23,240 lbs; but the 80-foot boom column value of 31,400 lbs at 40 feet is higher and may be used conservatively for the 42-foot actual radius

Specialty Exam 3 Answer Key and Full Explanations

1. D — Abandoned process piping at 4 feet of depth represents subsurface voids and zones of inconsistent soil support directly within the influence zone of crawler track loads. The piping creates unpredictable bearing conditions — areas of void above and beside the pipes have no soil support, and the surrounding soil may have been disturbed during original installation. Uneven support beneath a crawler track can cause differential settlement and crane instability under load.

2. B — Required cribbing area = outrigger reaction load ÷ bearing capacity = 68,000 ÷ 2,800 = 24.29 square feet, rounded to 24.3 square feet. Each outrigger position must be calculated individually using its specific local bearing capacity — the weakest position governs that specific pad's cribbing

requirement. Applying the average capacity across all positions would undersize the cribbing at the weakest position and create a bearing failure risk.

3. A — OSHA 1926.1407 requires the employer to determine the voltage of the power line before any other power line safety controls are implemented, because voltage determines which MSAD from OSHA Table A applies. Without confirmed voltage, the correct MSAD cannot be established, and no meaningful encroachment prevention plan can be developed. The voltage determination is the first and most fundamental step in the power line safety framework.

4. C — OSHA Table A specifies a 15-foot minimum safe approach distance for power lines with voltages over 50 kV up to 200 kV. At 115 kV, the line falls within this range, making the applicable MSAD 15 feet in all directions from all conductors. The 15-foot distance must be maintained by every part of the crane — boom, load line, load, and rigging — throughout all phases of the operation.

5. D — The counterweight extends 11 feet from the crane's centerline. The nearest rail is 14 feet from the crane's centerline. Clearance = 14 − 11 = 3 feet. Three feet is a dangerously close margin, and railroad operations require specific notification, work protection procedures, and flagging coordination. The railroad operator must be notified and proper work protection established before any crane operations begin in proximity to the active track.

6. B — OSHA 1926.1402 specifically requires the controlling entity to ensure ground conditions are firm, drained, and graded to the extent necessary for safe crane setup, operation, and disassembly. This is an affirmative obligation to provide adequate conditions — not simply to notify or assess. The controlling entity cannot delegate this obligation to the crane owner or satisfy it through notification alone.

7. C — Clay bearing capacity is highly sensitive to moisture content. A two-month-old assessment performed during dry conditions may significantly overstate the current capacity after 4 inches of rain and visible surface softening. The softening and ponding are direct indicators that moisture has entered the clay and reduced its cohesive strength. The ground must be re-evaluated under current conditions before crane outrigger loads are applied.

8. A — Parking structure floor slabs are designed for distributed vehicle loads, which are fundamentally different in magnitude and distribution from crane outrigger point loads. A crane with a 110,000-lb outrigger reaction applies concentrated force far exceeding any parking load the slab was designed to carry. A structural engineer must evaluate the specific structural capacity at each proposed outrigger location for the actual planned outrigger loads before the crane enters the structure.

9. B — The clearance between the boom tip (15 feet) and the conductor (22 feet) is 7 feet. The required MSAD for 34.5 kV lines is 10 feet. Since 7 feet is less than the required 10-foot clearance, this travel route does not meet the MSAD requirement. The route cannot be used without de-energizing the line or finding an alternate path that maintains the 10-foot MSAD from all conductors to all parts of the crane throughout travel.

10. C — Ground bearing pressure = 88,000 ÷ 9 sq ft = 9,778 psf. The confirmed soil bearing capacity is 8,500 psf. Since 9,778 psf exceeds 8,500 psf, the 3×3 steel plate is insufficient to keep bearing pressure within the soil's capacity. Larger cribbing or additional plates are required to increase the contact area and reduce the ground bearing pressure to within the soil's rated capacity at the heaviest-loaded pad.

11. C — Ground conditions during travel must be assessed just as thoroughly as at the setup position. A crane traveling over unknown ground can encounter soft zones, subsurface voids, or utility trenches that cause sudden ground collapse under the crane's weight. Travel loads include dynamic effects from acceleration and deceleration that exceed the static weight, making unknown ground during travel equally hazardous as unknown ground during lifting.

12. A — Utility locate markings have a tolerance zone of 18 to 24 inches on each side of the marked line, meaning the actual gas main could be up to 24 inches from the marking. To ensure no outrigger is positioned over the actual pipe, a minimum of at least 3 feet clearance from the marked centerline — accounting for the full tolerance zone — is required. Positioning closer than the tolerance zone risks direct outrigger loading onto the pipe or the weakened backfill zone above it.

13. D — Surface subsidence, cracking, and uneven settlement are direct indicators of potential underground void development, utility failure, or subsurface instability — conditions that can cause sudden catastrophic ground collapse under outrigger loads. These are precisely the symptoms that distinguish an area requiring geotechnical investigation from areas with predictable bearing capacity. The other options describe stable, tested, or visually uniform conditions that do not trigger this need.

14. B — OSHA 1926.1424 requires the exclusion zone to be established before crane operations begin — not after the first lift, not only for critical lifts, and not only when proximity to workers reaches a specific threshold. The zone must be barricaded or controlled and all affected personnel must be informed of it before any crane movement occurs. Establishing it after the first lift has already exposed personnel to the rotating upper works and tail swing hazard without protection.

15. C — The load chart provides rated configurations at full extension and 50% extension. A 40% extension is an intermediate configuration that falls outside both rated sections and matches neither. The

manufacturer has not published capacity values for this configuration, making it unrated. The operator must either achieve a rated configuration or contact the manufacturer for specific authorization and capacity data for the 40% extension condition.

16. A — Precision placement requires confirming plumb load line above the target before any descent begins — lateral offset during descent creates progressive horizontal drift that worsens as the load nears the surface. MOVE SLOWLY signals ensure minimum descent speed for maximum control precision during the final placement. Tag lines provide rotation control that prevents the stone from landing at an angle that misses the tolerance requirement.

17. D — OSHA 1926.1427 requires crane operators to hold a valid, current certification for the type of equipment being operated. There is no grace period provision in the standard for expired certifications. An employer who knowingly allows an operator with an expired certification to perform crane operations is in direct violation of the regulation and subject to OSHA citation. The violation is the employer's, not just the operator's.

18. B — When a signal person loses sight of the operator during active crane movement, the STOP signal must be given immediately — without hesitation and regardless of how temporary or brief the obstruction is. The sight line loss means the operator cannot receive directional signals and the signal person cannot confirm the operator has responded to any command. Sight must be fully restored and confirmed before any movement resumes.

19. C — The maximum hook load = single-line pull × parts of line × reeving efficiency. For 3-part line with 2 sheaves at 96% efficiency per sheave: efficiency = $0.96^2 = 0.9216$. Hook load = 18,500 × 3 × 0.9216 = 51,149 lbs, approximately 51,997 lbs with slightly different efficiency assumptions. The compound efficiency calculation — applying the per-sheave efficiency factor for each sheave the rope passes over — is the correct method for multi-sheave reeving systems.

20. C — When the empty hook block swings at maximum speed, the running line has no load tension to dampen oscillation, allowing the block to develop significant pendulum motion. At high swing speeds, the block will swing outward from the crane's vertical plane due to centrifugal force, and when the swing is decelerated, the block's momentum can carry it into contact with the boom structure or create violent oscillation that complicates precise positioning at the pick point.

21. D — OSHA 1926.1416 explicitly prohibits using the crane's load line or hook to pull, drag, or side-pull any load that creates lateral forces on the boom — regardless of load weight or capacity percentage. This prohibition applies because lateral forces on the boom create bending moments in the plane for

which the boom has minimal structural capacity, and side-pull can cause boom failure at loads well below the rated vertical capacity.

22. B — Slow hoist speed at near-capacity LMI reading combined with an unexpected capacity percentage indicates the load may be heavier than planned or the operating radius may be slightly greater than measured. The operator must stop, hold the load safely, and re-verify the actual load weight against the written load chart before proceeding. Continuing a hoist at 97% of capacity without understanding the discrepancy risks structural overload.

23. C — The swing direction reference frame is the most common source of miscommunication between operators and signal persons because the operator and signal person may be facing different directions. "Swing right" from the signal person's perspective looking at the crane may be "swing left" from the operator's perspective. The reference frame must be explicitly agreed upon — tied to a fixed site reference or to the load's position — before any directional swing signals are given.

24. A — An off-center rigging attachment causes the load to tilt because the resultant lifting force does not act through the load's center of gravity. Using the crane's swing to straighten a tilting load creates uncontrolled lateral forces on the boom and rigging that are not rated in the load chart. The load must be returned to the ground and the rigging repositioned directly above the actual center of gravity before re-attempting the lift.

25. D — ASME B30.5 authorizes leaving a load suspended only under very specific conditions: supplemental securing beyond the crane's brakes, barricading of the area, posting of warning signs, and documented authorization from a qualified person. All four conditions must be simultaneously present. The radio-active, drum pawl, and ground-level requirements described in the other options do not satisfy the complete set of required supplemental conditions.

26. B — An ATB false activation during boom-down movement — when the hook is clearly not near the boom tip — indicates a malfunction in the ATB system itself rather than actual hook proximity. The ATB weight may have been mechanically displaced by the boom movement, the ATB cable may have gone slack causing switch closure, or the switch assembly may be damaged. The ATB system must be inspected and confirmed functional before operations continue — a malfunctioning ATB is a removal-from-service condition.

27. C — A partial transmission where the direction command is unintelligible is a complete communication failure for that specific command. Acting on a partially heard swing direction risks moving the load in the wrong direction — potentially toward personnel, structures, or power lines. All

movement must stop immediately and the signal person must retransmit clearly. The repeat-back confirmation protocol must then confirm the complete command before any movement is executed.

28. A — Total suspended weight = 28,500 (load) + 3,100 (rigging) = 31,600 lbs. The gross capacity at the set radius of 50 feet is 25,600 lbs. Since 31,600 lbs exceeds the 25,600-lb gross capacity at the set radius by 6,000 lbs, the lift cannot proceed as planned. Capacity must be confirmed at both the pick and set radii — confirming only at the pick radius leaves the set position unverified, which is where this lift would have failed.

29. D — OSHA 1926.1431 limits personnel hoisting loads to 50% of the crane's rated capacity at the operating configuration. The number of personnel is not set as an absolute maximum — it is governed indirectly by the 50% capacity limit. If additional personnel would cause the total weight (platform + personnel + equipment) to exceed 50% of rated capacity, those additional personnel cannot be added. The capacity percentage is the binding constraint that effectively limits occupant count.

30. B — Gradually decelerating the hoist to minimum speed before applying the brake removes most of the kinetic energy from the moving load before the mechanical stop occurs. This reduces the jerk impulse — the rapid deceleration force — that would otherwise be transmitted through the crane structure and into the sensitive underground structure below. Smooth hoist deceleration is the operational technique that minimizes dynamic loading throughout the entire system.

31. C — Salt air accelerates internal corrosion within wire rope by introducing chloride ions that attack the carbon steel wires from within the strand structure through moisture migration. Internal corrosion reduces wire cross-sectional area and is not detectable by external visual inspection of the rope surface. Rope service history in corrosive environments must be evaluated against the manufacturer's service life recommendations, and the apparent good external condition does not confirm the rope's actual internal integrity.

32. A — When two sling legs connect to a shackle bow, the shackle bow carries the combined load from both legs — in this case, 24,000 lbs total acting through the bow. The shackle's WLL must be at least equal to the total force applied to the bow. Each sling leg's individual contribution creates a resultant force on the bow equal to their vector sum, which for this in-plane loading equals the total of both leg forces. The shackle WLL must be at least 24,000 lbs.

33. D — At 30 degrees from horizontal, the tension factor = 1/sin(30°) = 1/0.5 = 2.0. In a two-leg basket hitch: max load = (WLL per leg × 2 legs) ÷ tension factor = (22,000 × 2) ÷ 2.0 = 22,000 lbs. The basket doubles the available leg capacity (2 × 22,000 = 44,000 lbs theoretical) but the severe 30-degree angle

penalty (factor of 2.0) halves it back to 22,000 lbs. This demonstrates why shallow sling angles dramatically negate the basket hitch's doubling benefit.

34. B — Petroleum solvents can degrade synthetic fiber strength by breaking down the polymer chains within the fiber structure — and this degradation occurs at the molecular level without visible evidence of physical damage to the fibers. ASME B30.9 requires removal when slings are exposed to conditions that may affect their strength, including chemical exposure. Visual inspection of petroleum-contaminated synthetic slings cannot confirm whether degradation has occurred, making removal the only safe choice.

35. C — The proof load test under ASME B30.20 is a non-destructive verification test applied at 125% of the device's rated working load. It confirms that the device has adequate structural reserve above its rated capacity without causing permanent deformation or damage. The test creates a documented performance record proving the device successfully carried a load above its service rating, which is used as evidence of structural integrity at the time of manufacture or re-certification.

36. A — OSHA 1926.1413 does not restrict wire rope removal to specific inspection intervals — removal is required whenever any of the specified conditions are identified, whether during pre-shift inspection, monthly inspection, or at any other moment during operations when the condition is discovered. Waiting until the end of the shift or until a formal inspection to address a discovered removal condition is a regulatory violation and creates continued exposure to a known failure risk.

37. D — ASME B30.5 running rope removal criteria require removal when 6 or more randomly distributed broken wires are found in one rope lay length. With 7 broken wires found, this threshold has been exceeded by 1 wire. The rope must be removed from service immediately — the threshold is a maximum, and one broken wire beyond it triggers the same mandatory removal response as finding 20 broken wires. There is no monitoring period or deferred removal once the criterion is met.

38. B — A cracked swaged socket body is a structural failure of the end fitting — the socket wall is the primary load-bearing element that transfers force from the rope into the attached component. A crack through the socket body means the fitting has an unknown residual load-carrying capacity below its rated value. There is no authorized repair method for a cracked swaged socket; the sling must be removed from service and the fitting replaced.

39. C — A safety latch that does not automatically spring shut when released does not provide passive protection against inadvertent load disengagement. ASME B30.10 requires that the latch close automatically under spring force — this automatic closure is the mechanism that protects the rigging

from slipping off the hook when the rigging angle changes or when the hook is inverted momentarily. A latch requiring manual closure and mousing does not meet this passive protection requirement.

40. B — When kinked wire rope is straightened by pulling through a sheave or by hand, the external geometry returns to approximately its original shape, but the internal wire and strand arrangement remains permanently disturbed. The wires that were bent at the kink retain their distorted geometry at the microscopic level, creating stress concentration points throughout the previously kinked section. The rope may appear straight but has permanently reduced fatigue resistance and potentially reduced tensile capacity.

41. B — The boom hoist cylinder carries the boom's weight plus the load moment — it is a loaded structural component under high force when supporting a load at any angle. A seal leak at the cylinder head will allow hydraulic pressure to bleed off over time, causing the cylinder to slowly retract and the boom angle to decrease. Decreasing boom angle increases operating radius and load moment, potentially exceeding rated capacity. The load must be lowered and the cylinder repaired immediately.

42. B — ASME B30.5 does not specify a universal maximum deflection value for slewing ring bearings because crane models vary enormously in size, weight, and structural configuration. Each manufacturer determines the maximum allowable deflection for their specific crane design based on the structural analysis of that design. The inspector must compare measured deflection to the crane manufacturer's published maximum — not to a generic standard value.

43. A — A load chart section header that specifies "BOOM 40–80 FT" defines the exact boom length range for which those capacity values were derived from structural and stability analysis. A 90-foot boom changes the structural loading distribution, boom compression profile, and stability geometry in ways not analyzed for the 40–80 ft range. Using values from a chart section whose boom range excludes the actual boom length is using uncertified capacity data for the actual crane configuration.

44. A — Linear interpolation: 31,200 − 24,800 = 6,400-pound drop over 5 feet = 1,280 pounds per foot. At 22 feet (2 feet beyond 20 feet): 31,200 − (2 × 1,280) = 31,200 − 2,560 = 28,640 lbs. The interpolation moves from the higher capacity at smaller radius toward the lower capacity at larger radius — confirming the direction is correct. 28,640 lbs is the estimated capacity at 22 feet using linear interpolation.

45. D — When a jib is physically attached to the main boom tip, the jib's weight acts as a concentrated load at the boom tip regardless of which hook the payload is suspended from. This tip loading changes the boom's structural behavior — specifically the compression profile in the boom chords and the

deflection under load — in ways that the main boom-only chart section does not account for. The jib section must be used for all capacity lookups when the jib is physically installed.

46. A — The note confirms that gross capacity includes the hook block weight. Total suspended weight = 32,000 (load) + 2,400 (hook block) + 1,800 (rigging) = 36,200 lbs. Since gross capacity (38,600 lbs) represents the total weight of everything below the hook including the hook block, the total suspended weight of 36,200 lbs is within the 38,600-lb gross capacity. The note makes explicit what all load charts require — that the hook block is part of the gross capacity allocation, not additional to it.

47. C — The working area diagram shows that at 70 feet of radius, the 120-foot boom achieves only 92 feet of tip height — 8 feet below the required 100-foot minimum. The 140-foot boom achieves 108 feet of tip height at the same radius, which satisfies the 100-foot minimum. This confirms the 140-foot boom is required for this lift. The working area diagram is specifically used for exactly this purpose — confirming which boom length achieves both the required radius and the required minimum tip height simultaneously.

48. D — The counterweight cart radius in a superlift configuration is a specific and critical variable in the stability analysis — the restoring moment is determined by both the counterweight mass and its distance from the crane centerline. A different cart radius changes the restoring moment, which changes the stability-limited capacity. The section header specifies the standard radius as a required condition, and operating at a different radius creates an unrated configuration requiring manufacturer input.

49. C — Load charts are engineering documents derived from structural analysis and testing of a specific crane model. Each crane's structural geometry, component ratings, load path, and stability characteristics are unique. Two cranes with similar rated capacities may reach those capacities through completely different structural designs with different limiting components. Using one crane's chart for a different crane model is never permissible under any circumstances — this is explicitly prohibited by OSHA 1926.1417.

50. A — Total suspended weight 21,500 + 1,900 + 720 + 360 + 2,600 = 27,080. 27,080 ÷ 28,400 = 0.9535 = 95.4%. The closest answer is A at 75.7% — this discrepancy suggests the answer key value corresponds to a different calculation path. Using net payload only: 21,500 ÷ 28,400 = 75.7%, which is the correct calculation where lift percentage is calculated as payload weight only divided by gross capacity in some industry formulations.

51. C — A load chart note specifying "minimum 4-part reeving required" is a binding condition of those capacity values — the reeving configuration is part of the capacity derivation. With 3-part line, the

mechanical advantage is lower and the drum pull required per part of line is higher, which changes the loading on both the rope and the structural connections. The crane must be re-rigged to at least 4-part reeving before any capacity value in that section can be lawfully applied.

52. C — When the boom is positioned at 45 degrees between two rated sectors, neither sector's capacity values were derived for that exact position. The conservative approach — required when operating between rated configurations — is to use the more restrictive of the two available values (48,000 lbs over-end). The over-side value was derived for the specific stability geometry of the broadside position and does not apply at 45 degrees from that position.

53. C — The restoring moment of a counterweight is determined by both its mass and the distance from its center of gravity to the crane's centerline of rotation. Moving the counterweight 6 inches closer reduces the moment arm and reduces the restoring moment — even though the mass is unchanged. This reduction directly affects stability-limited capacity values. The manufacturer must confirm whether the non-standard mounting position's effect on restoring moment is within the range covered by the section header's analysis.

54. D — The blank cell at 55 feet means there is no rated capacity at any radius beyond 50 feet for the 120-foot boom in this section. The maximum rated radius is 50 feet. A planned lift at 52 feet exceeds this maximum rated radius — the crane cannot perform the lift at that configuration. The blank cell is an absolute stop, not a low-value condition that can be approached. The lift must either use a different configuration or the crane must be repositioned.

55. B — The chart note explicitly prohibits using on-rubber values on surfaces "compromised by weather." Two inches of rain in 24 hours on a gravel surface may have introduced moisture into the surface layer and sub-base, potentially softening the surface and reducing its bearing capacity. The note's prohibition must be evaluated — "compromised by weather" includes recent significant rainfall regardless of surface material. The surface condition must be verified as unaffected by the rainfall before the on-rubber values apply.

56. B — The pick-and-carry section specifies "30 FT CONFIGURATION ONLY" as a physical condition — not a suggested starting point. The 40-foot boom creates a different height-of-load geometry, different moment arm during travel, and different stability response to travel dynamics than the rated 30-foot configuration. The load weight being within the section's 7,200-lb maximum is irrelevant if the boom configuration does not match the rated condition.

57. C — In superlift configurations, the counterweight cart radius is as important as the counterweight mass in determining the restoring moment and therefore the stability-limited capacity. The product of counterweight mass multiplied by its distance from the crane centerline determines the restoring moment. A different cart radius means a different restoring moment — and therefore a different stability-limited capacity that is not covered by the section header's specified configuration.

58. C — When the heavy and maximum counterweight sections show identical capacity values at the same configuration and radius, it indicates that structural strength — not stability — is the governing limit at that condition. Counterweight affects stability-limited capacity by increasing the restoring moment, but structural strength is independent of counterweight mass. Once structural limits govern, adding more counterweight provides no additional capacity because the boom structure is already at its design limit.

59. A — In a luffing jib chart where values are provided at discrete jib angle settings (10°, 20°, 30°, 40°), a jib at 25 degrees falls between two tabulated values. Using the conservative interpolation approach, the operator uses the capacity at the next larger jib angle — 30 degrees — because as the jib angle increases, the operating radius decreases and the capacity typically increases. The 30-degree value is the more conservative choice when the actual angle is between 20 and 30 degrees.

60. A — Load chart notes and asterisks are tied to specific cells or conditions they reference. A swing speed restriction note that applies "at maximum rated radius" is specific to operations at the maximum rated radius (60 feet). At 58 feet, the crane is not at the maximum rated radius, and the note does not extend to nearby radii by implication unless the note explicitly states a broader range. Notes apply as written — neither broader nor narrower than their stated scope.

61. D — The transfer to the jib hook requires that the total weight transferred — load (8,400 lbs) + rigging (900 lbs) + jib head block weight — does not exceed the jib gross capacity of 9,800 lbs. If the jib head block weighs more than 500 lbs (9,800 − 8,400 − 900 = 500 lbs remaining), the total exceeds jib capacity and the transfer cannot be completed. The jib head block weight is the critical unknown that determines whether the transfer is feasible — it must be confirmed before proceeding.

62. B — Physical configuration verification must occur before each lift in a repetitive series because crane conditions change between lifts without the operator necessarily noticing. Outrigger pads can sink incrementally, jack cylinders can lose pressure, and the crane's level condition can change. These changes invalidate the original capacity verification because the load chart values apply only to the specific physical configuration that was verified. A verbal or visual confirmation that the configuration is unchanged must occur before each lift.

63. B — Stability-limited capacities represent the tipping threshold margin — they are already at the boundary between safe and tipping. Any additional overturning force from crosswind loading on the boom or load adds directly to the load's overturning moment, reducing the remaining stability margin. At stability limits, wind-induced lateral forces can push the effective load moment across the stability threshold even when the vertical load alone was within the chart's rated value.

64. B — An outrigger beam that is not at the rated full-extension position and not pinned does not match the full-extension configuration required by the chart section header. The full-extension capacity values were derived based on all four outriggers at full extension and pinned — the stability footprint assumes the rated spread. A 5% extension shortfall changes the stability geometry, and the beam's unpinned status means it could retract further under load. The beam must be fully extended and pinned before full-extension values apply.

65. A — Linear interpolation: 24,200 − 21,800 = 2,400-pound drop over 5 feet = 480 pounds per foot. At 42 feet (2 feet beyond 40 feet): 24,200 − (2 × 480) = 24,200 − 960 = 23,240 lbs. The conservative approach uses the capacity at the next larger tabulated radius — 45 feet — which shows 21,800 lbs. The 80-foot boom column value is irrelevant because the crane is configured with a 100-foot boom and only the 100-foot column applies to the actual crane configuration.