Brieser CONSTRUCTION

Section 33
Safety Health and Environmental Manual

2025

Lifting & Rigging

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RIGGING & LIFTING

PURPOSE:

The purpose of this procedure is to provide requirements and guidance to support safe rigging and handling of loads. Guidance is included for identification, control, storage, issuance, usage and prior to use inspections of lifting and rigging equipment (cranes, mobile cranes, hand operated hoists, wire ropes, chains, slings, rigging tackle), and for determining the center of gravity, safe working load, and signals.

RESPONSIBILITIES

The Program Administrator: Director of Safety (Kevin Colwell)

This person is responsible for:

- Issuing and administering this program and making sure that it satisfies all applicable federal, state, and local requirements.
- Ensuring that employees receive initial and refresher training on the use of this policy.
- Maintaining training records for all employees included in the training sessions.
- Ensuring all necessary inspections are maintained by conducting field audits of all rigging equipment. Bi-annual informal inspections are made in January and July. Formal annual inspections are conducted in the 3rd. quarter.

Equipment Manager

These people are responsible for:

- Ensuring that the annual formal inspections are conducted on all rigging equipment company wide.
- Ensuring each piece of lifting equipment is appropriately identified.
- Maintaining documentation as required on lifting equipment.
- Maintaining rigging or lifting equipment
  - Repairing, discarding, or destroying damaged or defective rigging / lifting equipment.
  - Assuring proper tagging (depicting rigging or lifting equipment is unsuitable for use) is placed on damaged or defective equipment.
- Maintaining all special lifting equipment within required periodic inspection intervals.

Equipment Manager continued.

- Ensuring manufacturer's recommended preventative maintenance is performed on rigging or lifting equipment.
- Performing or assisting vendors in performing required periodic inspections of rigging or lifting equipment.
- Purchasing new / replacement lifting, rigging and special equipment, as required.

Project Managers, Superintendents and Foremen

These people are responsible for:

- Review any current revision of the rigging and lifting plans prior to implementation.
- Ensuring personnel assigned rigging tasks are sufficiently trained and qualified in safe rigging practices to perform assigned task adequately and safely.
- Ensuring any rigging and lifting plan is discussed and reviewed during the TSTI prior to making the lift.
- Performance of proper planning, pre-use inspection, safe and correct rigging practices and tagging of equipment that is found damaged or defective.
- Safe rigging and handling of loads during any rigging task.
- Performing any necessary decontamination of rigging or lifting equipment as appropriate.
- Returning rigging or lifting equipment to appropriate rigging and lifting equipment storage area (e.g., Brieser Shop)

Designated Signal Person

These people are responsible for:

- Communicating with the signalman during lifting load evolutions to ensure the crane maintains a safe distance from hazards.
- Communicating with the mobile crane operator when a signalman is not being used during crane travel and maneuvering under "No Load" conditions.
- Know the location of the crane mainline disconnect.
- Walking down the planned travel path before moving the crane to ensure possible hazards and obstructions are identified and communicated to the crane operator / signalman.

Crane Operator

These people are responsible for:

- Not engaging in any practice that could divert attention while actually engaged in crane operation.
- Only those employees qualified by training or experience shall be allowed to operate equipment and machinery.
    - By November 10th, 2017, employers must ensure operators be qualified/certified by one of the following methods:
        - Certification by an accredited crane operator testing organization.
        - Qualification by an audited employer program
        - Qualification by the U.S. military
        - Licensing by a government entity

- Being physically or otherwise fit for the proficient and safe operation of any crane under his/her controls.
- Being familiar with and understanding hand signals.
- Obeying an emergency always stop signal, no matter who gives it.
- Evaluating potential emergent or abnormal conditions during a lift, and stopping the lift to resolve such conditions, if necessary
- All manufacturer procedures applicable to the operational functions of equipment, including its use with attachments, must be complied with.
- The manufacturer must approve all modifications/additions in writing. A registered professional engineer must be qualified with respect to the equipment involved and must ensure the original safety factor of the equipment is not reduced.
- Whenever there is a safety concern, the operator must have the authority to stop and refuse to handle loads until a qualified person has determined that safety has been assured.
- The operator shall have access to procedures applicable to the operation of the equipment. Procedures include rated capacities (load charts), recommended operating speeds, special hazard warnings, instructions, and operator's manual.

- The work zone shall be identified by demarcating boundaries such as flag and range limiting devices or defining the work zone as 360 degrees around the equipment up to the maximum working radius. The hazard assessment must determine if any part of the equipment could get closer than 20 feet to a power line.
    - If it is determined that any part of the equipment, load line or load could get closer than 20 feet to a power line then at least one of the following measures must be taken:
        - Ensure the power lines have been deenergized and visibly grounded.
        - Ensure no part of the equipment, load line or load gets closer than 20 feet to the power line.
        - Determine the line's voltage and minimum approach distance permitted. In Table A Attachment 8 of this policy.

Crane Inspection(s).

- Equipment must not be assembled or used unless ground conditions are firm, drained, and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer’s specifications for adequate support and degree of level of the equipment are met.
- The manufacturer's procedures and prohibitions must be complied with when assembling and disassembling equipment.
- The assembly/disassembly of equipment must be directed by a competent and qualified person.
- A competent person must conduct a visual inspection of equipment prior to each shift. The inspection must consist of observation for apparent deficiencies. Some inspection items shall include control mechanisms, pressurized lines, hooks and latches, wire rope, electrical apparatus, tires (when used), and ground conditions.
- Equipment must be inspected monthly by a competent person. The inspection must be documented. Documentation must include the following: items checked, results of inspection, and name and signature of the inspector. Documentation must be retained for 3 months. (Documented monthly inspection not required if the daily inspection is documented and records are retained for 3 months)
- Safety devices are required to be on all equipment and must be in proper working order before operations begin. If any of the devices are not in proper working order the equipment must be taken out of service and operations must not resume until the device is working properly again. Examples of safety devices may include:
    - Crane level indicator
    - Boom stops.
    - Jib stops.
    - Foot pedal brake locks
    - Horns, etc.

Signalman Responsibilities

- The Signalman's primary responsibility is to give signal/communicate directions to the crane operator, and he/she should be clearly identifiable (e.g., wearing bright colored vest).
- Know the location of the crane mainline disconnect.
- An appropriate TSTI should be conducted with the signalman and rigging team to ensure the rigging expectations are clear. There are several instances when it is acceptable for the Signalman to touch/guide the load and they are as follows:
    - To check/inspect and adjust the rigging setup prior to lifting the load.
    - When the load is being lifted lowered into a fitted area and the fit is preventing the load from swinging or shifting.
    - When the load is being aligned for lowering over guide rods/alignment pins or lifted/lowered over guide rods/alignment pins that are preventing the load from swinging or shifting.
    - The load is at a minimal height (less than approximately 6 inches above the landing location) and is being lifted/lowered initially or being guided to a precise landing location.
    - When the item is being/lowered into a location that requires hands on guidance (insufficient room for tag lines) AND there is room for only one person to guide the load AND the crane operator will still have a clear view of the Signalman.

- These instances allow the Signalman to determine if there are signs of binding and precise positioning without posing an equipment or personnel safety risk. The signalman's actions should be such that he/she has the ability to immediately provide hand signals with both hands if required.

- During periods when the designated signalman is not working in the capacity of a signalman and performing other rigging activities, he/she should remove his vest.

- For Non-Heavy Load lifts, A Signalman is not required if the load is such that the hoist/crane operator will have control, will be in the immediate vicinity of the load (i.e., pendant controller), and is able to visually see the load during all phases of lifting, moving, and setting the load. A Signalman is to be used for all other hoist/crane handling situation.

DEFINITIONS

Breaking Strength – The measured strength required to break cable, chain, synthetic webbing, etc.

Critical Load – A lifted load whose uncontrolled movement or release could adversely affect safety related system(s) when such system(s) are required for unit safety or result in potential off-site exposure comparable to the guideline exposures outlined in 10 CFR 100.

Dynamometer / Load Cell – A device used to measure/determine the weight of the load being lifted. Dynamometer / load cell are also used as equivalents in the mobile cranes that have a computer assisted load determining systems.

Dynamic Loading – Is the loading that occurs from force generated by acceleration or deceleration. A dynamic load results from a force applied to the load/rigging (for example, during operation of the crane moving the load). Dynamic load is equal to static load plus the dynamic force applied to the rigging as a result of accelerating or decelerating the crane hook caring the load (typically about 25% greater than the load weight to be lifted).

Dynamic Load Factor – The safety factor use to select the proper rated slings/rigging for a specific load to be lifted. Multiply the Dynamic Load Factor times the weight of the load to be rigged (Static load).

Fabricated Rigging Devices – The design, fabrication, labeling, testing and utilization of fabricated rigging devices shall comply with the requirements of ASME B30.20.

Lifting Equipment – All equipment used for hoisting and lowering loads.

Load Bearing Parts – Any part of a material-handling device in which the induced stress is influenced by a hook load. A primary load-bearing part is one, the failure of which could result in dropping, upset, or uncontrolled motion of the load. Load bearing parts which, if failed, would result in no more than stoppage of the equipment without causing dropping, upset, or loss of control of the load, are not considered to be primary load-bearing parts.

Load Rating – The amount of weight that a component or assembly can safely lift.

Material Handling – The process of moving material using devices that are not classified as rigging and lifting tools. (i.e., be moving material using carts, forklifts, pallet jacks, dollies, and rope)

Nil Ductility Temperature – Is defined as that temperature at which a material is subject to catastrophic brittle failure when placed under load or stress. This condition may occur in cold weather conditions to carbon steel or carbon steel alloys.

Nominal Strength – Breaking strength of rope which begins to reduce the moment a rope is put in service.

Qualified Person – A person, who by documented training, knowledge, and experience, is competent to perform the required task.

Qualified Rigger - A qualified rigger is a person who, by possession of a recognized degree, certificate, or professional standing, or by extensive knowledge, training, and experience, successfully demonstrated the ability to solve/resolve problems related to the subject matter, the work, or the project. Brieser accepts a 40-hour rigger card issued by a union trade or 10 years of experience.

Rated Capacity – The manufacturer's rated capacity. The maximum load which a piece of hoisting equipment is designed to safely carry. Also, the maximum load which a sling, hook, shackle, or other rigging tackle is designed to safely carry.

- When shackles are to be used at temperatures above 400ºF(204ºC) or below -40ºF(-40ºC), the shackle manufacturer or a qualified person should be consulted.
- When adjustable hardware, excluding swivel hoist rings and carbon steel eyebolts, is to be used at temperatures above 400ºF(204ºC) or below -40ºF(-40ºC), the hardware manufacturer or a qualified person should be consulted.
- When swivel hoist rings are to be used at temperatures above 400ºF(204ºC) or below -20ºF(-29ºC), the hardware manufacturer or a qualified person should be consulted.
- When carbon steel eyebolts are to be used at temperatures above 275ºF(135ºC) or below 30ºF(-1ºC), the hardware manufacturer or a qualified person should be consulted.
- When wire rope clips are to be used at temperatures above 400ºF(204ºC) or below -40ºF(-40ºC), the wire rope clip manufacturer or a qualified person should be consulted.
- When wedge sockets are to be used at temperatures above 400ºF(204ºC) or below -4ºF(-20ºC), the wedge socket manufacturer or a qualified person should be consulted.
- When steel links, rings, or swivels, are to be used at temperatures above 400ºF(204ºC) or below -40ºF(-40ºC), the steel link, ring, or swivel manufacturer or a qualified person should be consulted.
- For links, rings, or swivels made from other materials than steel, the steel link, ring, or swivel manufacturer or a qualified person should be consulted.

Rigging – The act of lifting or moving an object with equipment and/or materials designed for that purpose.

Rigging Equipment – Defined as shackles, turnbuckles, eyebolts, wire rope clips, ropes, pulleys, etc. and includes attachments used for connecting, anchoring, fixing, or supporting the load. Using non rigging equipment devices (unless approved by Engineering) as rigging equipment are not acceptable (i.e., C-Clamps, manufactured parts, etc.)

Rigging and Lifting Plan – Defined as an identification of the load, an assurance that correct rigging equipment is used, a safe travel path designation, and that a lay down area has been designated and any other considerations that apply (Ref: Attachment 13). Rigging and lifting plans that were reviewed, evaluated, or approved by Engineering will require additional reviews, evaluations, or approvals if the plan requires a revision.

Safe Load Path – A path (direction and clearances) defined for transport of heavy or critical loads to minimize the actual or increased potential for exposure release as defined in 10 CFR or would adversely affect safety related system(s) if dropped.

Safe Working Load (SWL) / Working Load Limit (WLL) – The maximum allowable working load for lifting and handling equipment (rigging) also called load capacity, maximum working load or load rating.

Special Lifting Devices – Pieces of equipment especially designed to handle specific types of loads. They are usually made to hang from the hook of a crane during a Special Lift.

Static Load – Is the load that would be indicated on a dynamometer / load cell when a load is suspend in a stationary position.

Suspended Load

- The total superimposed weight on the load block or hook that would result in a load drop if the hoisting device or interfacing rigging equipment were to fail.
- ASME/ANSI B30.20, Below the Hook Lifting Devices, such as lifting beams, spreader beams, "C" beams, and hook boxes are considered suspended loads and shall not be carried over personnel. Portable Load Cells are also considered suspended loads.
- Crane operators should avoid carrying unloaded slings, chain falls, and rigging hardware over personnel when practical.
- All rigging equipment suspended from the crane hook(s) shall be removed prior to leaving the crane unattended.

GENERAL REQUIREMENTS

Rigging tasks that require special detailed handling instructions require certain minimum information be supplied prior to performance of task. Information may include:

- Weight of object to be rigged.
- Special precautions for handling of load.
- A sketch or drawing showing sling locations, balance points, angle of attachment, and methods of attachments.
- Types and size of rigging to be used should be identified on the drawing plan.
- A rigging and lifting plan should be considered for conditions identified on Attachment 13. The rigging and lifting plan checklist on Attachment 13 is optional and may be used as a rigging and lifting plan.

Precautions shall be taken during performance of task as follows:

- To prevent personnel from passing below or standing under suspended loads. If this is unpreventable the crane hook must have latch and load must be rigged by qualified rigger.
- Exercise care when rigging around electrical wiring or equipment. (See Attachment 13)
- Protective (e.g., leather) gloves shall be worn when handling rigging.
- Hands, feet, arms, and legs shall be kept clear of pinch points.
- Shock loading of rigging equipment shall be avoided.
- Rigging or lifting equipment shall be removed from load prior to performing arc welding.

EXCEPTION

Rigging or lifting equipment may be left in place provided the arc welding is performed in accordance with Section 23, Hot Work, and the potential for the crane chain or wire rope from becoming a path for current flow is mitigated by:

- Using a **DRY** non-conductive sling rated for the load (to ensure the chain, wire rope, and/or hook are insulated from the work piece), **and**
- Establishing the welding ground directly adjacent to the welding joint **and** ensuring that there is electrical contact between the two pieces being welded, **and**
- Covering the portions of the crane chain, wire rope, and/or hook located within 4 feet of the weld location with a non-conductive insulating material, to prevent accidental electrical contact, when applicable.

Fabrication or modification of rigging devices (tools), or special rigging and lifting equipment outside the control of the company engineering programs is not permitted.

- An Engineering Request should be initiated to solicit Engineering support when a need for fabrication or modification of a rigging device (tool) is identified.
- The Brieser Project Manager shall maintain records of design, fabrication, testing, use and inspection of the rigging device (tool).

Rigging and lifting equipment that does not meet manufacturer's specifications shall not be used.

Rigging and lifting equipment not specifically addressed in approved procedures shall be used in accordance with manufacturer's recommendations.

Use of scaffolding as an attachment or anchor point during rigging activities shall not be allowed unless evaluated and approved by an Engineering firm.

Rigging points shall not be made from permanently installed plant system components at or associated supports (e.g., cable trays, cable tray supports, piping, snubbers), at customer sites unless approved by the customers Engineering department. A record of approval stamped by the resident Engineer shall be filed in the Brieser job file.

Use of non-shouldered eyebolts shall be strictly limited to specialized vertical lift applications where the design of load attachment points prohibits safe use of shouldered type.

Modifications to rigging, lifting and special lifting equipment shall only be authorized by equipment manufacturer and installed through Brieser approved procedures.

Rope shall not be used as direct or indirect load bearing elements of any rigging operation. Rope may be used for tether lines.

Damaged or defective lifting, rigging and special equipment shall be tagged and removed from service.

Only rigging and lifting equipment identified, inspected, and issued in accordance with approved procedures shall be used.

NOTE: An immovable load rigged in such a way that a failure of the primary securing mechanism will not result in movement of the load (i.e., cribbing to support load from underneath, pipe rigged in place for welding, redundant rigging system, etc.) is not considered a suspended load.

Work shall not be performed on or under a suspended load.

Exception 1: Stationary Loads

1. For infrequent situations, work may be performed on or under a suspended load while it is stationary (e.g., not being raised, lowered, or moved) when it is infeasible to conduct the work while the load is not suspended and the work is limited, authorized, and performed in accordance with the three steps listed below (Conduct, Prior & During) and Attachment 16. Infeasible situation is defined as a situation which there is no other way to accomplish the work. Working under suspended loads will not be performed simply due to convenience or as an alternate way to accomplish work.

If it is infeasible to conduct the work while the load is not suspended, then:

1. **CONDUCT** a Job Hazards Analysis that documents why the activity cannot be performed while the load is landed or by using normal means of blocking or cribbing.
    a. The Job Hazard Analysis shall address the height the load will be raised, potential swing of the load, trip hazards, body positioning, and explanation of how workers are not at risk of being struck by the load should the rigging shift or fail.
    b. Whenever possible, long handle tools and/or redundant rigging systems should be used.
2. **PRIOR** to starting the activity:
    a. The Brieser Site Qualified Rigger and Brieser Safety, or their designees must grant authorization on Attachment 16. A TSTI shall be conducted with all workers prior to starting the activity and at the beginning of each subsequent shift.
    b. The TSTI with Job Hazard Analysis and a completed Attachment 16 shall be posted at the job site.
3. **DURING** the activity, a dedicated Brieser Supervisor shall be assigned to the work activity and be in attendance until work activity is completed.

Exception 2: Steel Erection Connecting

1. If an Iron Worker, who is a Qualified Rigger and Connector, is actively aligning and connecting structural members, that employee may work under a suspended load only if:
    a. Materials being hoisted must be rigged to **prevent unintentional displacement.**
    b. Hooks with self-closing safety latches be used to prevent components from slipping out of the hook.
    c. All loads must be rigged by a qualified rigger.

Suspended loads shall not be left unattended unless specific precautions have been instituted, are in place, and have been approved by the site Superintendent, if no site Superintendent is assigned to the work location, the VP of Operations will be notified. The following criteria must be met:

- Softener material placed under load to lesson impact if drop occurs.
- No safety related areas.
- Keep load as low as possible.
- Safety rope/barriers in place with signage.
- For short periods of time only - < 4hrs.
- No crane hook suspended loads.
- Loads shall be maintained balanced and/or level.
- Do not swing loads.
- Loads shall be blocked / cribbed in a stable condition.
- Uncontrolled movement shall be prevented when rotating a load by maintaining center of gravity below rigging point.
- Loads, rigging or lifting equipment shall not be dragged.
- Damaged or deteriorated rigging or lifting equipment shall not be used.
- Loads shall be maintained as close as possible to nearest floor or load bearing structure.
- Rigging equipment shall not be loaded above its rated capacity.

Special lifting devices shall be controlled per applicable site documents in accordance with ANSI 14.6

Portable hoist annual inspection shall be verified current prior to use.

Portable hoists controlled by Brieser Construction Co. are tagged with the current year the hoist was inspected in and the expiration date (month and year) is identified on the tag.

- Portable hoist examination shall be in accordance with applicable requirements.
- Personnel shall not engage in any activity, which will divert his/her attention.
- Operator shall ensure personnel are clear before commencing lift.
- Load chain shall not be exposed to temperatures more than 600° F.
- Hoisting wire rope or chain shall not be wrapped around load.
    - NOTE: Planned engineered lifts are only applicable to powered hoists having a load rating of 5 tons and above.

Except for planned engineered lifts and equipment load testing, lifted load shall not exceed maximum load capacity of supporting structure (beam clamps, trolleys, etc.), or hoist and equipment used for rigging. Adhere to the requirements of ASME B30.16-2003 (or latest rev),

- Hoist shall not be operated to jam or dead block at upper travel limit (Two-Block).
- Hooks shall be equipped with a latch except where it would interfere with operation of equipment or create additional personnel hazards.
- Do not place a side, back or tip load on hooks. Rigging shall be centered in hook.
- Swivel hooks shall rotate freely 360°.
- Hooks shall be positioned over the center of gravity of the load to minimize swinging.
- Rated load capacities, and recommended operating speeds, special hazard warnings, or instruction, shall be conspicuously posted on all equipment.
- Instructions or warnings shall be visible to the operator while he/she is at his control station. If all warnings are not visible to the crane operator, then they shall be included in the TSTI.
- An illustration of the signals shall be provided at the job site.
- Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted, shall be barricaded in such a manner as to prevent an employee from being struck or crushed by the crane.
- All exhaust pipes shall be guarded or insulated in areas where contact by employees is possible in the performance of normal duties.
- All windows in cabs shall be of safety glass, or equivalent, that introduces no visible distortion that will interfere with the safe operation of the machine.
- Where necessary for rigging or service requirements, a ladder, or steps, shall be provided to give access to a cab roof.

- Guardrails, handholds, and steps shall be provided on cranes for easy access to the car and cab.
- Platforms and walkways shall have anti-skid surfaces.
- An accessible fire extinguisher of 5BC rating, or higher, shall be available at all operator stations or cabs of mobile cranes.
- Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line, and it has been visibly grounded.
- Whenever a crane powered with an internal combustion engine exhaust in enclosed spaces, tests shall be made and recorded to see that employees are not exposed to unsafe concentrations of toxic gases or oxygen deficient atmospheres. Contact the Brieser Safety Professional for guidance.
- Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or other moving parts or equipment shall be guarded if such parts are exposed to contact by employees, or otherwise create a hazard.

RIGGING EQUIPMENT REQUIREMENTS:

The following requirements apply to Slings:

1. Slings shall not be loaded beyond capacity indicated on manufacturer's tag for hitch being used.
2. For all configurations, lifting devices that are not specially designed should be installed and used in accordance with this procedure. In selecting the proper sling, the load used should be the sum of the static and maximum dynamic load. The rating on the sling should be in terms of the "static load" which produces the maximum static and dynamic load.
3. Use a "Dynamic Load Factor" of 1.25 times the load to be lifted (static load) when selecting rigging (i.e., wire/synthetic/nylon slings) unless another value is specified in site specific procedures.
4. Slings shall not be pulled from under a load when load is resting on sling.
5. Twisting and kinking of slings shall be avoided.
6. Slings shall not be shortened with knots, bolts, rope clips or other unapproved methods.
7. Temporary repairs to slings are not permitted.
8. Multiple part slings or chains shall not be twisted around each other.
9. Loads shall not be lifted with unused sling legs dangling loose, use right equipment for job.
10. A single sling shall not be used as a bridle to lift a load by hanging it over the hook if the sling can shift over the hook / shackle.

RIGGING EQUIPMENT REQUIREMENTS continued:

11. A single sling with spliced eyes shall not be used alone to lift a load.
12. Longest sling(s) possible shall be used to provide minimum angle to load.
13. Slings used in a choker hitch shall be of sufficient length to assure choking action is on webbing.
14. Nylon, Polyester and Polypropylene slings shall not be used where acid or caustic conditions exist.
15. Synthetic and fiber slings may be used at rated capacity between temperatures of minus 20°F to 180°F except for frozen slings, which may not be used.
16. Fiber slings shall be protected when being used near a heat source of 220°F or more.
17. Fiber core wire rope slings shall not be exposed to temperatures in excess of 200°F.
18. Synthetic and fiber slings shall not be left in wet or chemical environments or exposed to direct sunlight for extended periods.
19. Fiber slings shall not be subjected to a sustained load equal to rated capacity for more than three days.
20. Wire rope slings shall not be used above temperature of 400°F or below minus 60°F.
21. Wire rope slings with turned back eyes configurations should not be used.
22. Slings should be stored in an area where they will not be subjected to mechanical, chemical, or ultraviolet damage or extreme temperatures.

The following requirements apply to rigging hardware / fittings:

1. Aluminum rigging fittings shall not be used in caustic environments.
2. Homemade links, makeshift fasteners formed from bolts, rods, etc. or other such attachments shall not be used.
3. Temporary repairs of rigging hardware / fittings are not permitted.
4. Protective covers, pads, softeners, or guards shall be used to protect slings from edges and corners that may cut or damage slings (such as sharp edges, sharp corners, or abrasive edges). Engineered edge protectors/softeners/corner protectors are preferred.
5. Loads lifted in a basket hitch shall be balanced.

6. Eyebolts must have full thread engagement, shoulder fully seated, only one washer/ shim may be used under eyebolts if needed for orientation purposes to alleviate side pulling of eyebolt. Loads must always be applied to the eyebolts in the plane of the eye, not at some angle to the plane. To attain manufacturers rated capacities for shouldered and plain eyebolts the minimum thread shank length of engagement must be as follows:
    a. Steel – 1 x Bolt thread diameter
    b. Cast iron, brass, bronze – 1.5 x Bolt thread diameter.
    c. Aluminum, magnesium, zinc, plastic – 2 x Bolt thread diameter

    For additional information, safe load limits and guidance use the appropriate listed references (e.g., Jerry Klinke's Rigging Handbook and Bob's Book of Rigging).

7. Load pins shall be fully seated and secure in shackles and turnbuckles.
8. Eyebolt manufacturer/supplier shall be consulted for safe load ratings of non-shouldered eyebolts prior to use.
9. Shackles with round non-threaded pins shall not be used.
10. Observe temperature limitations identified under the "Rated Capacity" definitions for rigging hardware.
11. When using swivel hoist rings, the user must torque hoist rings to the manufacturer's specifications.

The following requirements apply to selecting proper connection hardware for use with *Tuflex* Roundslings manufactured by Lift-All®:

1. *Tuflex* Roundslings may be connected to hardware that is either specifically designed for use with them or they may be connected to standard hardware, if the hardware meets the following criteria:
    a. Must be approved for use in lifting applications by the manufacturer.
    b. Must have an adequate capacity for the lift requirements.
    c. The hardware opening at the sling attachment must be sufficient to allow the *Tuflex* Roundslings to slide freely.
    d. Must be of an adequate size such that the bearing area of the hardware conforms to the size requirements specified by Lift-All® or is sized such that the bearing stress value at the connection does not exceed 7,000 lbs./in during sling loading. (Refer to WSTDA RS-1)

I. Inspections

A Pre-use visual inspection by a qualified person is required to be performed prior to the start of each work shift or prior to each use of rigging and lifting equipment for the following equipment using the appropriate attachment guidelines.

1. Overhead and Gantry Crane — Attachment 1
2. Hand Chain Hoists and Come-A-Long — Attachment 2
3. Electric/Air Hoists — Attachment 3
4. Wire Rope Slings — Attachment 4
5. Synthetic/Nylon Slings — Attachment 5
6. Rigging Hardware — Attachment 6
7. Mobile Crane (typical) — Attachment 7
8. Mobile Crane Pre-Lift Checklist — Attachment 8
9. Monorail and Underhung Cranes with Integral Hoisting Mechanism — Attachment 9
10. Monorail and Underhung Cranes without Integral Hoisting Mechanism — Attachment 10
11. Padeye to Steel and Concrete Embedment's — Attachment 11

A documented inspection will be performed for each wire rope sling and synthetic sling per *Attachment 4* and *Attachment 5* respectively when the slings are initially issued to perform a rigging evolution and thereafter conduct a pre-use inspection using the checklist as a guide. The documented forms will be turned in to the Brieser office for filing and scan. The inspection will be performed by a qualified rigger for the assigned task.

Documented periodic inspection of rigging and lifting equipment shall be performed in accordance with approved procedures and performed by qualified personnel.

Vendor/Sub-Contractor owned rigging equipment is to be controlled and inspected by the Vendor/Sub-Contractor per their program.

II. Lifting Concrete Blocks

PRIOR to lifting concrete blocks, floor plugs, floor covers, and security vehicle barrier system (VBS) blocks by attaching rigging equipment to metal connections that are integral to the load:

1. **VERIFY** the connections installed on the load are intended to be used as rigging points and have rated capacities sufficient for the load based on the lift plan (via design drawings, vendors specifications, or engineering evaluation).
2. **CONFIRM** the connections are free of cracks, excessive wear, or corrosion and that the integral attachments to the load, i.e., inserts that are embedded in concrete blocks, are not degraded and/or loose. If excessive wear or corrosion is present, then **CONDUCT** a non-destructive examination (NDE) to **CONFIRM** the connections are still acceptable for use.
3. **VERIFY** the sling angles are appropriate for the type of fittings / hardware (i.e., eye bolts, lifting lugs, etc.) being used.
    - *NOTE A lifting beam specifically designed for both the 9 foot and 10-foot VBS concrete barriers is available that provides a direct, vertical lift for each VBS and avoids any stresses other than the direct "dead weight" of each block.*
4. If a security VBS block is being lifted, then the slings shall be kept vertical.

III. Loads with Tight Clearances (i.e., loads suspect to binding, dragging, etc.)

CAUTION

To ensure against rigging failure with disastrous consequences due to over stressing rigging equipment, adhere to this policy when conducting lifts that have potential interferences, drag, binding, or suspect load values.

All rigging lifts that are greater than 1,000 pounds and that have potential interferences, drag, binding, or suspect load values, such as concrete blocks, shoring boxes, etc., must utilize a load cell with a safety factor of at least 5-to-1 to prevent excessive stress which could inadvertently load equipment above its rated capacity.

If the configuration of lift is not conducive to the use of a load cell such that a load cell cannot be used, **then DEVELOP and IMPLEMENT** a rigging and lifting plan (i.e., *Attachment 13*), reviewed and approved by the Site Qualified Rigger, that utilizes appropriate means to alleviate excessive stress from the allowable concentrated load values, such as:

a. Increasing the rigging capacity by at least 100%.
b. Mechanically agitating, lubricating, heating, hydraulically jacking and/or prying loose from the rest point prior to lifting.
c. Placing indicators / precision levels to visually verify if load is moving correctly (i.e., horizontal / vertical)

IV. Performance of Lifting and Rigging

Rigging activities shall be reviewed and discussed during the pre-job briefing. When possible and practical the pre-job brief should include a tour of the job site. The pre-job brief shall include a review of the roles and responsibilities of all persons involved with the lifting evolution. When using a mobile crane, a Signal Person individual shall be designated during the pre-job brief.

- One person shall be designated (typically during pre-job brief) as in charge of the lift.
- A qualified rigger shall be present during rigging evolutions.

A signalman shall be:

- A qualified rigger per the Brieser Construction Lifting & Rigging S.O.P. or
- Qualified as a signalman in accordance with 1926.1428(c).

Any mobile crane that is operated shall have a designated Signal Person.

The safe travel path should be walked down when required to ensure it is clear of obstacles and personnel hazards. When a Signal Person is supporting the operator of a mobile crane, then the Signal Person and the operator shall have a clear understanding of the crane travel path.

Use a Signal Person if temporary obstructions have the potential to impact the crane's travel path.

Due to wind having a significant effect on loads, Grove Crane manufacturer recommends when wind velocity exceeds 20 mph, the crane’s capacities be reduced to 44% of the allowable stability and structural capacities appearing on the crane’s load capacity charts and that all crane operation cease when wind velocity reaches or exceeds 30 mph.

Radios may be used to enhance communications between the signalman (when used) and crane operator.

For Non-Heavy Load lifts, A Signalman is not required if the load is such that the hoist/crane operator will have control, will be in the immediate vicinity of the load (i.e., pendant controller), and is able to visually see the load during all phases of lifting, moving, and setting the load. A Signalman is to be used for all other hoist/crane handling situation.

1. To avoid personnel injury or equipment damage, only one qualified person shall be designated to give hand signals to the crane / hoist operator.
    a. ANSI / ASME approved hand signals shall be used as the primary means of communication for all crane / hoist movements (see attachment 14 and 15).
        i. Special operations may require additions to or modifications of standard signals.
        ii. Special signals shall be agreed upon in advance and understood by the signalperson and the operator.
        iii. Special signals shall not conflict with standard hand signals.
    b. The designated signalman shall wear a bright colored vest or other apparel so the signal person can be clearly identified.
    c. When the crane / hoist operator's view is obstructed, hand signals may be relayed to the crane / hoist operator by more than one person – Continuous radio headset communications would also be an acceptable practice and in this case be the preferred method. The crane operator must be hands-free if radio type of communication is utilized.
2. The crane / hoist operator shall obey ANY emergency stop signal given by ANYONE in the lift area.

When loads are moved past several elevations, personnel performing the lift shall evaluate the need to position attendants at each elevation the load travels past. This evaluation shall include, but is not limited to the following items:

- Size, weight, and shape of load
- Visibility between load and crane / hoist operator
- Size of opening in relation to size of load
- Orientation of load in relation to opening
- Any obstructions in lift path

ENSURE that access to the lift area or any openings created is strictly controlled by a watch person, barriers, or both. Sufficient watch persons and/or barriers must be used to completely limit access to the lift area except for personnel involved with the lift. Barriers may consist of safety tapes, ropes, or hard barricade as necessary and shall be posted with warning signs. The use of barriers is expected when it is possible and practical in those areas where personnel traffic is probable.

Weight of load shall be determined from one of the following:

- Equipment name plate
- Manufacturer's technical manual or drawing
- Work history
- Calculation using weight chart and formula on *Attachment 12*
- Use of the dynamometer/load cell

NOTE: Planned engineered lifts are only applicable to powered hoists having a load rating of 5 tons and above.

Any load greater than equipment rated capacity shall not be lifted, unless reviewed by 3rd. party Engineering firm. Brieser V.P. of Operations and Safety must be involved.

Adhere to the requirements of ASME B30.16-2010 (or latest rev), Section 16-2.2, "Testing", and Section 16-3.2.2, "Planned Engineered Lifts", prior to performing all lifts above rated capacity.

Type, quantity, rating and use configuration of rigging equipment required to perform lift shall be determined from Manufacturer's recommendations. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded.

Pre-use and operational check of rigging and lifting equipment shall be performed.

Rigging or lifting equipment shall be installed with hook positioned at center of gravity and rigging attached to load.

- If load is a close fit, odd shaped or unbalanced, then a chain fall, Come-A-Long or turnbuckle of the appropriate load rating should be used to provide additional control.
- Hitches shall be adjusted so that each will share its part of the load.
- Size of rigging shall be adjusted as necessary to support unbalanced loads.
- A tag line should be used if possible and should be of sufficient length and strength to allow manipulation of the load without endangering personnel.
- Precautions shall be taken during load movement to prevent personal injury and equipment damage. All personnel must be clear before lifting load.
- Loads shall be lifted, moved, started, and stopped slowly to minimize dynamic loading of rigging and lifting equipment.

- Load shall be lifted just enough to check for balance and level. If necessary, load should be lowered, adjustments performed, then lifted and rechecked.
- Load shall be moved slowly and under control to destination. Load shall be lifted the minimum amount necessary to clear obstacles, keeping load as close as possible to nearest load bearing surface.
- Load shall be securely blocked before relaxing rigging.

All rigging and lifting equipment shall be returned to appropriate storage area at completion of the lifting activity. Any Brieser equipment found defective due to rigging and lifting shall be tagged with defective equipment tag and reported to the Tool Room. Any vendor/contractor owned equipment found defective shall be controlled by the vendor/contractor per their program to prevent use.

V. Training, Evaluation, and Observation of Rigging/Lifting Activities

Designated Supervisors or Rigging/Lifting personnel shall conduct performance Observations of personnel performing Rigging/Lifting and material handling quadrennial. Designated Observers will have experience, and knowledge of Rigging/Lifting and material handling activities.

1. Designated Observers shall use Attachment 17 to document observation.
2. Attachment 17 will be forwarded to the Brieser office for entry.

VI. Attachments

Attachment 1, Inspection Requirements for Overhead and Gantry Cranes

Attachment 2, Minimum Inspection for Hand Chain Operated Hoists and Come-A-Longs

Attachment 3, Minimum Inspection for Electric or Air Operated Hoist

Attachment 4, Inspection Requirements for Wire Rope Slings

Attachment 5, Minimum Inspection Requirements for Synthetic/Nylon Slings

Attachment 6, Minimum Inspection Standards for General Rigging Hardware

Attachment 7, Minimum Inspection Requirements for Mobile Cranes

Attachment 8, Mobile Crane Pre-Lift Checklist

Attachment 9, Minimum Inspection Requirements for Monorail and Underhung Cranes with Integral Hoisting Mechanism

Attachment 10, Minimum Inspection Requirements for Monorail and Underhung Cranes without Integral Hoisting Mechanisms

Attachment 11, Inspection Requirements for Padeye to Steel and Concrete Embedment's

Attachment 12, Load Weight Chart and Calculating Load/Tension on Each Leg of a Sling

Attachment 13, Rigging and Lifting Plan Guidance

Attachment 14, Bridge Crane Signals

Attachment 15, Mobile Crane Signals

Attachment 16, Work on/under a Suspended Load – Limited Exceptions.

Attachment 17, Observation Form for Rigging/Lifting Competency

VII. Attachment 1

Minimum Inspection Requirements for Overhead and Gantry Cranes

PERFORM the following pre-use inspections:

- Visually **INSPECT** hoist ropes for gross damage such as distortion of the rope, corrosion, broken strands, kinks, or any other unusual abnormalities.
- Visually **INSPECT** lines, tanks, valves, pumps, and other parts of air or hydraulic systems for leaks.
- Visually **INSPECT** general rigging hardware in accordance with *Attachment 6*.
- Functionally **TEST** hoisting limit switch.
- Functionally **TEST** lower travel limit switch, if hoist is being used at or near its lower travel limit.
- Functionally **TEST** all other limit switches as applicable (i.e., Trolley/Bridge travel, etc.)
- **CHECK** that the rated load of the crane shall be plainly marked on each side of the crane, and if the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block, and this marking shall be clearly legible from the ground or floor.
- **CHECK** that bridge trucks are equipped with sweeps which extend below the top of the rail and project in front of the truck wheels.
    - NOTE: A gong or other audible alarm is not required for floor-operated cranes.
- **CHECK** that a gong or other effective audible warning signal shall be provided for each crane equipped with a power traveling mechanism.
- The locations of the crane mainline disconnect/breaker must be known and discussed between the riggers and crane operator prior to conducting rigging evolutions associated with the crane.

If any abnormal conditions / defects are found, then **CONTACT** the Brieser Equipment Manager for resolution prior to utilizing the equipment.

VIII. Attachment 2

Minimum Inspection Requirements for Hand Chain Operated Hoists and Come-A-Long

PERFORM the following pre-use inspections:

- **VERIFY** Portable hoist annual inspection current prior to use.
- Functionally **TEST** controls and operating mechanisms for proper operation in hoisting and lowering directions.
- **CHECK** all load bearing components for apparent damage.
- Visually **INSPECT** load chain for the following:
  - Stretch
  - Wear
  - Twists
  - Broken or damaged links
- Visually **INSPECT** general rigging hardware in accordance with *Attachment* 6.
- **CHECK** load chain for proper operation of chain and sprockets with special focus on the travel area of the chain.

If any abnormal conditions / defects are found, then **CONTACT** the Brieser Equipment Manager for resolution prior to utilizing the equipment.

IX. Attachment 3

Minimum Inspection Requirements for Electric or Air Operated Hoist

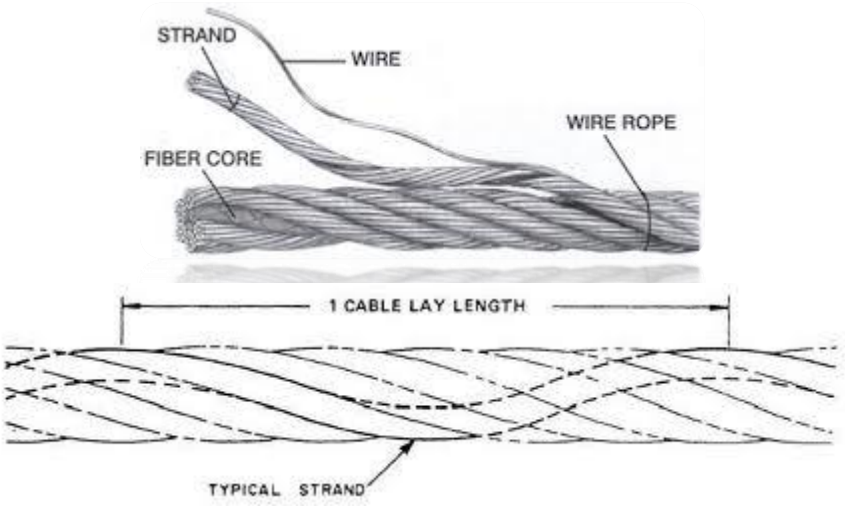
PERFORM the following pre-use inspections:

- **VERIFY** Portable hoist annual inspection current prior to use.
- **CHECK** upper limit switch cut off.
- **CHECK** for proper operation of safety devices.
- **CHECK** all load bearing components for apparent damage.
- **CHECK** wire rope per *Attachment 4* (if applicable).
- **CHECK** wire rope securely attached to hoist drum (if applicable).
- Visually **INSPECT** load chain (if applicable) for the following:
  - Stretch
  - Wear
  - Twists
  - Broken or damaged links
- **CHECK** load chain (if applicable) for proper operation of chain and sprockets with special focus on the travel area of the chain.
- Visually **INSPECT** general rigging hardware in accordance with Attachment
- Functionally **TEST** controls and operating mechanisms for proper operation in hoisting and lowering directions.
- **VERIFY** controls, except in automatic cycling operation, return to the off position when released, and hook motion stops.
- Functionally **TEST** Lower Travel Limit Switch, as applicable, if hoist is being used at or near its lower travel limit.
- Functionally **TEST** all other limit switches as applicable (i.e., Trolley/Bridge travel, etc.)

If any abnormal conditions / defects are found, then **CONTACT** the Brieser Equipment Manager for resolution prior to utilizing the equipment.

X. Attachment 4

Minimum Inspection Requirements for Wire Rope Slings



NOTE: Wire Rope Sling inspection shall be conducted on the entire length of the sling including splices, end attachments and fittings for deterioration which would result in loss of original strength.

WARNING
Protective gloves shall be worn while inspecting wire rope to prevent hand injury.

PERFORM the documented pre-use inspections using *Attachment 4a*.

XI. Attachment 4a
Documented Inspection for Wire Rope Slings

Sling #: _____ Capacity (safe working load): _____ Length: _____

Sling #: _____ Capacity (safe working load): _____ Length: _____

Sling #: _____ Capacity (safe working load): _____ Length: _____

Sling #: _____ Capacity (safe working load): _____ Length: _____

Equipment Name: _____

PERFORM the following pre-use inspections:
(Any unsatisfactory condition listed below is cause for rejection)

Sat	Unsat	
		VERIFY manufacturer's tag is installed indicating rated load.
		Visually **INSPECT** for worn, corroded or broken wires
Sling shall be considered defective if any of the following conditions exist:		
		Six broken wires in one rope lay
		Kinked, crushed, bird caged or distorted rope structure
		Evidence of heat damage
		Deformed, cracked, corroded, or worn end attachments
		Three broken wires in one strand in one rope lay
		Wear or scraping of one-third original diameter of outside individual wires
		In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection

Inspection Performed by: _____ Date: _____

If any unusual defects are detected during the inspection, CONTACT the Brieser Equipment Manager to ensure proper documentation and final disposition of the Sling.

ROUTING	**PERSONNEL MANAGER**	**Add to Scan**
	SCAN	**SAFETY/USER INSPECTIONS/WIRE ROPE SLINGS/MMDDYY**

XII. Attachment 5

Minimum Inspection Requirements for Synthetic/Nylon Slings

Documented Inspection Requirements for Synthetic/Nylon Slings

Sling #: _____ Capacity (safe working load): _____ Length: _____

Sling #: _____ Capacity (safe working load): _____ Length: _____

Sling #: _____ Capacity (safe working load): _____ Length: _____

Sling #: _____ Capacity (safe working load): _____ Length: _____

Sling #: _____ Capacity (safe working load): _____ Length: _____

Equipment Name: _____

PERFORM the following pre-use inspections:
(Any unsatisfactory condition listed below is cause for rejection)

Sat	Unsat	
		Acid or Caustic burns
		Melting or charring
		Snags, punctures, tears, or cuts
		Broken or worn stitches
		Abnormal wear and wear or elongation exceeding manufacturer's recommendations
		Distortion or fittings/hardware
		Discoloration or rotting
		Excessive stretching or evidence of over-loading
		Powdered fiber between strands (unjacketed slings only)
		Manufacturer's tag is installed indicating rated load
		Hardened sling or stiffness in sling
		If applicable, One or both tell-tails is not visible or is less than ½ inch in length. Remove sling from service
		Lack of fiber-optic light transfer in sling models with the fiber-optic. Remove sling from service

Inspection Performed by: _____ Date: _____

If any unusual defects are detected during the inspection, CONTACT the Brieser Equipment Manager to ensure proper documentation and final disposition of the Sling.

ROUTING	**PERSONNEL MANAGER**	**Add to Scan**
	SCAN	**SAFETY/USER INSPECTIONS/SYNTHETIC SLINGS/MMDDYY**

XIII. Attachment 6

Minimum Inspection Requirements for General Rigging Hardware

Visually **INSPECT** Hooks for the following:

- Deformation
- Cracks
- Excessive throat opening / overloading.
- Twisting
- Safety Latch in place and operating correctly.
- Hook secure
- Hook rotates freely (where required)
- Excessive corrosion

Visually **INSPECT** Shackles for the following:

- Excessive wear of crown and pin
- Overloading
- Excessive pitting or corrosion
- Missing or illegible manufacturer's name or trademark and/or rated load identification
- Indications of heat damage including weld spatter or arc strikes
- Bent, twisted, distorted, stretched, elongated, cracked, or broken load bearing components.
- Excessive nicks or gouges
- A 10% reduction of the original or catalog dimension at any point around the body or pin
- Incomplete pin engagement
- Excessive thread damage
- Evidence of unauthorized welding
- Other conditions, including visible damage, which cause doubt as to the continued use of the shackle.

Visually **INSPECT** turnbuckles for the following:

- Cracks in the end fittings, especially at the neck of the shank
- Deformed end fittings
- Deformed and bent rods and bodies.
- Cracks and bends around the internally threaded portion
- Any signs of thread damage

Visually **INSPECT** Compression Hardware, Davit Lifting Eyebolts, Eyebolts, Rings, Links, and Swivels for the following: (All installed hardware must be removed and thoroughly inspected including the blind hole to the criteria below)

- Excessive wear
- Overloading
- Excessive pitting or corrosion
- Missing or illegible identification
- Indications of heat damage including weld spatter or arc strikes
- Bent, twisted, distorted, stretched, elongated, cracked, or broken load bearing components.
- Excessive nicks or gouges
- A 10% reduction of the original or catalog dimension at any point around the body or pin
- Excessive thread damage
- Evidence of unauthorized welding or modification
- For swivels / swivel hoist rings, lack of the ability to freely rotate or pivot when not loaded.
- For swivels, loose or missing nuts, bolts, cotter pins, snap rings, or other fasteners and retaining devices.
- For compression hardware
    - Unauthorized replacement components
    - Insufficient number of wire rope clips
    - Improperly tightened wire rope clips
    - Indications of damaged wire rope
    - Indications of wire rope slippage
    - Improper assembly
- Other conditions, including visible damage, which cause doubt as to continued use.

Visually **INSPECT** Special Rigging or Lifting Hardware for the following:

- Cracks
- Excessive wear
- Overloading
- Excessive corrosion

If any abnormal conditions / defects are found, then **CONTACT** the Brieser Equipment Manager for resolution prior to utilizing the equipment.

XIV. Attachment 7

Minimum Inspection Requirements for Mobile Cranes, Excavators & Backhoes[odk[h

NOTE: The mobile crane, excavator, and backhoe manufacturers' pre-use inspection checklist specific to the machine being used should be consulted for additional pre-use inspections. The following are minimum typical pre-use inspection attributes.

PERFORM the following pre-use inspections:

- **CHECK** control mechanisms for proper operation.
- **CHECK** all hydraulic hoses for leaks or damage, and particularly those which flex during normal crane operation.
- **CHECK** hydraulic system for proper fluid level.
- IF hydraulic fluid level is low, then ADD fluid approved in accordance with Station Lubricant Program and/or Manufacturer's recommendation.
- **CHECK** wire rope which will be used during crane operation for gross damage such as distortion, corrosion, broken strands, kinks, or any other unusual abnormalities.
- **CHECK** engine oil.
- **CHECK** radiator coolant level.
- **CHECK** tire pressure for proper inflation.
- **CHECK** fuel level. Fuel tank shall be at least half full. Fuel tank filler pipe shall be in such a position, or protected in such manner, as to not allow spill or overflow to run onto the engine, exhaust, or electrical equipment of any machine being fueled.
- Visually **INSPECT** general rigging hardware in accordance with *Attachment 6*.

If any abnormal conditions/defects are found, then **CONTACT** the Brieser Equipment Manager for resolution prior to utilizing the equipment.

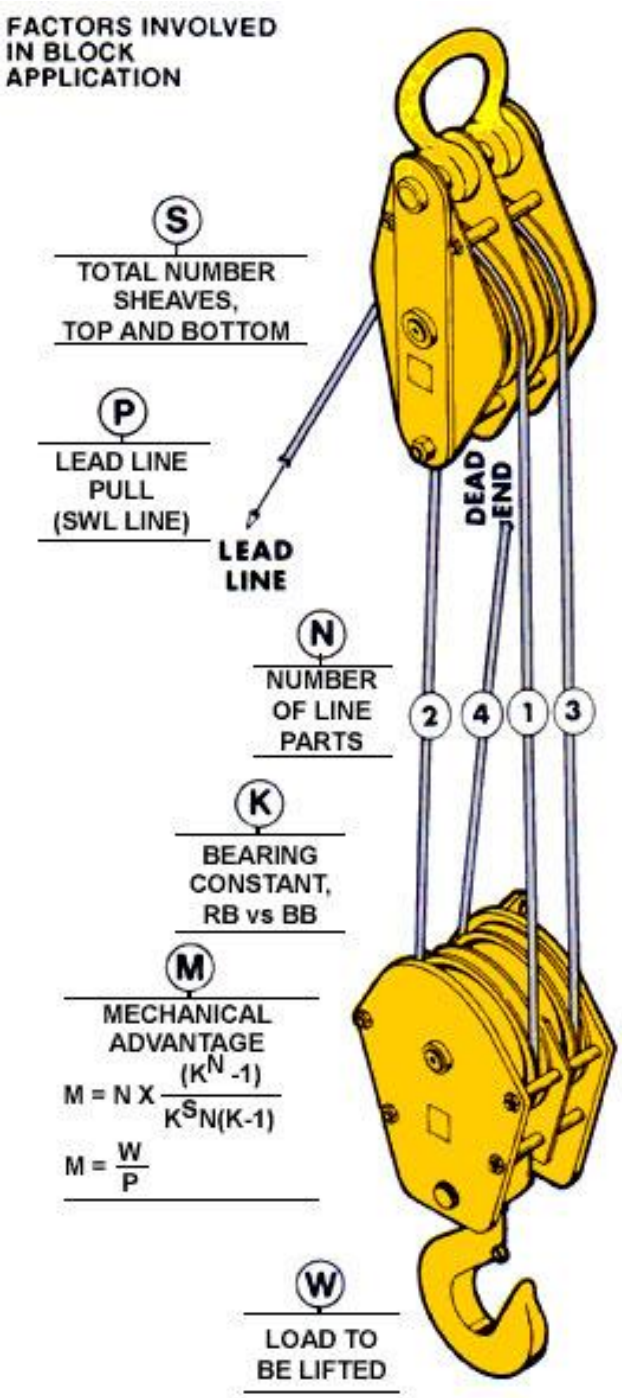
NOTE: Heavy equipment parked outside in cold weather may have an engine block heater connected. The engine block heater must be disconnected, and the engine allowed warming up at idle prior to increasing throttle position.

XV. Attachment 8

MOBILE CRANE/EXCAVATOR/BACKHOE PRE-LIFT CHECKLIST

Perform inspection on the following (as applicable):

Yes,	No	N/A	
			Has the travel path been walked down to identify obstructions and hazards?
			Has the minimum clear distance from power lines been verified by measurement (i.e., laser measuring device in lieu of eyeball estimate)?
			Are operations taking place at night? Install adequate lighting.
			Management Approval is required for night operations.
			Are the tires properly inflated?
			Is the fuel tank at least half full?
			Did you complete the equipment pre-use inspection checklist?
			Is the equipment properly grounded?
			Are all personnel clear of the swing radius?
			Are all the outriggers fully extended and level?
			Are you set up on safe ground?
			Do you have an accurate estimate for the weight of the load?
			Did you read and understand all notes on the load chart?
			Are you aware of what quadrants you can safely operate in?
			Have you identified your work radius according to the load chart?
			Do you have clear communications between the operator and the rigger?
			Is the designated Signal Person identified?
Excavator/Backhoe Only			
			Are approved lifting points being used?
			Lift capacity determination for the arm. Is the boom in its transport position?
			Lift capacity determination for the boom. Is the arm fully rotated outward?
Crane Only			
			Did you allow for the weight of the jib boom, hook block, crane cable, and the rigging?
			Are you reeved for the proper mechanical advantage?
			Is the counterweight fully extended and clear?
			Have you considered reduced crane capacity due to wind loading (wind velocity >20mph)?
			If used indoors, is the Fuel Selector Switch in PROPANE mode?


FACTORS INVOLVED IN BLOCK APPLICATION
S
TOTAL NUMBER SHEAVES, TOP AND BOTTOM
P
LEAD LINE PULL (SWL LINE)
LEAD LINE
DEAD END
N
NUMBER OF LINE PARTS
2
4
1
3
K
BEARING CONSTANT, RB vs BB
M
MECHANICAL ADVANTAGE
$M = N \times \frac{(K^N - 1)}{K^S N(K-1)}$
$M = \frac{W}{P}$
W
LOAD TO BE LIFTED

29CFR1926.1408-Power line safety (up to 350 kV) --equipment operations

Hazard assessments and precautions inside the work zone

Before beginning equipment operations, the employer must:

- Identify the work zone by either:
  - Demarcating boundaries (such as with flags, or a device such as a range limit device or range control warning device) and prohibiting the operator from operating the equipment past those boundaries, or
  - Defining the work zone as the area 360 degrees around the equipment, up to the equipment's maximum working radius.
- Determine if any part of the equipment, load line or load (including rigging and lifting accessories), if operated up to the equipment's maximum working radius in the work zone, could get closer than 20 feet to a power line. If so, the employer must meet the requirements in Option (1), Option (2), or Option (3) of this section, as follows:
  - Option (1) --Deenergize and ground. Confirm from the utility owner/operator that the power line has been deenergized and visibly grounded at the worksite.
  - Option (2) --20-foot clearance. Ensure that no part of the equipment, load line, or load (including rigging and lifting accessories), gets closer than 20 feet to the power line by implementing the measures specified in paragraph (b) of this section.
  - Option (3) --Table A clearance.

TABLE A—MINIMUM CLEARANCE DISTANCES

Voltage (nominal, kV, alternating current)	Minimum clearance distance (feet)
up to 50	10
over 50 to 200	15
over 200 to 350	20
over 350 to 500	25
over 500 to 750	35
over 750 to 1,000	45
over 1,000	(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

Note: *The value that follows "to" is up to and includes that value. For example, over 50 to 200 means up to and including 200kV.*

XVI. Attachment 9

Minimum Inspection Requirements for Monorail and Underhung Cranes with Integral Hoisting Mechanism

NOTE: The following inspection requirements apply to cranes whose end trunks operate on the bottom flange of a runway track section and to trolleys operating on monorail systems with integral hoisting mechanisms.

PERFORM the following pre-use inspections:

- Visually INSPECT hoist ropes for gross damage such as distortion of the rope, corrosion, broken strands, kinks, or any other unusual abnormalities.
- CHECK all load bearing components for apparent damage.
- Visually INSPECT lines, tanks, valves, pumps, and other parts of air or hydraulic systems for leaks.
- Visually INSPECT load chain for the following:
    - Stretch
    - Wear
    - Twists
    - Broken or damaged links
- Visually INSPECT general rigging hardware in accordance with Attachment 6.
- CHECK load chain for proper operation of chain and sprockets with special focus on the travel area of the chain.
- Functionally TEST to assure proper operation of, but not limited to, control systems, bridge travel, trolley travel, brake mechanisms and hoisting mechanisms.
- Functionally TEST all limit switches.

If any abnormal conditions / defects are found, then **CONTACT** the Brieser Equipment Manager for resolution prior to utilizing the equipment.

XVII. Attachment 10

Minimum Inspection Requirements for Monorail and Underhung Cranes without Integral Hoisting Mechanisms

NOTE: These inspection requirements apply to hoisting equipment whose end trunks operate on the bottom flange of a runway track section and to trolleys operating on monorail systems and do not have a hoisting mechanism as a permanent part of the system.

REFER TO *Attachment 2, 3, and 6* as appropriate for inspections requirements associated with hoists used with these type cranes.

If any abnormal conditions / defects are found, then **CONTACT** the Brieser Equipment Manager for resolution prior to utilizing the equipment.

XVIII. Attachment 11

Inspection Requirements for Padeye to Steel and Concrete Embedment's

PERFORM the following pre-use inspections:

- ✓ Visually **INSPECT** Padeye welds for obvious cracking.
- ✓ Visually **INSPECT** Padeye main body for indications of twisting or stretching.
- ✓ Visually **INSPECT** Padeye hole for indications elongation.
- ✓ If concrete embedment is used, then Visually INSPECT Padeye base bolts to ensure Padeye is solid and stable.

If any abnormal conditions / defects are found, then **CONTACT** the Brieser Equipment Manager for resolution prior to utilizing the equipment.

XIX. Attachment 12

Load Weight Chart and Calculating Load/Tension on Each Leg of a Sling

Load Weights - Calculating (6)

Materials and Liquids - Pounds / cu. ft.			
Aluminum	165	Iron Casting	450
Asbestos	153	Lead	708
Asphalt	81	Lumber - Fir	32
Brass	524	Lumber - Oak	62
Brick	120	Lumber - RR Ties	50
Bronze	534	Oil, Motor	58
Coal	56	Paper	58
Concrete, Reinf.	150	Portland Cement	94
Crushed Rock	95	River Sand	120
Diesel	52	Rubber	94
Dry Earth, Loose	75	Steel	480
Gasoline	45	Water	63
Glass	162	Zinc	437

Pounds / sq. ft.	
Steel plate	
• 1/8"	5
• 1/4"	10
• 1/2"	20
• 1"	40
Aluminum plate	
• 1/8"	1.75
• 1/4"	3.50
Lumber	
• 3/4" Fir	2
• 3/4" Oak	4

Pounds / gal.	
Gas	6.0
Diesel	7.0
Water	8.3

- 7.5 gallons of liquid to a cubic foot
- 27 cubic feet to a cubic yard
- 2,000 lbs = 1 U.S. ton

Formulas and Information

- H = Height • W = Width • L = Length • d = diameter • r = 1/2 diameter • π = 3.2 (approx.)
- Area of square or rectangle = LW • Vol. of cube = HWL • Area of circle = πr^2 • Circumference = π d
- The area of a circle is approx. 80% of its diameter squared (diameter x diameter)
- Load Weight (to estimate) ⟶ Volume in cu. ft. x 500 lbs. x density factor .02, .05, .10, .20, .30 etc.

THE ACTUAL LOAD MUST NOT EXCEED THE RATED SLING CAPACITY

As the horizontal angle between the legs of a sling decreases, the load on each leg increases. The effect is the same whether a single sling is used as a basket, or two slings are used with each in a straight pull, as with a 2-legged bridle. Load/ Tension on each leg of a sling may be calculated by

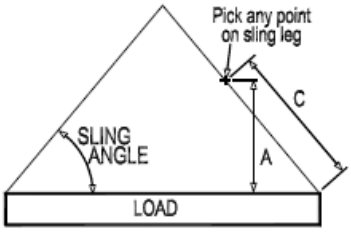
1. measuring length and height of a sling leg or
2. using the Leg Angle Load Factor as follows:

<u>Calculating the Load on Each Leg of a Sling by Measuring Length and Height of a Sling Leg:</u>

Determine tension/load on each sling by using the following formula.

A. Load/Tension on Sling Leg = $\frac{length\ C}{length\ A} \times share\ of\ load\ wt.$
   a. C = sling length
   b. A = Point on sling to load length
   c. C □ A = load factor

B. Share of Load Weight = $\frac{Load\ Weight}{Number\ of\ Legs}$



EXAMPLE:
C = 10', A = 8', Load Weight = 10,000#
Share of Load= $\frac{10{,}000}{2}$ = 5,000 lbs. each leg
Load/Tension on Sling Leg = $\frac{10}{8} \times 5000 = 1.25 \times 5000 = 6{,}250$ lbs. on each leg.

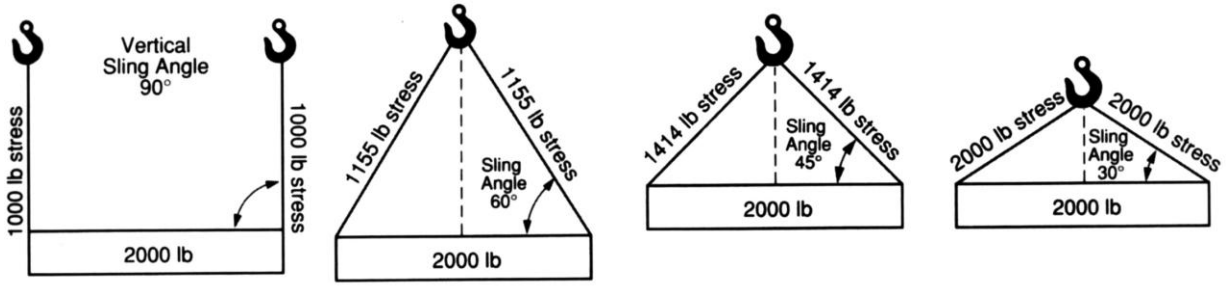
Calculating the Load on Each Leg of a Sling by Using the Leg Angle Load Factor:

Anytime pull is exerted at an angle on a leg or legs of a sling, the load per leg can be determined by using the data in the table at right. Proceed as follows to calculate this load and determine the rated capacity required of the sling, or slings, needed for a lift.

A. First, divide the total load to be lifted by the number of legs to be used. This provides the load per leg if the lift were being made with all legs lifting vertically.
B. Determine the horizontal angle.
C. Then **MULTIPLY** the load per leg (as computed in Step A above) by the Load Factor for the leg angle being used (from the table at right) to compute the **ACTUAL LOAD** on each leg for this lift and angle.

Load Factor Chart	
Leg Angle	Multiplier
90°	1.000
85°	1.003
80°	1.015
75°	1.035
70°	1.064
65°	1.103
60°	1.154
55°	1.220
50°	1.305
45°	1.414
40°	1.555
35°	1.743
30°	2.000

Example



XX. Attachment 13

Rigging and Lifting Plan Guidance

Conditions When a Rigging and Lifting Plan is Recommended

- The load weight & configuration (including all rigging components) exceeds 85% capacity of crane or rigging equipment.
- The load is "one of a kind" and critical to plant operations/ damage or destruction from the load would result in generation reduction or outage extension.
- The Sling Rating selected for lifting a load should be a minimum of 1.25 times the actual load weight to be lifted is greater than 25% due to the of the approved dynamic loading factor (1.25 x actual load weight = minimum rigging rating)
- The lift requires more than one crane (multiple-crane lift).
- The lift requires a mobile crane with outriggers that will be directly over underground piping or tunnels that could be damaged or collapse.
- The load is being moved horizontally with 2 or more hoists and the angle (at the loads highest position) of the load chain(s) are greater than 45 degrees from horizontal.
- The rigging used will have horizontal sling angles less than 30 degrees/ low headroom in location.
- The load will be lifted near energized power lines as defined in the Safety manual.
- The load is in a hazardous environment and or contains environmentally sensitive or controlled materials.
- Does the load have potential binding or interference fit & load cell usage is needed but not practical.
- Infrequently performed rigging activity or first-time evolution.
- Does the rigging evolution involve/include two or more work groups and have all the rigging equipment/hardware been inspected to verify free of defects and satisfactory for performing the required lifts. All vendor supplied equipment/hardware is required to be inspected and meet the requirements of this procedure.

The Rigging and Lifting Plan Checklist on the next page is optional and may be used as the rigging plan.

Rigging & Lifting Plan Guidance

Rigging & Lifting Plan Checklist

	Signalman & Single Point of Contact (qualified rigger) has been designated?
	Do you know how much the load weighs by calculation, drawing or markings? Weight =_____Lbs. Load cell required.
	Is the lift going to be near unprotected energized conductors, such as crane bus or electrical equipment, wires, etc.? – Robust barriers installed – Electrical lines protected or deenergized?
	Do you understand the load path?
	Has the load path been walked down for tag line requirements (for uncontrolled movement of loads) and obstructions or sharp objects that could damage slings?
	Have you inspected your rigging, verified load reductions, and is it satisfactory?
	Is the center of gravity known? Verify stability and capacity according to hitch type. (Vertical, Basket, Choke)
	Calculated for sling angle and de-rated the slings accordingly. Dynamic loading/additional stresses assessed.
	Is all rigging hardware selection adequate for the lift? Inspect periodically during lifting evolutions for signs of imminent failure.
	Does the load have any corners that require softeners / abrasion protection required? (Cornermax sling protection needed)?
	For inverted basket hitches, ensure sling attachment points are above the center of gravity
	Have you verified that nothing could shift when the load is lifted? (i.e., loaded gang box)
	Are the appropriate hand signals, if required, available at the job site? (OSHA standard)
	Has a safe lift zone been properly established and communicated.
	Safe set down contingency established? Cribbing available and inspected for set down.
	Are you aware that outdoor cranes shall be secured at wind speeds sustained 30 mph or above?
	Capacity is reduced approximately 45% when winds are sustained at 20 mph.
	Hoist ring usage – Torque per manufacturers specifications

Rigging & Lifting Plan Guidance

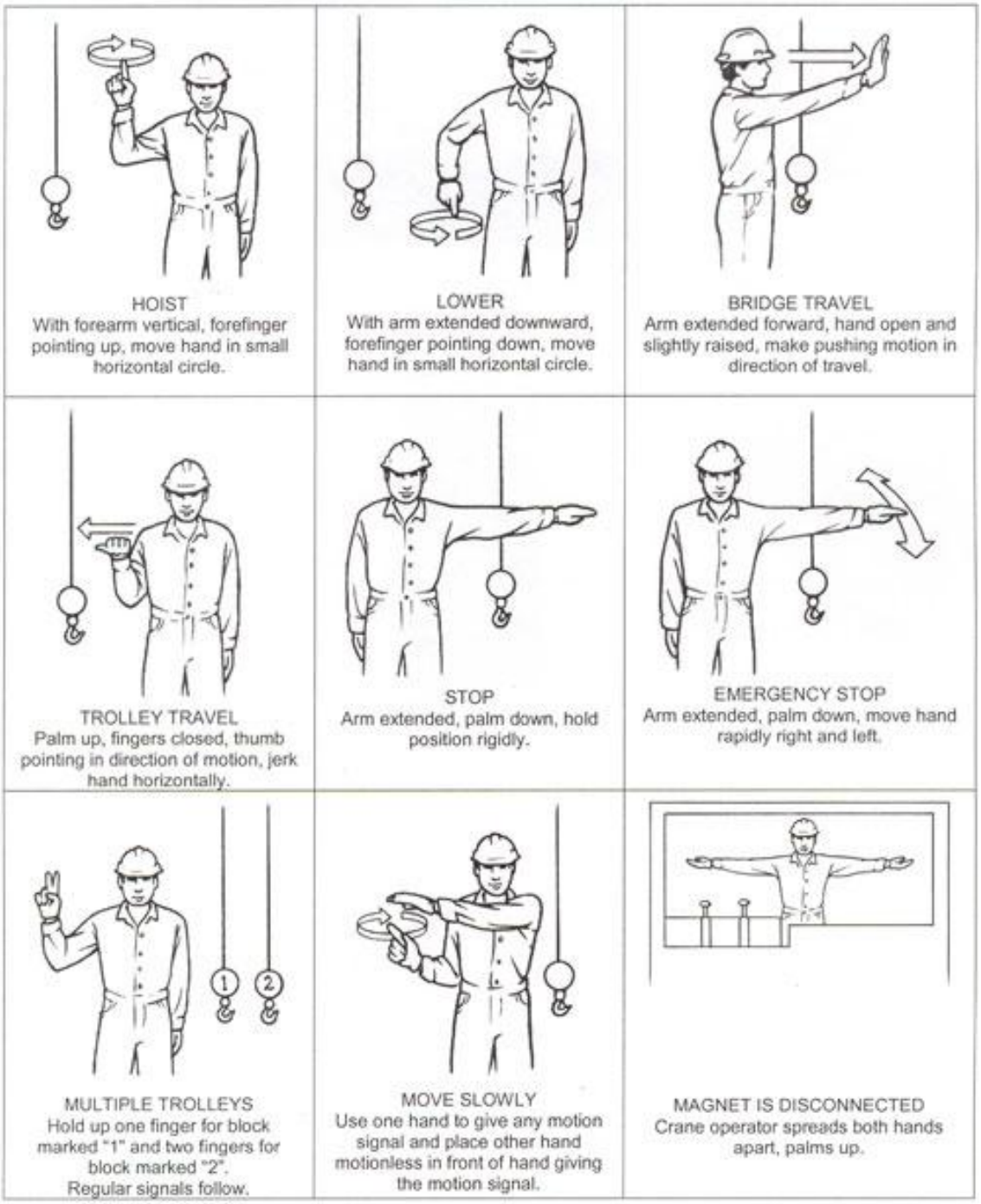
Rigging & Lifting Plan Checklist-Additional Items to Consider

- What is being lifted? _____
- Who is in charge of the lift? Is a competent rigger / Brieser oversight person required prior to moving the load? _____
- Shackle pins fully seated? – Eyebolts shouldered and adequate thread engagement?
- Does the rigging have appropriate identification? – Pre-use inspections completed?
- Does all rigging have adequate/known working load limits?
- Will there be any side or angular loading?
- Turnbuckles have at least full thread engagement?
- Will personnel be clear of suspended load? Safe lift zone established?
- Rigging attachment points approved for use, capacity, and visually inspected?
- Any unusual environmental concerns (weather, electrical wires, visibility, noise, high radiation areas, heat stress, etc.)? _____
- Will personnel be restricted from elevations below the load path?
- For Mobil Crane lifts see *attachment 8*.

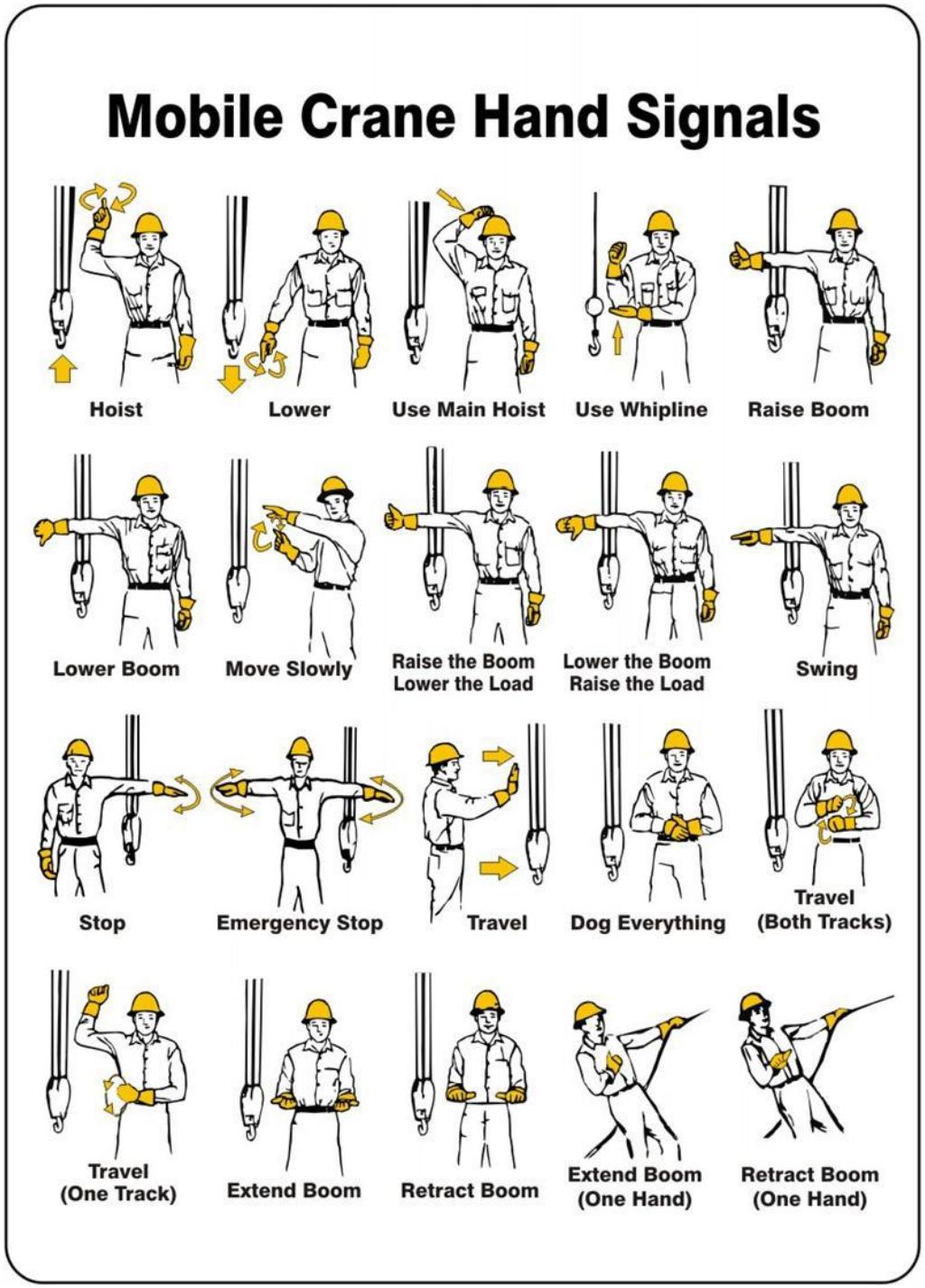
Brief description of lifting operation:

Checklist completion performed by:	Date:
Rigging Supervisor:	Date:

XXI. Attachment 14



XXII. Attachment 15



XXIII. Attachment 16

Description of Job _____

Job # _____ Location _____

Start Date _____ Expiration Date _____

Requirements

- The Job Hazard Analysis shall be attached to this authorization and will be posted at the site. Job Hazard Analysis includes (as applicable):
  - Height the load will be raised.
  - Potential swing of the load
  - Trip Hazards
  - Body Positioning
  - Explanation of how workers are not at risk of being struck by the load should rigging shift or fail.
  - Reasons why long handle tools and/or redundant rigging systems could not be used to eliminate the need for working under suspended load.
- A Pre-Job Brief shall be conducted with all workers prior to starting the activity and at the beginning of each subsequent shift.
- A Dedicated First Line Supervisor / Craft Labor supervisor (or designee) shall be assigned to the work activity and be in attendance until work activity is completed.

Name of Dedicated Supervisor

Authorization:

I have reviewed the attached Job Hazard Analysis and request for an exception from the normal prohibition against working on/under a suspended load and agree that this limited exception is warranted for the time frame listed above and the activities specified on the JHA.

The activity will be supervised by a dedicated First Line Supervisor/Craft Labor Supervisor (or designee) to ensure the work activity is limited to the described scope and all precautions and limitations documented in the Job Hazard Analysis are followed.

Submitted by Supervisor	Print Name	_____	Signature	_____	Date	_____
Concurrence (Safety or Designee)	Print Name	_____	Signature	_____	Date	_____
Approve (V.P. Operations)	Print Name	_____	Signature	_____	Date	_____

XXIV. Attachment 17

Observation Form for Rigging/Lifting Competency

Worker's Name _____ Date Observed _____

Worker's Signature _____ Worker's Trade _____

Brieser Lifting & Rigging Course Certification Date _____

Observer's Name _____ Observer's Title _____

Overall Observation Criteria SAT UNSAT

*****THE INTENT OF THIS FORM IS TO BE A PROFICIENCY OBSERVATION OF AN ACTUAL RIGGING/LIFTING ACTIVITY*****

P = Perform – Use of actual equipment to demonstrate performance.

S = Simulate – Create a realistic representation of task performance by simulating performance while explaining the task, expected responses, and required performance standards.

D = Discuss – Perform a thorough discussion of the task and required performance standards using procedures, drawing, photos, prints or other similar equipment. This option should only be used if lift equipment is not readily available.

SAT (Satisfactory) = Acceptable performance of all observable attributes

UNSAT (Unsatisfactory) = Unacceptable attributes are observed and mandates disqualification of RIGGING/LIFTING activities

	Performance Level	SAT	UNSAT
Make necessary calculations to determine the weight of an object.	P/D		
Determine what rigging is necessary and ensure that it is rated appropriately to perform the task.	P		
Following the rigging plan, discussed during the pre-job brief, set up the rigging. During set up activities the observer will focus on the proper pre-use inspection of all RIGGING/LIFTING equipment.	P		
Perform a pre-use inspection of the crane	P/S/D		

Observation Form for Rigging/Lifting Competency			
Attach the rigging to the hook and to the object to be lifted	P		
Using the proper hand signals, direct the lifting device to center the hook over the object to be lifted.	P/S/D		
Raise and level the load. Level may be verified visually if a level was not needed for criticality of the lift.	P/S/D		
Using proper hand signals, direct lifting device operator to raise, move, and stabilize the load.	P/S/D		
Prepare cribbing/blocking to set the load upon. Lower the load onto the cribbing/blocking and properly secure.	P/S/D		
Perform a transfer of the load. The load may be transferred from a stationary hoist to an overhead crane. The load may be transferred from the lifting device to a lay down area.	P/D		
Turn the lifted object over in a controlled manner	P/D		
Upright the lifted object in a controlled manner	P/D		
Lift the object, transfer it over an obstacle, then lower the object into a cart and secure it	P/D		
Proper use of guideline was utilized when required	P/D		
Stop a load swing and gain control within 5 moves	D		
Lower the load and remove all rigging	P		
All rigging equipment has been properly stored	P		

BRIESER CONSTRUCTION
SAFETY & HEALTH MANUAL
SECTION 33
LIFTING & RIGGING
SUB-SECTION TRAINING

Brieser Construction
Section 33 Test

Score: **%**

Employees Name:		**Date:**	
Company:		**Instructor:**	
		Job Title:	

Answer the following questions "True" or "False" by circling the appropriate letter.

T **F** 1. A Signalman should be clearly identifiable. Such as wearing a safety vest.

T **F** 2. A Dynamometer measures wind speed?

T **F** 3. Rated Capacity means: The manufacturers rated capacity. The maximum load which a piece of hoisting equipment is designed to safely carry.

T **F** 4. Rigging is the same as Material Handling?

T **F** 5. Fabrication or modification of rigging devices (tools), or special rigging and lifting equipment outside the control of the company engineering programs is not permitted?

T **F** 6. It is not necessary to obtain a record of approval stamped by the (customer) resident Engineer to be filed in the Brieser job if I am rigging from permanently installed plant system components at or associated supports (e.g., cable trays, cable tray supports, piping, snubbers)?

T **F** 7. Work shall NEVER be performed on or under a suspended load?

T **F** 8. Rigging shall be centered in hook?

T **F** 9. An illustration of the signals shall be provided at the job site?

T **F** 10. Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line, and it has been visibly grounded?

Brieser Construction
Section 33 Test

Answers

T	F	1. A Signalman should be clearly identifiable. Such as wearing a safety vest.
T	***F***	2. A Dynamometer measures wind speed? Pg. 6
T	F	3. Rated Capacity means: he manufacturers rated capacity. The maximum load which a piece of hoisting equipment is designed to safely carry.
T	**F**	4. Rigging is the same as Material Handling? Pg. 6 Definition
T	F	5. Fabrication or modification of rigging devices (tools), or special rigging and lifting equipment outside the control of the company engineering programs is not permitted?
T	***F***	6. It is not necessary to obtain a record of approval stamped by the (customer) resident Engineer to be filed in the Brieser job if I am rigging from permanently installed plant system components at or associated supports (e.g., cable trays, cable tray supports, piping, snubbers)? Pg.10
T	***F***	7. Work shall NEVER be performed on or under a suspended load. Pg. 10
T	F	8. Rigging shall be centered in hook?
T	F	9. An illustration of the signals shall be provided at the job site?
T	F	10. Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line, and it has been visibly grounded?