TECHNICAL GUIDELINES FOR CRANES AND RIGGING OPERATIONS

Project No:	

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PREPARED BY:	**REVIEWED & APPROVED BY:**
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1.0. PURPOSE

This practice defines the operational requirements for cranes and rigging equipment, including the categorization of rigging lifts and the design, engineering, and approval of the transportation and rigging of all equipment and modules.

2.0. SCOPE

This practice includes the following major sections:

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3.0. APPLICATION

This practice applies to work activities and employees under the control of [CLIENT/COMPANY NAME] and its contractors.

4.0. DEFINITIONS

4.1. Competent Person — One who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt, corrective measures to eliminate them.

4.2. Crane — A mechanical device for raising, shifting, or lowering a load. For this document, and, unless otherwise noted, “crane” will refer to any such device, stationary or mobile, whose use is governed by the American Society of Mechanical Engineers (ASME) documents referenced herein.

4.3. Crane Mats — Load-spreading mats composed of uniform lengths of 8-inch minimum thickness wood timbers, or approved alternate, securely fastened together to form a durable load-bearing unit. Timber material must be sound and free of rot and pests.

4.4. Critical Lift—A non-routine crane lift requiring detailed planning and additional or unusual precautions. Critical lifts include, but are not limited to:

- Lifts made when the load weight is 75 per cent or more of the rated capacity of the crane
- Lifts that require the load to be lifted, swung, or placed out over critical processes
- Lifts over operating processes, within 33 feet of energized overhead power lines, or in hazardous areas
- Lifts made with more than one crane (other than a tail crane)

4.5. Lifts involving non-routine or technically difficult rigging arrangement

4.6. Hoisting personnel with a crane or derrick

4.7. Field Rigger — A field rigger who has the necessary training and/or experience to safely perform the work he/she is assigned and has been designated a “qualified field rigger” by the rigging supervisor.

4.8. Heavy Haul — Any transportation operation or activity that requires the use of equipment or machinery of unusual ability or exceptional capacity above and beyond that of the standard highway tractor/trailer configuration, or that would surpass the American Association of State Highway Officials (AASHO) HS-20 wheel-loading requirements.

4.9. Heavy Rigging Activity — Any transportation, lifting, or load-handling operation that falls within the guidelines of a “critical lift” as defined by the [CLIENT/COMPANY NAME] Administrative Practice for Rigging, and Cranes and Rigging — Introduction/Preuse.

4.10. Load — The item or equipment being transported or lifted. In most lifting operations, this term includes all under-the-hook load-handling devices and any other item that must be considered as part of the load for lift capacity calculations.

4.11. Operator — A person who is trained, licensed, and experienced in the use, the capabilities, and all of the functions of a specific machine, mechanical system, or tool.

4.12. Qualified Person/Qualified Rigger — One who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.

4.13. Rigging Engineer — A graduate engineer trained and experienced in the methods and means to evaluate and design transportation and erection plans, lift attachments, and related hardware.

4.14. Rigging Supervisor/Manager — A supervisor/manager who has been selected by site management as having adequate experience and knowledge in rigging to safely perform the rigging on the project and has received certification from the [CLIENT/COMPANY NAME] Rigging Engineering Group or a qualified 3rd party, that they have the training and/or shown the competency to prepare and review rigging plans.

Signal Person — A designated person trained and experienced in the hand signals used and understood by the crane operators on the project.

- One designated signal person will be responsible for the control and coordination of any particular heavy rigging activity.
- Under certain conditions, such as multiple-crane lifts, or lifting “in the blind,” it may be deemed necessary for additional signal persons to participate in a heavy rigging activity. One signal person will be designated as the “lead signal person.” All designated subordinate signal persons must be ultimately directed and coordinated in their efforts by the designated lead signal person.

4.15. Sling — A flexible line designed to be used for securing, raising, lowering, or otherwise manipulating a load. For this document, and, unless otherwise noted, “sling” will refer to any such device, constructed of steel strands or links or of natural or synthetic fibres, whose use is governed by the ASME documents referenced herein.

5.0. GENERAL REQUIREMENTS

This practice must be developed into an operational, site-specific procedure (formally referred to as a “specification”) covering the use of cranes and rigging. The requirements of this practice must be implemented and enforced by [CLIENT/COMPANY NAME] (Health, Safety, and Environmental and Construction) and Contractor Management, their staff, the Project/Site HSE Representative, and specifically the rigging staff and rigging coordinators of the project.

The requirements in this practice and Practices, Administrative Practice for Rigging, and, Cranes and Rigging — Introduction/Preuse, have been structured to bring together and combine the resources of [CLIENT/COMPANY NAME] (Health, Safety, and Environmental and Construction) and its contractors to achieve ZERO crane and rigging accidents during the construction and/or maintenance phase of each project.

5.1. Practices and Procedures

In addition to the requirements in this practice about lifts, all legal and contractual requirements must be adhered to in planning and carrying out all lifts of any size or reach on all projects.

A. Categorizing Lifts

Practice Ref. (000000) details rigging points of contact, and categorizes rigging lifts and the design, engineering, and approval of the transportation and rigging of all equipment and modules.

B. Preuse

- Practice Ref. (000000) contains the precise requirements. Refer to Practice Ref. (000000) for the following topics:
- Responsibilities
- Training and Licensing (crane operators, riggers, signal persons)
- Drivers
- Procurement and Hire
- Assembly/Disassembly, Inspection, and Maintenance
- Modifications
- Riggers/Rigging (training/inspection)
- Air Tugger Operations
- Gin Wheels (detailed in Practice Ref. (000000)

C. Operations (Site-Specific)

This practice contains the operational requirements for cranes, hoisting, and rigging;
All work must be by this procedure and the requirements of the following codes, standards, and procedures, except as noted otherwise on the design drawings or within this procedure. Unless otherwise specified, referenced publications must be the latest edition. References that conflict with one another or with this procedure must be brought to the attention of the [CLIENT/COMPANY NAME] Site Manager for clarification.

- ASME B30.xx, All applicable safety standards for cableways, cranes, derricks, hoists, hooks, jacks, slings, and spreader bars, etc.
- Manual of Steel Construction, Allowable Stress Design, American Institute of Iron and Steel (AISC)
- Occupational Safety and Health Administration Standards (OSHA), approved State-Plan equivalents, or applicable in-country standards
- Practice Ref. (000000), Administrative Practice for Rigging
- Practice 000.653.3201, Cranes and Rigging — Introduction/Preuse
- Practice 000.653.3209, Working Near Overhead Power Lines
- Form (Ref. (000000), Monthly Inspection Report — Construction Equipment and Light Vehicles
- Form (Ref. (000000), Daily Inspection Report — Cranes

5.2. Documentation in Cranes

The following documentation (as a minimum) must be stored in the crane during operation:

- Completed pre-shift inspection (Form Ref. (000000)

- The most recent monthly inspection
- The most recent annual inspection
- Inspection Report – Crane Work Area (Form Ref. (000000)
- Operating manual
- Load chart
- Load cell calibration certificate (if available)
- Critical lift permit(s), and any associated rigging drawings, as applicable

5.3. Labels/Placards in Cranes

Recommended operating speeds, special hazard warnings, operating notes, and special instructions will be posted on and visible to the operator at the control station. All of this information must be legible; if not legible, the labels/placards must be replaced.

5.4. Barricades around Cranes

Accessible areas within the swing radius of the rotating superstructure counterweight of a crane must be barricaded by Practice Ref. (000000), Barricades, Signs, and Tags, to prevent employees from being struck or crushed by the counterweight.

Accessible areas within the swing radius of the rotating superstructure or the rotating superstructure counterweight of a crane will be barricaded to prevent personnel from being struck or crushed.

5.5. General

The operator, riggers, and signal persons must be trained, experienced, and licensed for the operation of that specific make and model of tower crane, and by Practice Ref. (000000),

Each time a crane is moved into service, or to a new location, the operator must inspect the area in which the crane will be operating. Results will be documented on Form Ref. (000000), Inspection Report – Crane Work Area.

Entertainment headphones will not be worn by operators/oilers.

Employees will not be allowed to ride the headache ball, hook, block, or the load being handled by the crane.

Equipment must not be lubricated while the crane is in operation unless the crane is designed for safe lubrication during use and the manufacturer’s guidelines are followed.

Passengers will not ride the crane unless it is specifically designed for more than one passenger/operator. The crane will not be used for personnel transportation or as a personnel carrier unless specific approval is obtained from the **[CLIENT/COMPANY NAME]** Project/Site Manager and the HSE Representative.

A tag or restraint line(s) will be used to control the swinging of the load unless the tagline creates a greater hazard.

A professional engineer must certify that the crane foundations and underlying soil are adequate support for a tower crane with its maximum overturning movement.

6.0. Submittals

6.1. Rigging Drawings

Rigging Drawings (Ref. (000000), Typical Rigging Plot Plan, for example) must be supplied for all lifts classified as “Critical Lifts” in Section 8.2 of this practice.

Rigging Interference Drawings (Ref. (000000), Rigging Interference Drawing, for example) must be required when necessary to show foundations and equipment that must be removed or not installed until after a heavy lift operation.

Rigging Plot Plans and Elevation Drawings must be detailed and comprehensive erection drawings that define all major elements of a heavy rigging activity. The drawings must include the following as a minimum:

- Total weight to be lifted including load blocks and rigging gear
- A scale plan view showing the locations of lifting equipment, lifted items, and their relationship with any potential obstructions
- A scale elevation view that shows the relationship and clearances between the lifting equipment, lifted items, and potential obstructions
- Lifting and tailing hookups, including shackle, sling, and spreader bar sizes, lengths, and capacities
- A description of the configuration of the cranes indicating model number, boom length, boom type, auxiliary counterweights, parts of the load line, jib, length, type, offset, etc.
- Crane capacities based on the actual working radii and the crane configuration
- A description of the placement of crane mats, dead men, guy lines, earth fill, or any other items required for the safe execution of the lift
- A description of any “holds” that must be placed on existing plant structures or equipment that would interfere with the lift plan.

- A detailed written description that adequately describes any part of the lift not made clear by the drawings.

Note: When crane placement and boom clearance are not critical, a "Rigging Data Sheet" may be acceptable (Ref. (000000), Rigging Data Sheet, for example). This drawing contains all of the elements listed above except the plan and elevation views. The execution of the lift must not deviate from the rigging plan and specification.

6.2. Heavy Haul Drawings

A Heavy Haul Drawing (Ref. (000000), Transportation Drawing, for example) must be provided for all equipment transportation classified as a "critical lift" by Section 8.2 of this practice.

A Heavy Haul Drawing must contain the following minimum information:

- Equipment to be used in transporting and handling each item, including equipment capacities
- Method of securing the load to the heavy haul equipment
- Axle loads and spacing

7.0. CRANES

7.1. General

Lattice boom and hydraulic mobile cranes (except articulating boom cranes) must be equipped with the following:

- Boom angle or radius indicator
- Drum rotation indicator
- A means for the operator to determine the levelness of the crane
- Anti-two-block device, two-block damage prevention, or two-block warning device

Jibs for crawler, locomotive, and truck cranes must have positive stops to prevent their movement of more than 5 degrees above the straight line of the jib and boom on conventional-type crane booms. The use of cable-type belly slings does not constitute compliance with this requirement.

Cranes with variable angle booms must be equipped with a boom angle indicator, readily visible to the operator.

Crane operators must have a thorough understanding of all operational characteristics and capabilities and safety rules and regulations about the different types of cranes, including “cherry pickers” and boom trucks.

Load capacity charts indicating all pertinent configuration information for any crane must be with the crane and available at all times. Speciality load capacity charts and charts developed for a particular crane must show the configuration and crane serial number on the chart. This information must correspond with the configuration and serial number of the crane it is being applied to.

For all stationary-lifting operations, the total load lifted, including all deductions, may not exceed 95 per cent of the crane’s load chart for the actual configuration and lift radius. Under extraordinary circumstances subject to prior review and acceptance by the [CLIENT/COMPANY NAME] Site Manager and a [CLIENT/COMPANY NAME]rigging engineer, and with a [CLIENT/COMPANY NAME]rigging engineer on site for the lift, this limitation may be exceeded.

Note: The operator must test the brakes each time a load that is 90 per cent or more of the maximum line pull is handled by lifting the load a few inches and applying the brakes. In duty cycle and repetitive lifts where each load is 90 per cent or more of the maximum line pull, this requirement applies to the first lift only.

Federal Aviation Administration (FAA) Regulations Part 77 must be met. This includes the requirement that 30 days notification to the local FAA office for the erection of any structure (such as a crane boom) higher than 200 feet above ground level or above 100 feet above ground level, if within 20,000 feet (about 3.8 miles) of an airport.

A tape measure must be used to lay out the radius. The boom angle indicator will only be used as a reference.

The operator must be instructed to engage the boom dog and release it only when booming down is required.

Lifts must not be made in winds that exceed the manufacturer’s recommendation, or in winds 20 MPH or greater without approval from the [CLIENT/COMPANY NAME] rigging supervisor.

Hydraulic truck cranes must not be used to walk loads from one place to another unless approved by the [CLIENT/COMPANY NAME] rigging supervisor/manager and the following conditions are met:

- The crane is moving over firm-level ground or the outriggers are extended and the floats are positioned close to the ground
- The boom is positioned in the pick-and-carry position
- Load capacities, boom length, travel speed, and tyre inflation pressures are by the manufacturer's recommendations

For all lifting operations where the crane is travelling with the load, the total lifted load, including all deductions, must not exceed 90 per cent of the crane's load chart for the actual configuration and lift radius.

- Under extraordinary circumstances and subject to prior review and acceptance by the [CLIENT/COMPANY NAME] Site Manager or a Fluor rigging engineer, this limitation may be exceeded.
- The minimum clearance between the load and the crane boom, or any other critical structural component, will not be less than 3 feet while the crane is travelling.
- Before travelling with a load, the load must be tied back or secured in such a way that the swinging of the load is controlled or minimized.
- The rated capacities of each crane used in multiple-crane lifts (exclusive of a tailing crane) must be reduced by a minimum of 30 per cent unless one of the following conditions are met:
- An equalizing beam, or other approved method of load equalization, is used.
- It can be determined by calculations, or demonstrated, that the transfer of load from one crane to another during any operation of the erection process cannot occur to any appreciable extent.
- It can be determined by calculations, or demonstrated by safe and reliable means, that the monitoring of the respective loads and the control of each crane during the erection process must provide a fail-safe means for performing the lift safely.
- Crane mats, or other acceptable load-spreading devices, will be used for all lifts. They are mandatory when lifts exceed 85 per cent of the crane's chart capacity when stationary, or 75 per cent of chart capacity when travelling, except under one of the following conditions:
- It can be determined by calculations, or demonstrated, that the bearing pressure of the crane acting on the crane pad without mats must not exceed the allowable bearing capacity of the soil.
- Conditions of the soil are such that mats become mandatory during a lift of any magnitude.
- The lift is of such a critical or sensitive nature that mats become mandatory during a lift of any magnitude.

Crane Jibs – A jib or fly jib on any crane must be used only if the following requirements are met:

- Application to the rigging supervisor for use of the jib is submitted with the request for an inspection and the subsequent inspection finds it structurally sound
- The crane manufacturer's specifications for the jib are on-site and followed
- A load/capacity chart for the jib is available and with the crane
- Cranes equipped with weight or load indicators incorporate the jib operation
- The Crane operator is certified to be knowledgeable/proficient in jib assembly/disassembly and operation

7.2. Outriggers

Crane outriggers must be fully extended or deployed by load-rating chart specifications and set to remove the machine weight from wheels before the boom is moved from its travel position or any lifting operation begins.

Blocking or load spreaders must be used under each outrigger float regardless if the crane is being set up on soil or concrete.

Blocking or load spreaders under outriggers must be sized to provide at least a minimum of 400 per cent more load-bearing area than the outrigger floats provide and to resist the resulting bending stresses. Exception: If it can be determined by calculations, or demonstrated by safe and reliable means, that the bearing pressure of the crane floats acting with the load spreaders of the reduced size must not exceed the allowable bearing capacity of the ground.

When crane mats are used, they must be made of hardwood timbers a minimum of 8 inches thick and arranged to spread the load to the soil. In conditions of poor soil, more than one layer of crane mats may be required to spread the load sufficiently. (Mats made of other materials may be used if prior acceptance is obtained from the [CLIENT/COMPANY NAME] Site Manager or rigging engineer.)

Under no circumstances will laminated "truck mats" be used to spread the load to the soil.

All lifts must be performed in such a manner that impact-loading is kept to a minimum.

All lifts must be made in a manner that is consistent with the equipment manufacturer's design, procedures, or recommendations.

7.3. Tower Cranes

Due to the high potential for personal injury, property damage, and the liability associated with the operation, erection, and disassembling of tower crane equipment, the basic precautions outlined in this procedure must be followed. However, this procedure is not to be considered all-inclusive, and additional sources will be consulted (refer to the References section).

A contractual hold-harmless agreement between [CLIENT/COMPANY NAME] and all other interested parties, such as the tower crane owner and/or supplier, the erecting/disassembling contractor, and all crane users will be evaluated. While there is a hold-harmless clause in the "safety" portion of the Project/Site contract, some projects/sites use different client contracts and supplier contracts. The use of a separate agreement is recommended if the hold-harmless clause is not already in the contract.

Because of the nature of tower cranes, the stress placed on weld joints, the lack of a good visual inspection because of painting, and the causes of failure in past accidents, a complete and documented ASME periodic inspection conducted by a Qualified Person before the machine being erected on the project/site is required. ASME frequent (monthly conducted by a Competent Person) and periodic (annual conducted by a Competent Person) inspections thereafter are mandatory. The complete periodic inspection of all structural crane parts, including nondestructive examination testing (NDE) of welded joints is to be carried out by a Competent Person. A copy of this inspection and NDE test results will be maintained on the project/site. A registered engineer will also certify the inspection.

All tower, jib, and structural bolts and nuts will be new at erection time and meet the manufacturer's specifications. The same conditions stated previously also affect the machine's other structural fasteners. The equipment and structural fasteners including all tower, jib, and slewing ringbolts and nuts will be closely inspected and replaced as required during erection. A Qualified Person must perform preventive maintenance and repairs of tower cranes.

Tower cranes must have flags or other indicators on the jib that identify the working load radius to the operator.

Tower cranes must have limiting devices for:

- Trolley travel at both ends of the jib
- Anti-two-blocking device
- Operating radius by load to be lifted
- Pressures in hydraulic or pneumatic circuits
- Crane travel at both ends of the runway tracks

Load-limiting devices and acceleration and deceleration limiters, when provided, must be installed in enclosures that can be locked or sealed to inhibit unauthorized tampering. Operational tests must be conducted and a load-limit device setting must be verified by applying test loads of 100 per cent of the applicable ratings. These tests must be performed before the use of the newly erected and altered cranes, with documentation kept on the project/site.

The trolley rope must be marked (so it can be seen by the operator) at a point that will give the operator sufficient time to stop the trolley before the end stops, or a spotter who is in direct communication with the operator must be used when operations are conducted within 10 feet (3.1 meters) of the outer or inner trolley end stops.

A wind velocity-indicating device must be mounted at or near the top of the crane. A velocity readout must be provided at the operator's station in the cab, and a visible or audible alarm must be triggered in the cab and at remote control stations when a predetermined wind velocity has been exceeded.

An operator's manual, provided by the manufacturer, must be kept in the cab of the crane while it is on the project/site.

Prior tower crane experience is mandatory for the operator because of the differences between tower cranes and other types of equipment operations. The contractor must provide documentation of the operator's experience, even if he/she is using a sub-/lower-tier contractor on the project/site.

Regular inspections and maintenance of the cranes must be conducted and performed according to the manufacturer's specifications and ASME standards or other applicable in-country standards. Maintaining the tower crane in good working condition will eliminate unnecessary downtime and prevent possible accidents. Using contractors must be able to provide documentation concerning crane condition, which must be monitored regularly.

Refer to 29 CFR 1926.1435 (Tower Cranes) or other applicable in-country, state, or local regulations for additional requirements.

8.0. HELICOPTERS

When planning a helicopter lift, the Project/Site Manager, the Project/Site HSE Representative, and the craft/area superintendent supervising the activity must provide a specific lift plan, along with a certified pilot flight plan, for each job undertaken. The plan must be written to comply

with any applicable regulations of the FAA, OSHA 1926.551 relating to helicopters, and OSHA 1926.251 relating to rigging equipment for material handling, or other applicable local, state, or in-country requirements.

The plan must be submitted to the appropriate Project/Site Manager for approval before making the lift. The Project/Site Manager will be responsible for obtaining the necessary approvals from the client. Documentation of the plan must be filed with permanent records on the project/site.

A job may consist of one or more lifts. A job plan and flight plan must be written for each lift. If the job plan specifies multiple lifts during a regularly scheduled workday (8- or 10-hour shift), one job plan will suffice, provided the criteria of the lift plan are met. If this method of operation is used, it will be mandatory that at least one briefing takes place before each lift. The briefing must set forth the continuing plan of operation for the pilot, supervisor, and ground personnel.

When preparing a lift plan, the following items must be included:

- Written permission from the client to make a lift
- Written flight plan
- Copy of helicopter pilot's license and proficiency check record
- Material safety data sheet (MSDS) or equal on aviation fuel
- Helicopter company certificate of insurance
- Copy of supplier contract making the lift
- Weather condition reports
- Certificate of Clearance (Workers' Compensation Board – applicable to Canadian operations only).

The pilot of the helicopter that is hoisting materials or equipment must be certified to fly an externally loaded helicopter.

The pilot determines the size and weight of the loads to be hoisted and the method by which they are attached to the helicopter.

Project/Site Management, along with the pilot, will determine if weather conditions are conducive for making a lift, continuing with a lift, or if the lift will be aborted. Under no circumstances will a lift be made during threatening weather, such as when lightning, hail, or high winds are prevalent.

Lifts will be made during daylight hours.

Riggers and signal persons for a helicopter being used to hoist materials or equipment must be trained by Practice Ref. (000000).

Project/Site Management must take precautions against hazards caused by helicopter rotor downwash.

Job Safety Analysis (JSA) and pre-lift alignment meetings must be held with all workers to establish good communication procedures.

When employees are required to perform work under hovering craft to hook or unhook loads, a safe means of access must be provided for the employees to reach the hoist line hook and engage or disengage the cargo slings.

Personnel in the area of the lift must wear required personal protective equipment (PPE). Personnel must wear complete eye protection equipment and hard hats secured by chinstraps.

Loose-fitting clothing, likely to flap in the downwash and potentially snag on the hoist line will not be worn.

Good housekeeping must be maintained in the lift area.

All loose material within 100 feet of the place where the lift is being performed, and all other areas susceptible to downwash, must be removed or secured to avoid displacement.

The static charge on the suspended load must be dissipated with a grounding device before the load is touched by any ground personnel, or all ground personnel touching the suspended load must wear protective rubber gloves.

9.0. RIGGING EQUIPMENT AND HARDWARE

Placement and use of all transportation, lifting, and rigging equipment must be to the manufacturer's specifications and industry standards. In no case must such equipment be used beyond the safe limits imposed by the manufacturers or other applicable safety standards.

Transportation, lifting, and rigging equipment must not be modified or altered without the manufacturers' written approval. All such modifications must be to the manufacturer's specifications or guidelines.

Under special circumstances, and with the approval of the manufacturer and the [CLIENT/COMPANY NAME] Site Manager, equipment may be re-rated, or modified and re-rated.

- If the manufacturer's specifications are not available, the limitations assigned to the equipment must be based on the determination of a qualified engineer competent in this field. Such determination must be appropriately documented and recorded.
- Re-rated equipment must be given a dynamic load test using a test load of 125 per cent of the lift weight. Except as otherwise directed, a dynamic load test must include the raising, traversing, and lowering of the load over the full range of motion of the actual lift.
- All custom-designed rigging equipment, such as spreader bars, beams, links, and any other device that carries all or part of the load being lifted, must be:
- Designed to meet ASME B30.20 allowable design stresses, using 1/3 of yield or AISC allowable stresses with a load factor of 1.8 will meet this requirement.
- Load tested by ASME B30.20, to 125 per cent of the rated load, and test reports were kept on record.
- Marked by ASME B30.20 with manufacturer's name and address, identification number, weight, and rated load.

All shackles must be in good condition, with the capacity permanently indicated on the shackle.

All slings must be in good condition, load-tested as required in ASME B30.9, and identified with a permanent identification to show:

- Name or trademark of a manufacturer
- Rated loads for the type(s) of the hitch (es) used and the angle upon which it is based
- Diameter or size and length
- Types and grades of material used
- For synthetic materials, the manufacturer's code or stock number

If one wire rope of a set (such as pendant lines) will require replacement, the entire set of ropes must be replaced. Wire rope with one or more of the following defects will be removed or replaced immediately:

- Kinking, crushing, bird caging, or any other damage resulting in distortion of the rope structure
- Evidence of heat damage from any cause
- Protect rigging and lashing from damage by softeners or other means.

Protect nylon, wire rope, or other slings subject to damage by sharp edges during the lift.

Do not use chains or ropes of a come-along or chain fall as chokers. Chain Falls may be utilized in a rigging hook-up as long as the manufacturer's instructions for use are followed.

Cover and secure buckets, barrels, and tubs used to lift smaller objects during lifting to prevent their contents from spilling.

Do not use sheet dogs to lift sheet goods (such as sheet metal and boiler siding) or other objects of a sheet nature without management/supervision approval.

Store rigging equipment and protect it from the elements when not performing work activities.

The capacity or size of the shackle or lifting link must not be less than that specified on the lift drawings or plans.

Unless specified otherwise, pinhole diameters will be at least 90 per cent of the diameter of the pinhole. For pin diameters smaller than 90 percent the lifting lug must be reviewed for the effect of using a small pin.

The rated capacity of a sling whose body is bent around a pin, crane hook, or any other object must be reduced by the MacWhyte Wire Rope Efficiency Chart (refer to Attachment 06, MacWhyte Wire Rope Efficiency Chart).

Exposed or unprotected carbon steel slings and rigging hardware must not be permitted to come into contact with stainless steel or nonferrous plant equipment except at the pin holes of lifting lugs.

Synthetic fibre slings (web or round) must not be used to choke or wrap around structural steel or in any other application where they could be exposed to sharp edges. A [CLIENT/COMPANY NAME] rigging engineer must approve any use of a synthetic fibre sling that requires the use of padding to protect the sling.

Temporary wood softeners, or other approved alternatives, must be used to protect plant equipment from damage due to concentrated bearing points and movement of rigging hardware. Finish-painted surfaces are to be further protected from discolouration, scratches, gouges, and other effects of direct contact with slings and rigging hardware.

Rigging equipment (such as ropes, slings, shackles, lifting beams, and hooks) must be visually inspected before each major lift. Unacceptable rigging equipment must be tagged and removed from the site.

10.0. LIFTING LUGS

Note: All weights are in metric tons but may be assumed to be imperial tons if the project is using imperial units.

A [CLIENT/COMPANY NAME] rigging engineer must design or review the lifting lugs for all equipment over 10 tons, or any equipment that will be upended during erection causing the load to the lug(s) to be applied in more than one direction.

Review of the lifting lugs for equipment equal to or below 10 tons must be the responsibility of the project home office discipline engineer.

The rigging supervisor must be responsible for requesting that a **[CLIENT/COMPANY NAME]** rigging engineer review any questionable lifting lugs encountered in the field.

All custom-designed lifting lugs must be designed to meet ASME B30.20 safety requirements and by ASME BTH-1 using a Design Category B unless the designer can justify a Design Category A. Using 1/3 of yield or AISC allowable stresses with a load factor of 1.8 will meet the BTH-1 Category B requirement, except for pin bearing, which should conservatively be based on the BTH-1 formula for allowable bearing stress.

The necessary rigging gear must be provided to use all designated lifting points on fabricated equipment as shown on the drawings unless directed otherwise by the supplier or the equipment engineer.

Only lift lugs, which appear on approved drawings, must be used.

Job or shop hooks and links, or makeshift fasteners, formed from bolts, rods, etc., or other such attachments must not be used.

Lifting attachments must only be used in a manner consistent with the design of the attachment. In general, flat, unstiffened plate lugs must only be loaded in the strong direction of the lug.

Lifting attachments used for overhead lifting, that are bolted on or otherwise attached so that they are not an integral part of the object being lifted, must be proof-tested to 125 percent of the rated load and marked to indicate the safe lifting loads.

11.0. SIGNALS AND SIGNAL PERSONS

Hand signals for signaling the operator are those prescribed by the ANSI standard applicable to each crane. Only one person will assume signal duties and no other person will signal the operator during the lift.

Exceptions:

- A person giving an emergency stop signal
- When 2 signal persons are needed for lifts

An illustration of the hand signals to be used must be conspicuously posted at the project/site.

12.0. CATEGORIES OF LIFTS

Note: The use of the word “lifts” in the heading of the following categories denotes both transportation and lifting.

Note: All weights are in metric tons but may be assumed to be imperial tons if the project is using imperial units.

Note: Refer to Attachment 01 for quick references to categories of lifts.

12.1. Noncritical Lifts

In general, a lift that is less than 75 percent of the rated capacity of a crane for the configuration of the lift, and does not involve lifting personnel.

Noncritical lifts are divided into the following 2 categories:

A. Type 1 Noncritical Lifts

Lifts that are under 5 tons; or under 20 tons and less than 50 percent of the rated capacity of a crane for the configuration of the lift.

Responsible personnel for a type 1 noncritical lift must be a crane operator and field rigger.

Green Lift Checklist, Ref. (000000)) is not required.

B. Type 2 Noncritical Lifts

Lifts that are 5 tons or more and more than 50 percent of the rated capacity of a crane for the configuration of the lift, or greater than 20 tons.

Responsible personnel for a type 2 noncritical lift must be a crane operator, field rigger, and rigging supervisor.

A Green Lift Checklist is required.

12.2. Critical Lifts

Critical lifts include, but are not limited to:

- Lifts made when the load weight is 75 per cent or more of the rated capacity of the crane (unless weight criteria supersedes)
- Lifts that require the load to be lifted, swung, or placed out over critical processes
- Lifts over operating processes, within 33 feet of energized overhead power lines, or in hazardous areas
- Lifts made with more than one crane (other than a tail crane)
- Lifts involving non-routine or technically difficult rigging arrangement
- Hoisting personnel with a crane or derrick

If the permit to work process is in use, a Permit to Work must be obtained (Form Ref. (000000)) by Practice Ref. (000000), Permit to Work.

All lifts by cranes, except bridge cranes, that are “critical lifts” (refer to definitions) require a Critical Lift Permit (Form Ref. (000000)) to be developed and approved. If the permit-to-work process is in use, a Critical Lift Permit is in addition and subordinate to a Permit to Work.

Before a critical lift, a Critical Lift Permit must be developed by the rigger or rigging supervisor, and the required approvals obtained. A copy of the permit and any associated rigging drawings must be placed in the cab of the crane, with the original filed at the site.

Critical lifts are divided into the following 3 categories:

A. Type “A” Critical Lifts

Lifts per the following requirements:

- Vessels Vertical Less than 30 tons
- Vertical Less than 8 feet (2.4 meters) diameter
- Horizontal Less than 60 tons
- All other equipment and structures are less than 60 tons.
- All lifts 75 percent, but less than 80 percent, of the capacity chart of the crane for the boom length and operating radius being used, or less than 90 percent of the crane has an operational load indication device with an overload cut off.
- Transportation – All plant equipment is less than 60 tons.
- A Green Lift Checklist (Form Ref. (000000)) and a Critical Lift Permit (Form Ref. (000000)) are required.

Responsible personnel for a type “A” critical lift must be:

Note: The designer and checker cannot be the same person. The crane operator and the qualified rigger are jointly responsible for the determination of the load weight and placement of the crane so that it is set up within the operating radius selected. The job site rigging supervisor has final responsibility for all operations.

Designer: Qualified field rigger

Checker: Qualified field rigger

Reviewer: Jobsite rigging supervisor

C. Type “B” Critical Lifts

Lifts per the following requirements:

- Vessels Vertical 30 tons to 600 tons
- Vertical 8 feet (2.4 meters) in diameter and over
- Horizontal 60 tons to 600 tons
- All other equipment and structures are 60 tons to 600 tons.
- Equipment or vessels over 20 tons that are inside structures, in inaccessible locations, over operating processes, or in hazardous areas as determined by the Site Manager or rigging engineer. Also included are equipment and vessels constructed of nonferrous materials, or are otherwise prone to damage during handling.
- All multiple-crane lifts (exclusive of a tailing crane) in which the load could be transferred from one crane to another during the lift.

- All lifts over 80 percent of the capacity chart of the crane for the boom length and operating radius being used, or over 90 percent if the crane has an operational load indication device with an overload cut-off.
- Transportation – All plant equipment 60 tons to 600 tons.
- A Critical Lift Permit (Form Ref. (000000)) and rigging drawings are required.

Responsible personnel for a type “B” critical lift must be:

Note: The designer and checker cannot be the same person. The lead engineer can function in a dual role as designer/approver or checker/approver.

Designer: Responsible site rigging supervisor, [CLIENT/COMPANY NAME] rigging engineer, or contractor

Checker: **[CLIENT/COMPANY NAME]** rigging engineer

Reviewer: **[CLIENT/COMPANY NAME]** rigging engineer, **[CLIENT/COMPANY NAME]** led rigging engineer, and site manager

D. Type “C” Critical Lifts

Lifts and transportation — 600 tons and above.

Before awarding a rigging contract and approving a rigging plan, the [CLIENT/COMPANY NAME] Project Manager, along with the **Fluor** Site and Rigging Managers, must review the rigging plan, risk analysis, and/or contractor bid evaluation to ensure that risk/liabilities are understood and mitigated to the maximum extent possible.

A Critical Lift Permit (Form Ref. (000000)) and rigging drawings are required.

Responsible personnel for a type “C” critical lift must be:

Note: The designer and checker cannot be the same person. The lead engineer can function in a dual role as designer/approver or checker/approver.

Designer: **[CLIENT/COMPANY NAME]** rigging engineer or contractor

Checker: **[CLIENT/COMPANY NAME] rigging** engineer

Reviewer: **[CLIENT/COMPANY NAME]** lead rigging engineer

Reviewer: **[CLIENT/COMPANY NAME] lead** rigging engineer from another rigging office

Reviewer: Optional third-party rigging consultant; the Site Manager, Rigging Manager, and Project Manager will determine if the lift requires an independent review by a third-party rigging consultant.

Reviewer: Rigging Manager, Site Manager, and Project Manager

Note: Review by the above managers is mandatory!

12.3. Special Circumstances with Lifts

A mobile crane lift that is greater than 95 percent of the crane load/capacity chart requires a [CLIENT/COMPANY NAME] rigging engineer to be present at the site to review and witness the lift. Permanent installations such as overhead bridge cranes and gantry cranes on which the load capacity is indicated by the appropriate ASME specifications may be exempt from this requirement with the approval of [CLIENT/COMPANY NAME]'s Project/Site HSE Representative.

Special circumstances will be considered by the rigging engineer and the Site Manager on a case-by-case basis to determine if a lift needs to be elevated to a higher category of design and/or approval.

13.0. STEEL ERECTION

Cranes and rigging used in steel erection must comply with applicable sections of 29 CFR 1926, Subpart R — Steel Erection, or applicable in-country standard(s) if as or more stringent than the requirements of 29 CFR 1926, Subpart R.

A multiple lift ("Christmas treeing") will only be performed if the following criteria are met:

- A multiple-lift-rigging assembly is used
- A maximum of 5 members are hoisted per lift
- Only similar structural members are lifted
- Employees engaged in the multiple lifts have been trained by the Code of Federal Regulations (CFR) 1926.761(c) (1), or applicable in-country standards.

14.0. WORK NEAR OVERHEAD ELECTRICAL LINES AND HAZARDOUS PIPELINES

Any activity involving a crane (including assembly and disassembly) where there is a potential for any part to come with 33 feet (10.1 meters) of an energized power line requires special controls to be developed and implemented — refer to Practice Ref. (000000), Working Near Overhead Power Lines.

15.0. TRAVELING WITH A LOAD

When traveling with a load, the following requirements will be implemented:

- A Competent Person must supervise the operation.
- Determines if it is necessary to reduce rated capacity.
- Makes determinations regarding load position, boom location, ground support, travel route, overhead obstructions, and speed of movement necessary to ensure safety.
- The determinations of the Competent Person are implemented.
- For equipment with tires, the tire pressure specified by the manufacturer is maintained.
- The rotational speed of the equipment must be such that the load does not swing out beyond the radius at which it can be controlled.
- A tag or restraint line must be used — as appropriate/necessary— to prevent rotation of the load that would be hazardous.
- The brakes must be adjusted by the manufacturer's procedures to prevent unintended movement.
- The operator must obey a stop (or emergency stop) signal, irrespective of who gives it.

16.0. EXECUTION

Immediately before any heavy rigging activity, a meeting must be held involving all participants, including duly assigned representatives of the contractor, owner, and [CLIENT/COMPANY NAME], to fulfill the following functions:

- Review the procedures, requirements, and details specified in the work plans and drawings.
- Review safety items such as weather concerns, plant activity, escape routes, contingency plans, and locations of fire-fighting and personal safety equipment.
- Designate key personnel such as the signalman, and tagline handlers
- Complete and sign off all appropriate checklists and safety permits.

- Check the placement of all banners and barricades that define the safety boundaries of the work area.
- Discuss and give due consideration to any additional appropriate steps that any participant feels are necessary to perform a safe and timely operation.

Electrical Hazards — The requirements contained in Practice Ref. (000000) must be followed.

No one will be allowed to place him/herself under a suspended load without an approved safety device or other means to ensure that the load cannot fall.

All motor vehicles and unauthorized personnel must be kept out of hazardous areas associated with heavy rigging activity.

Welding to any load while the rigging is attached must be avoided to prevent damage to the load lines.

No welding or cutting must be allowed on any of the vessels or process equipment without the written permission of Fluor.

The [CLIENT/COMPANY NAME] Site Manager or his designated representative must retain the right to halt the operation of a sub-/lower-tier contractor any time they see an unsafe act or situation developing and not allow the operation to continue until the condition is corrected.

Night work must be done only with prior approval of the [CLIENT/COMPANY NAME] Site Manager. For any night work done, artificial light must be provided sufficient to permit the work to be carried on efficiently and safely.

17.0. Suspended Personal Platforms (Workbaskets)

A workbasket will be used only when other means of access to the work are extremely hazardous or not feasible because of structural design or worksite conditions.

In no case is a workbasket to be used as an elevator and the safe working limit is not to be exceeded.

The “safe working limit” of the workbasket must not be exceeded.

Qualified Persons, proficient in structural design, must design workbaskets. The workbasket will be constructed for the specific purpose of hoisting employees using a crane.

The use of the workbasket requires approval by the Project Manager and the HSE Representative, as well as 3 levels of construction line management; this responsibility may not be delegated to subordinates. In addition, a Job Safety Analysis (JSA) (Form Ref. (000000)), a Crane Lift Permit, and a Suspended Personnel Workbasket/Platform Checklist and Authorization (Form Ref. (000000)) are required.

If the permit-to-work process is in use, a Permit-to-work must be obtained (Form Ref. (000000)) by Practice Ref. (000000).

Before work involving a suspended personnel workbasket, Form Ref. (000000) will be completed by the supervisor, and the required approvals obtained. A copy of the permit must be placed in the cab of the crane, with the original filed at the site.

The appointment and training of a Suspended Personnel Workbasket Authorized Permit Issuer is similar to Permit to Work and Confined Space Entry Authorized Permit Issuers (refer to Practice Ref. (000000)). However, in addition, they will have sound and thorough knowledge of matters relating to the preparation and conduct of critical lifts. Practical experience in preparing critical lift permits under guidance may be appropriate. The appointment is made in writing on Form Ref. (000000), Authorized Permit Issuers, by the Project Manager.

Note: When using a suspended personnel work platform in an operating facility, it is a common requirement to use the facility's “suspended personnel workbasket permit process” instead of the process described above.

Load and boom hoist drum brakes, swing brakes, and locking devices such as dogs and pawls, as equipped, MUST be engaged when the occupied workbasket is in a stationary working position.

Crane work involving workbaskets must be positively isolated against “free fall.”

If the basket is not landed, it must be secured to the structure using the double lanyard and tie-off system before employees exit.

Generally, employees may not exit or enter the basket while working at height. However, if entry and exit in a workbasket while working at height is required, a task-specific JRA must be developed and approved.

17.1. Design Requirements

The design of the workbasket must be by 29 CFR 1926.550 or equivalent in-country standards. Lifting bridles on the workbasket must be designed to minimize the tipping of the basket during the movement of employees.

The personnel platform, excluding the guardrail system and body harness anchorages, must be capable of supporting, without failure, its weight and at least 5 times the maximum intended load based on a minimum allowance of 500 pounds (226.8 kilograms) for the first employee with light tools and an additional 200 pounds (90.7 kilograms) for each additional employee.

A 42-inch (106.9 centimeters) high guardrail for perimeter protection of employees within the workbasket is required. It must be of either solid construction or expanded metal having openings no greater than 1/2 inch (13 centimeters); with a gate that swings inward only and equipped with a device to restrain the door from inadvertent opening (refer to Attachment 08, Employee Properly Positioned in Suspended Workbasket).

The workbasket must have a plate specifying the weight of the empty workbasket, the maximum number of employees, and the weight for which the workbasket is rated and may not be exceeded. The workbasket must be easily identifiable by color or markings.

A grabrail, 6 inches (15.2 centimeters) from the guardrail, must be provided inside the personnel basket. Overhead protection must also be provided when employees are exposed to falling objects. Welding must be performed by a certified welder for the weld grades, types, and materials specified in the design. Exposed rough edges must be ground smooth to prevent hand injuries.

17.2. Rigging

Workbaskets must be rigged under the direction of a rigger designated as a Competent Person.

Load block or ball hooks must be of the type that can be closed and locked (moused), thereby eliminating the throat opening; as an alternative, a shackle with a screw pin, nut, and retaining pin may be used.

When a wire rope lifting bridle is used to connect the workbasket to the load line, the bridle legs must be connected to a single ring or shackle. Lifting bridles and associated hardware used for attaching the workbasket to the hoist line may not be used for any other service.

All eyes in wire rope slings must be fabricated with thimbles. Wire rope, shackles, rings, and other rigging hardware must have a minimum safety factor of 5.

Taglines must be used unless it creates a greater hazard.

A safety wire rope sling must be affixed from the uppermost part of the workbasket structure to a point above the ball or the dead-end load line of the load block.

For a picture of an employee properly positioned in a suspended workbasket, refer to Attachment 08.

For additional requirements on the inspection, testing, operation, and maintenance of suspended personnel platforms, refer to 29 CFR 1926.550 or other applicable in-country standards.

17.3. Crane Setup and Operation

The crane must be uniformly level within 1 percent of the level grade and located on a firm footing. Crane outriggers, if provided, must be used according to the manufacturer's specifications when hoisting employees. Crane travel is prohibited while the workbasket is suspended.

The crane operator must remain at the controls at all times, with the engine running, when the workbasket is suspended.

Outrigger pads must be used when lifting a suspended workbasket.

The total weight of the loaded workbasket and related rigging may not exceed 50 percent of the rated capacity for the radius and configuration of the crane. The minimum load hoist wire rope safety factor must be at least 7. Except where rotation resistance ropes are used, the line will be capable of supporting without failure at least 10 times the maximum intended load. Lifting and lowering speeds must not exceed 100 feet (30.5 meters) per minute.

The load line hoist drum must have controlled (power) load-lowering capability; free fall is prohibited and must be positively isolated.

Telescoping booms must be marked or equipped with a device to indicate to the operator, at all times, the boom's extended length.

A positive-acting device must be used that prevents contact between the load block or overhaul ball and the boom tip (anti-two-blocking device), or a system must be used that deactivates the hoisting action before damage occurs in the event of a two-blocking situation ("two-block damage prevention" feature).

17.4. Inspection and Testing

The crane and the workbasket to be used must be inspected by a Competent Person at the beginning of each shift and before hoisting employees in the workbasket. The crane and the workbasket to be used must also be inspected before hoisting employees in the workbasket after the crane has been used for any operation in which greater than 50 percent of the rated capacity was lifted.

A test lift with the unoccupied workbasket must be made at the beginning of each shift and for each new work location to verify that all systems, controls, and safety devices are functioning properly. A full-cycle operational test lift at 125 percent of the intended load of the workbasket for no less than 5 minutes must also be made at each new setup location before hoisting employees for the first time. A visual inspection of the crane, workbasket, and base support must be conducted immediately after the test lift to determine whether the testing had any adverse effect on any component or structure.

17.5. Safe Work Practices

Employees must keep all parts of their bodies inside the workbasket during raising, lowering, and positioning.

The hoisting of employees will be discontinued upon indication of any dangerous weather conditions or other impending danger.

The workbasket will be hoisted just above the ground and inspected to verify that it is secure and properly balanced before employees are allowed to occupy the workbasket.

Employees being hoisted must be in continuous sight of or in communication with the crane operator or signal person. If at any time the operator cannot see hand signals or hear radio-relayed signals, he/she must stop all operations until he/she can receive signals.

Employees occupying the workbasket must wear a safety harness with a lanyard properly attached to a designated anchor point or suitable structural member within the workbasket.

A competent person rigger must be in the workbasket while it is hoisted aloft.

Only tools and materials that are required to perform the particular assigned function may be lifted in the workbasket. Personnel baskets must not be used as material hoists.

17.6. Prelift Meeting

A meeting attended by the crane operator, signal person, person (s) to be lifted, and the supervisor responsible for the task to be performed will be held to review this section of the practice, the JRA, the lift permit, and suspended personnel workbasket documents to be followed.

This meeting will be held before the beginning of personnel hoisting operations at each new work location, and thereafter for any employees newly assigned to the operation.

18.0. VARIANCES

If the Site Manager determines that a specific requirement of this practice will cause an undue hardship and that the work can be done safely by employing another practice, the Site Manager or designee will:

- Develop an explanation and justification that they are suspending that specific requirement, describing why it is not appropriate for their job and what other method(s) will be employed to ensure the safety of the rigging operations.

Obtain written approval from the Project/Site HSE Representative, and the site rigging supervisor.

Note: This “Standard Copy” is provided as a guide for the Site Manager, or his representative, and the rigging engineer to develop a “site-specific crane and rigging procedure” for each site.