

LIFT & MOBILE EQUIPMENT



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1. INTRODUCTION

- a. As an employee of **H2 Enterprises, LLC (H2)**, you can be reasonably expected to participate in materials handling operations during your daily work routine. Some of these materials will be too heavy or bulky for individual or two-person movement and powered mobile lifting equipment will be needed for safe movement. Examples are forklifts, truck cranes, backhoes and sidebooms. Only trained, certified and authorized employees are ever allowed to operate this equipment. They are ultimately responsible for their own safety as well as the safety of their coworkers. By recognizing potential dangers and making correct decisions, you can help ensure the safety of yourself and those around you at the project site.
- b. **H2** shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all forklifts, cranes and derricks. 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. Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer.
Note: Modifications or additions which affect the safe operation of any equipment listed in this procedure may only be made with the manufacturer's written approval.

2. FORKLIFT EQUIPMENT PROVISIONS AND INSPECTION

- a. All authorized employees will be made aware of the forklift equipment provisions and their daily inspection and documentation requirements. An operational check will be conducted by each employee assigned to perform work utilizing a powered industrial fork-truck. Employees will ensure that all communication devices used to transmit signals are tested on site before beginning operations to ensure that the signal transmission are effective, clear and reliable.
- b. The Craft Foreman will be informed of any hazards found by the inspecting employee, which would render that equipment unsafe to operate. The equipment will be "tagged out of service" and the keys removed until authorized maintenance services correct the identified hazard(s). Items for inspection will include checking for the following:
 - i. secure overhead guard (roll cage)
 - ii. load engaging device (uneven forks or cracks in heel)
 - iii. mast cylinder hydraulics, attachment bolts and tight mast chains
 - iv. operational warning horn and backup alarm
 - v. legible capacity plate (load limit data plate)
 - vi. operational directional lighting (forward or reverse)
 - vii. efficient braking mechanisms (foot and hand-operated parking)

LIFT & MOBILE EQUIPMENT



Doc. Type:	Program	Effective Date:	5/1/2017
Section:	23	Revision Number:	02
Status:	Issued	Last Revised:	11/14/2018

- viii. tire conditions, secure lug nuts
- ix. fuel and power supply (connections, leaks, warning signals)
- x. directional movement controls (gears, clutch, inching)
- xi. tilt, lift and side-shift controls operability
- xii. steering maneuvers (tight, firm control)
- xiii. appropriate fluid levels (hydraulic, oil, brake, transmission, fuel)

3. **GENERAL OPERATING GUIDELINES**

- a. While operating a forklift at project right-of-ways, employees can expect to encounter many possible hazards, including rough and irregular driving surfaces, blind spots, vehicular traffic, pedestrian traffic and general work-site obstacles. Safe operating procedures must be adhered to by observing the following guidelines:
 - i. Always look in the direction you are traveling.
 - ii. Keep to the right whenever possible, never pass in an intersection.
 - iii. Always drive with a load only as high as necessary to clear ground obstacles.
 - iv. Arms and legs are never to be extended beyond the cab or sides of the vehicle or into the lift uprights. Safety glasses must be worn if equipment does not have enclosed cab. Seat-belts before starting and during operation of equipment.
 - v. Always keep an eye out for overhead obstructions, other vehicles, pedestrians, vision obstructions, non-standard driving surfaces, loose objects on the ground and changing environmental conditions.
 - vi. Avoid sudden starts and stops by always driving under control.
 - vii. Know the equipment load handling capacity and never exceed it, or utilize additional weight as a counterbalance.
(NOTE: You can determine weight loads by asking a Supervisor, more experienced coworkers, or checking the bill of lading or shipping manifest papers. DO NOT ATTEMPT to elevate the load to determine if the counterbalance is stable.)
 - viii. Determine the nature of your load, make sure it is secure and adjust the forks appropriately to fit the maximum width of the pallet or load.
 - ix. Always check vehicle clearance before you turn to make sure there is enough room to clear the forks and rear-sway of your vehicle.
 - x. Observe posted facility speed limits at all times.
 - xi. Always sound the horn when backing up or approaching pedestrians, other vehicles and at cross aisles or any time vision is obstructed.

LIFT & MOBILE EQUIPMENT



Doc. Type:	Program	Effective Date:	5/1/2017
Section:	23	Revision Number:	02
Status:	Issued	Last Revised:	11/14/2018

- xii. Maintain a “3-truck length” safe following distance from other trucks, and follow established driving lanes or routes as marked.
 - xiii. If your load is causing a vision obstruction, drive the vehicle backwards, or use the assistance of an assigned “spotter”.
 - xiv. Do not allow bystanders when stacking loads or when dealing with elevated loads.
 - xv. Riders are never allowed on your vehicle, in the cab or on the forks.
 - xvi. The lift truck is never approved for personnel lifting by the forks.
 - xvii. Never allow anyone to pass underneath the elevated portion of the truck, either loaded or unloaded.
 - xviii. Always secure your load against the load backrest, and lower it to a safe ground clearance before changing directional movement or turning.
 - xix. Drive defensively; pedestrians always have the right of way.
 - xx. When parking your vehicle, always come to a smooth gradual stop, set the parking brake, fully lower the forks, and place all directional controls in neutral. (You will be required to turn the vehicle off if you move to where the vehicle is not in your direct view or you will be further than 25 feet away from the vehicle.)
 - xxi. Unauthorized repair of lift trucks is a federal law violation, mechanical breakdowns must be reported and repairs made by authorized personnel.
 - xxii. Refueling and propane bottle exchange areas are designated as non- smoking areas.
 - xxiii. Stunt driving, horseplay and speeding will not be tolerated.
 - xxiv. When loading or unloading trucks, ensure the parking brake on the trailer is set and the wheels chocked to prevent movement, and the bed of the trailer is in satisfactory condition to receive an intended load.
- b. Understand that the previously mentioned items are general guidelines and safe operating rules to be followed at all times. However, this does not constitute a formal forklift operator training program. This training will consist of classroom instruction conducted by a safety professional to include: discussion, video presentation, course material review, written test and followed by a driving skills test performed on approved facility grounds. Successful completion of these course requirements will license the approved operator for an established time period. Certificates will be maintained in the employee's safety/training file.

4. INITIAL TRAINING

- a. Formal forklift training will consist of a review and understanding of:

LIFT & MOBILE EQUIPMENT



Doc. Type:	Program	Effective Date:	5/1/2017
Section:	23	Revision Number:	02
Status:	Issued	Last Revised:	11/14/2018

- i. Characteristics of the fork-truck(s) to be operated
- ii. Similarities to and differences from an automobile operation
- iii. Controls/instrumentation location, how they work, where they are
- iv. Power plant operation and maintenance
- v. Steering and maneuvering
- vi. Visibility
- vii. Fork or attachment adaptation, operation, limitations of use
- viii. Vehicle capacity
- ix. Vehicle stability
- x. Vehicle service brake and parking brake requirements
- xi. Vehicle inspection and maintenance
- xii. Refueling and recharging batteries
- xiii. Operational limitations
- xiv. Driving surfaces, ground conditions, obstacles
- xv. Load manipulation, stacking and unstacking
- xvi. Pedestrian traffic
- xvii. Potentially hazardous environmental operating conditions
- xviii. Ramps or sloped surface concerns on fork-truck stability
- xix. Operating in closed environments with insufficient ventilation
- xx. Narrow aisle and restricted place operation

5. DERRICKS

- a. The most common types of derricks used on job-sites are the A-frame, stiff-leg, and guy derrick, however, you may encounter a gin pole or breast derrick also. Inspection items should include proper bracing, guys, ropes, clearances, load ratings, and foundation support, as well as all operators should be trained in safe work standards for the operation of this equipment.
- b. Signed, documented monthly inspections of all ropes utilized shall be maintained by the host-facility employer or contract labor hired to operate this equipment, as well as documentation of an existing preventative maintenance program.
- c. The **A-frame derrick** has a frame of steel or timber shaped like the letter "A", and is erected in a vertical plane. It has a single leg or brace that extends from the top of the A at a 45 degree angle to the ground. The sills, or lowest part of the framework, tie this

LIFT & MOBILE EQUIPMENT



Doc. Type:	Program	Effective Date:	5/1/2017
Section:	23	Revision Number:	02
Status:	Issued	Last Revised:	11/14/2018

brace to the bottom of the A-frame. The boom is then hinged at the horizontal member of the A. The base of the A-frame and the rear brace must be firmly weighted down.

- d. The **Stiff-leg derrick** has a mast with two braces at a 90 degree angle to each other and at a 45 degree angle to the ground. Usually steel or timber sills tie the mast and braces together at the ground. Heavy weight is added onto the stiff legs to withstand uplift caused by heavy loading on the boom.
- e. The **Guy derrick** is used largely for erecting structural steel in buildings over 10 stories high that cannot be reached by the boom of a crawler crane. Such derricks are usually made of latticed steel-work with spaced wire-rope guys, each equipped with a turnbuckle and attached to the steel beams or columns on the current erection floor.
- f. If a **hoist engine** is utilized there is the danger of a loaded cable line “whipping” about and causing striking hazards, therefore, the horizontal cables between the hoist engine and the boom hinge shall be barricaded, and all workmen prohibited from crossing over or under them.
- g. The **Gin pole derrick** is simply a mast slightly out of plumb, with a hoisting tackle suspended from its upper end. The gin pole is supported by a number of guys, most of which are on the same side away from the load.

6. CRAWLER LOCOMOTIVE AND TRUCK CRANES

- a. The construction industry is able to perform lifting and placement tasks once thought to be inconceivable due to the sizes and load capacities of building components. However, along with this increased capacity comes increased risk of crane failure/worker injury-fatality incidence. Recent industry statistics show that up to 90% of mobile crane accidents are due to operator error. As a result, **H2** shall only allow authorized personnel who have been trained in safe work standards to operate this type of equipment on an assigned project site.
- b. Employees will ensure that all communication devices used to transmit signals are tested on site before beginning operations to ensure that the signal transmission are effective, clear and reliable.
- c. All crawler, truck, or locomotive cranes used by **H2** shall meet the applicable requirements for design, inspection, construction, testing, maintenance and operation as prescribed in the ANSI B30.5-1968, Safety Code for Crawler, Locomotive and Truck Cranes. **H2** shall request from the equipment owner a certification record which includes the date the crane items were inspected; the signature of the person who inspected the crane items; and a serial number, or other identifier, for the crane inspected.

i. Components

All mobile cranes have booms with load hoists and boom hoists. In most instances, the crane swings or rotates on a turntable, which rests on a railroad car, crawler, or wheel chassis that has outrigger support. Power is provided by electric motor, steam, gasoline, or diesel engine. Documented monthly inspection

LIFT & MOBILE EQUIPMENT



Doc. Type:	Program	Effective Date:	5/1/2017
Section:	23	Revision Number:	02
Status:	Issued	Last Revised:	11/14/2018

of this equipment is required by the employer/owner/lessee, and it includes critical items such as brakes, crane hooks, and ropes.

ii. Capacity

Every crane should have a capacity plate or a sign that indicates its safe- load capacity at various radii from the center pin of the turntable. A substantial, durable chart with clearly legible letters and figures indicating boom length, angle, and capacity shall be provided with each crane, and securely fastened to the crane cab in a location easily visible to the operator while seated at this control station. The total weight of the work-load must never exceed 50% of the rated capacity.

iii. Unsafe actions

A boom must never be swung too rapidly as the suspended load will be swung outward by centrifugal force, which could cause the crane to rock or even tip over. Do not permit makeshift methods of increasing capacity by adding counterweight or increasing stability by unauthorized means. High angle lifts can cause damage to the boom lattice structure causing premature failure of the boom components.

The operator must center the hook directly over the load to keep it from swinging while it is being lifted. Under no circumstances are employees to stand under a suspended load, or attempt to stop any spinning motion of a lifted object. The operator should lower the load to the ground to stop this dangerous motion.

iv. Safe actions

When lifting equipment is being used, all employees are required to maintain a safe distance during operations. This is to prevent personnel from being struck by a broken cable, a ruptured hydraulic hose, or the item shifting during movement. Only non-conductive tag- lines will be used to control loads. Employees are to ensure these lines are free and clear of any obstacle including themselves, before the signal is given to move the load.

If it is necessary to help guide a winch line onto a spool, a bar or similar tool shall be used instead of hands or feet. Winch lines should always be spooled properly on the drum and not allowed to crisscross. A pre-job safety meeting should be held prior to starting any job which requires the use of lifting equipment to make all employees aware of the general hazards.

A CO2 or minimum ABC-rated cab-mounted or accessible fire extinguisher shall be made available for the crane operator to control electrical component failure, sparks, and fire potentials due to refueling measures, or for escape from the cab enclosure.

LIFT & MOBILE EQUIPMENT



Doc. Type:	Program	Effective Date:	5/1/2017
Section:	23	Revision Number:	02
Status:	Issued	Last Revised:	11/14/2018

When operating near or under overhead power lines rated 50 kV. or below, the minimum clearance between the lines and any part of the crane or load shall be 10 feet.

v. Inspections

Monthly, documented, rated load tests are required to be performed by the operator, which describe the test procedure used as well as confirmation of any alterations or repairs that were performed to meet these established guidelines. Any ropes used or not in use due to storage are required to have a monthly documented inspection with certification to include the date and signature of the person performing the inspection.

Since **H2** rents all equipment of this type, we will ensure, through the equipment owner, that a thorough, annual inspection of the rented/leased hoisting machinery has been made by a competent person, or by a government or private agency recognized by the U.S. Department of Labor. **H2** shall ensure that the equipment owner maintains a record of the dates and results of inspections for each hoisting machine and piece of equipment.

vi. Ropes / Slings / Chains

The dominant characteristics of a sling are determined by the components of that sling, which can either be formed of chain, wire, rope, metal mesh, natural fiber rope, or synthetic web. Factors to consider for sling selection are the particular job size, weight, shape, temperature and sensitivity of the material to be moved. Wire rope is composed of individual wires that have been twisted to form strands, which are then twisted again to form a rope. Four characteristics should be considered when choosing a wire rope:

- Strength
- Ability to bend without distortion (fatigue)
- Ability to withstand abrasive wear
- Ability to withstand abuse

Strength - of a wire rope is a function of its size, grade, and construction. It must be sufficient to accommodate the applied maximum load. This limit is determined by means of an appropriate multiplier. This is the number by which the ultimate strength of a wire rope is divided to determine the working load limit.

For example, a wire rope sling with a strength of 10, 000 pounds and a total working load of 2,000 pounds, the multiplier is 5. New wire ropes have a design factor of 5, although as a sling suffers the rigors of continued use, the design factor and the ultimate strength are reduced. If a sling is loaded beyond its ultimate strength, it will fail posing a hazard to personnel and material.



LIFT & MOBILE EQUIPMENT



Doc. Type:	Program	Effective Date:	5/1/2017
Section:	23	Revision Number:	02
Status:	Issued	Last Revised:	11/14/2018

Fatigue - a wire rope must have the ability to withstand repeated bending without the wires failing from fatigue. This is often the result of small cracks developing in the wire from repeated applications of bending loads. It occurs when ropes make small radius bends. The best prevention of fatigue is to use blocking or padding to increase the radius of the bend.

Abrasive wear - the ability of a wire rope to withstand abrasion is determined by the size, number of wires, and construction of the rope. Smaller wires bend more easily so they offer greater flexibility, but they are able to withstand less abrasive wear. Larger wires of less flexible ropes are better able to withstand abrasion than the smaller wires.

Abuse - or misuse of wire rope will cause a wire rope sling to become unsafe long before any other factor. Serious structural damage to the wire rope such as kinking can occur with misuse, which reduces the strength of the sling. All wire rope slings will be inspected before each use and the results of the inspection will be documented and maintained in appropriate files. This information is to include the date of inspection, ID of the rope inspected, and the signature of the person performing the inspection.

Natural and synthetic fiber rope slings are made from conventional three-strand construction fiber rope or weaves of various synthetic (nylon) materials. The synthetic weaves now usually consist of a bright-colored interior fiber that when it shows, acts as an indicator that the sling is stressed beyond its capabilities and is to be removed from service and replaced. Any physical sign of deterioration will disqualify this sling from service. These devices also have a weight capacity tag or label that indicates maximum load capacities dependent upon the sling configuration, either in the form of a choker, basket, or straight-line.

Safe lifting practices include considering the following items:

- size, weight, and center of gravity of the load,
- the number of legs and sling angle with the horizontal
- the rated capacity of the sling
- the history and care/usage of the sling

If the crane hook/sling is not centered over the load, dangerous tilting can result as well as unequal stress in the different sling legs. As the angle formed by the sling leg and the horizontal line decreases, the rated capacity of the sling also decreases. Larger loads can be safely moved if the weight of the load is distributed to a greater number of slings. Under no circumstances shall a sling's rated capacity be exceeded. Operators will utilize cover saddles, forms of padding, wood blocking, and safe lifting procedures such as not overloading so as to prevent sharp bends and cutting edges.

LIFT & MOBILE EQUIPMENT



Doc. Type:	Program	Effective Date:	5/1/2017
Section:	23	Revision Number:	02
Status:	Issued	Last Revised:	11/14/2018

vii. Electrical Hazards

When performing work around electrical power lines, extreme caution must be exercised at all times. The rules and regulations of Standard CFR1910.333 shall be followed. This states that the lines shall either be de-energized or grounded, or other protective measures will be provided before the work is to start. (See details in the Electrical Safety Program found in this manual.)

7. OVERHEAD & GANTRY CRANES

- a. Various styles, models, and types of hoisting apparatus are provided at some job-sites for any employee trained in the safe work standards, who may be required to raise, lower, position or transport heavy loads for limited distances. They may be operated by hand, hydraulics, air, or electricity, and can vary in design and capacity. Proper inspection by any operating employee is required of this equipment before engaging any load.

8. GENERAL SAFE OPERATING GUIDELINES

- a. All employees authorized to use hoisting equipment will be trained by sufficient means to demonstrate competency in safe handling operations of this equipment.
- b. The operator is will be a designated competent person and shall inspect all machinery and equipment prior to each use, and during use, to make sure it is in safe operating condition. Any deficiencies shall be repaired, or defective parts replaced, before continued use.
- c. Hand signals to crane and derrick operators shall be those prescribed by the applicable ANSI standard for the type of crane in use. An illustration of the signals shall be posted at the job site.
- d. Only one person shall give signals to a crane at a time, unless the emergency stop signal is given due to safety issues.
- e. When operating an overhead hoist, care will be taken to avoid injury to the operator, other workers, and equipment nearby. Therefore, all personnel must stay out from under loads being raised by the hoist, and all obstructions removed to facilitate free-travel of the load.
- f. Hoists must be directly over the center of gravity of a load before it is to be picked up. This will prevent swinging of the load and over- stressing of the hoist parts and supports.
- g. Maneuver the boom/beam/jib/rail into proper position by moving the chain of the hoist, remembering to never pull on the line to assist in any movement.
- h. A suspended load may never be left unattended by an operator.
- i. Never exceed the rated capacity listed on the side of the hoisting equipment cover. (A higher rated value may be observed as bold, block-style, printed letters and numbers

LIFT & MOBILE EQUIPMENT



Doc. Type:	Program	Effective Date:	5/1/2017
Section:	23	Revision Number:	02
Status:	Issued	Last Revised:	11/14/2018

located on the boom/jib/beam/rail, but still never exceed the hoist or draw-works rated capacity.)

- i. EXCEPTION: The rated capacity may be exceeded by no more than 125% only during a monthly documented load test of this equipment.
- j. If the hoist equipment stalls out while under load it is probably due to the operator exceeding the rated capacity, or an electronic failure. Know the rated capacity of your load before attempting to lift it, and/or tag-equipment out-of-service if failure is experienced.
- k. Service, maintenance and repairs are to be performed by authorized, certified personnel only. A preventative maintenance program has been established according to the manufacturer's recommendations.
- l. It is prohibited to use chains or rope slings that are kinked or twisted, or to use the hoist rope or chain wrapped around the load as a substitute for a sling.
- m. Hoists must never be used to lift, support, or transport personnel.
- n. **H2** employees shall not operate combustion engine equipment in enclosed spaces where toxic gases or an oxygen deficient atmosphere could become a hazard.

9. EQUIPMENT INSPECTION

- a. Overhead hoisting equipment is notorious for its high maintenance due to the intended loads to be lifted; therefore, operators are required to inspect this equipment prior to use. Any and all deficiencies are to be noted on the included inspection form, and will render this equipment unable to be used by any personnel. It should be tagged out-of-service and reported to the Craft Foreman as soon as practical for corrective action to begin.
- b. Observe the following items:
 - i. Inspect the load hook for excessive wear, (not to exceed 15% of the normal throat opening or more than 10 degrees twist from the plane of the unbent hook), mis-shaped curvature, stress cracks, and a fully- functional, spring-loaded latch hook that is centered in alignment with the hook. (Include the hook serial number, date of inspection, and signature of inspecting person.)
 - ii. Chains must be "Grade - A" metal, with no kinks, twists, distorted/stretched links, flat spots or excessive wear (including all end connections) that exceeds the following guidelines:

Chain Size, (in inches)	Minimum allowable chain size (in.)
1/4	13/64
3/8	19/64
1/2	25/64

LIFT & MOBILE EQUIPMENT



Doc. Type:	Program	Effective Date:	5/1/2017
Section:	23	Revision Number:	02
Status:	Issued	Last Revised:	11/14/2018

5/8	31/64
3/4	19/32
7/8	45/64
1	13/16
1-1/8	29/32
1-1/4	1
1-3/8	1 3/32
1-1/2	1 3/16

All included running ropes will be inspected also, with certification records to be maintained and to include the date of inspection and the signature of the inspecting person.

- iii. The upper and lower limit switch of each hoist shall be tried out under no load. The block shall be “inched” into the limit at slow speed. If the switch does not operate properly, notify your Foreman immediately and tag this equipment “out of service”.
- iv. Check to see if the rated load capacity of the hoist is legibly marked and visible to the operator.
- v. Inspect the directional controls of the hoist to see if they are plainly marked to indicate their designated functions, and test them to determine that they function properly. They should be grounded and no damage observed to the protective covering.
- vi. Observe that all guards or devices installed on the hoist will assure that hoist chains will be maintained in the sheave grooves. There shall be a minimum of 2 full wraps of hoist chain on the drum at all times.
- vii. Inspect the hook and pin on the trolley that supports the hoist/block/draw-works for wear, tear, cracks and deformities.
- viii. Roll the wheels of the trolley along the beam/jib/boom/rail; the bearings should allow for smooth movement, and no slack or slop. It should stay in place and not coast further when your directional movement stops.
- ix. Slide the trolley to the end of the beam/jib/boom/rail to make contact with the stop at the end which shall not fail.
- x. Rotate the boom/jib/beam/rail to its fully intended radius in its assigned work area, making sure the pivot pin is secure and no obstructions are encountered during movement.

LIFT & MOBILE EQUIPMENT



Doc. Type:	Program	Effective Date:	5/1/2017
Section:	23	Revision Number:	02
Status:	Issued	Last Revised:	11/14/2018

If items are found to not be in compliance with the above mentioned directives, this failed equipment shall be tagged “out of service” or have a “Out Of Order” sign placed on it, until the needed repairs have been completed.

10. CONCLUSION

- a. Mobile lifting equipment accidents can cause tremendous damage to people and property. Much of this damage potential results from the approximate tons of combined equipment and load mass weights. If you run into physical structures, other personnel or product, extensive damage is likely to occur. Even though property is replaceable, your coworkers are not! Product damage or injuries are to be reported immediately to the Project Safety Coordinator or your Craft Foreman.
- b. It is the intent of **H2** to eliminate, or at the very least, minimize all accident potentials by requiring all forklift, crane, derrick and overhead equipment operators to complete any and all required training, and at all times to perform in a safe operating manner while using powered industrial lifting equipment. Use extreme caution and be alert to changing conditions or situations as they present themselves.
- c. Non-compliance by any **H2** employee, with any part of this described program will result in disciplinary action as outlined in the Company’s Corrective Action and Disciplinary Program found in this manual.