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DUKE ENERGY NUCLEAR

MATERIAL HANDLING PROGRAM

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Material Handling Program Administrator

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1.0 MATERIAL HANDLING PROGRAM

1.1 Overview

Material handling may be defined as any activity whereby materials, parts, or supplies are carried, pushed, pulled, stacked, or tiered by the use of specialized equipment. The scope of equipment covered by these material handling guidelines includes forklifts, forklift attachments, pallet trucks, stackers, industrial trucks, hand trucks, scissor-lifts, rope and pulley systems, and lifting jacks. Material handling equipment may be manually operated or powered by electric motors or internal combustion engines. Excluded from the scope of these guidelines are vehicles and equipment used for earth moving and over-the-road hauling, railroad cars, building or mobile cranes, and equipment used for suspended loads.

1.2 Purpose

The purpose of the Material Handling Program is:

- To establish requirements for ensuring that material handling equipment used to stage or move non-suspended material is properly selected, inspected, and maintained.
- To minimize the potential for injury to personnel.
- To significantly reduce the potential for damage to equipment and material.
- To prevent accidents that could have the potential to release radioactivity.
- To provide oversight personnel with the level of knowledge to identify and correct problems with material handling activities.
- To provide requirements and controls for the purchase of material handling equipment.

1.3 Scope

This procedure applies to all employees, including contractors that are involved in the storage, requisitioning, inspection, or use of material handling equipment and hardware.
This program is applicable to all Duke Energy Nuclear site locations.

1.4 Material Handling in the Nuclear Power Industry

Although the majority of the material handling activities at nuclear power plant sites is similar to the material handling activities in many other industries, there are several unique differences that set material handling operations in the nuclear power industry apart.

1.4.1 Radiological Hazards

Periodically, material handling activities at nuclear power plant sites involve the movement and storage of radioactive materials and radiologically contaminated equipment. Handling of these items requires special training, procedures, barriers, and protective equipment to prevent the inadvertent release of radionuclides into the surrounding environment, and to prevent excessive exposure to ionizing radiation by plant personnel. There are also necessary security measures to prevent access to these items by unauthorized personnel.

1.4.2 Proximity of Critical Systems and Equipment

Material handling activities at nuclear power stations often involve the operation of lift trucks in the vicinity of equipment, piping, motor control centers, and high-voltage electrical conduits critical for the safe operation and emergency shutdown capabilities of the plant. Additionally, many of these same items, such as high-voltage cables and steam lines, pose deadly hazards to the forklift operator as well. Extreme caution needs to be taken to prevent any potential collisions between the material handling equipment and its loads with any of these critical systems and hazardous pieces of equipment. Under these conditions, the use of measures such as protective barriers, spotting personnel, warning signs, specialized operator training, and pre-job briefings is required to ensure that accidents do not occur.
Be especially mindful of overhead clearance requirements. Many forklifts have telescoping masts that rise simultaneously with the forks and carriage. When establishing the minimum required overhead clearance for a safe load path, be sure to measure the height of the forklift with the forks raised to the maximum estimated amount needed to pick up and move the load.

1.5 Material Handling Program Training Courses

Training courses shall be developed and used for training individuals to safely and correctly use material handling equipment. Training courses may be repeated at management's discretion based on proficiency of the individual. Material handling training courses and requirements are listed in the table below.

Course Name	Course Code	Description
Generic Material Handling	NANTeL 1505	The Generic Material Handling course provides awareness of the general risks and hazards associated with material handling of non-suspended loads. The level of training provided in this course is intended to meet knowledge requirements identified in SOER 06-1 for common material handling activities. However, this training does not qualify individuals to perform activities outside station procedures and programs.
Forklift Initial Operator	HS0100	This 'initial' course is designed to teach employees how to operate a forklift in a safe and efficient manner. This course will cover information on the four fundamental factors of safe and efficient forklift operation. These areas involve the driver, the forklift, the load to be moved and the environment in which the forklift is to be operated. This course is designed to increase the awareness of the forklift operator in each of these areas through the use of videotapes, group discussion, forklift inspection and practical exercises using the forklift at your location.
Forklift Performance Evaluation	HS0900	According to OSHA regulations, all current forklift operators shall be evaluated for his/her ability to operate a forklift safely and efficiently. This operator ability is demonstrated through a series of practical exercises which are planned as a separate event or through direct observation of on-

		the–job performance. For new operators, this evaluation is only a part of the required training prior to operating a forklift. For experienced/trained forklift operators, this evaluation is required to be performed every **three years**.
Order Picker Initial Operator	HS0901	This 'initial' course is designed to teach employees how to operate an order picker in a safe and efficient manner. This course will cover information on the four fundamental factors of safe and efficient order picker operation. These areas involve the driver, the forklift, the load to be moved and the environment in which the order picker is to be operated. This course is designed to increase the awareness of the order picker operator in each of these areas through the use of videotapes, group discussion, order picker inspection and practical exercises using the order picker at your location.
Order Picker Performance Evaluation	HS0911	According to OSHA regulations, all current order picker operators shall be evaluated for his/her ability to operate an order picker safely and efficiently. This operator ability is demonstrated through a series of practical exercises which are planned as a separate event or through direct observation of on-the–job performance. For new operators, this evaluation is only a part of the required training prior to operating an order picker. For experienced/trained order picker operators, this evaluation is required to be performed every **three years**.
Telescopic Handler Initial Operator	HS0903	This 'initial' course is designed to teach employees how to operate a telescopic handler in a safe and efficient manner. This course will cover information on the four fundamental factors of safe and efficient telescopic handler operation. These areas involve the driver, the telescopic handler, the load to be moved and the environment in which the telescopic handler is to be operated. This course is designed to increase the awareness of the telescopic handler operator in each of these areas through the use of videotapes, group discussion, telescopic handler inspection and practical exercises using the forklift at your location.
Telescopic Handler Performance Evaluation	HS0913	According to OSHA regulations, all current telescopic handler operators shall be evaluated for his/her ability to operate a telescopic handler safely and efficiently. This operator ability is demonstrated through a series of practical exercises which are planned as a separate event or through direct observation of on-the–job performance. For new operators, this evaluation is only a part of the required training prior to operating a telescopic handler. For experienced/trained telescopic handler operators, this evaluation is required to be performed every **three years**.
Motorized Pallet Truck Initial Operator	HS0927	This 'initial' course is designed to teach employees how to operate a motorized pallet truck in a safe and efficient manner. This course will cover information on the fundamental factors of safe and efficient motorized pallet truck operation. This course is designed to increase the awareness of the motorized pallet truck operator through the use of videotapes, group discussion, motorized pallet truck inspection and practical exercises using the motorized pallet truck at your location.
Motorized Pallet Truck Performance Evaluation	HS0928	According to OSHA regulations, all current motorized pallet truck operators shall be evaluated for his/her ability to operate a motorized pallet truck safely and efficiently. This operator ability is demonstrated through a series of practical exercises which are planned as a separate event or through direct observation of on-the–job performance. For new operators, this evaluation is only a part of the required training prior to operating a motorized pallet truck. For experienced/trained motorized pallet truck operators, this evaluation is required to be performed every **three years**.

1.6 Applicable Regulations and Standards

ANSI / UL 558-1991, “Standards for Safety for Internal Combustion Engine Powered Industrial Trucks.”

ANSI / UL 583-1991, “Standards for Safety for Electric-Battery Powered Industrial Lift Trucks.”

ASME B30.1, “Jacks.”

ASME B30.23, “Personnel Lifting Systems.”

ASME B56.1, “Safety Standard for Low Lift and High Lift Trucks.”

OSHA 1910.176, OSHA, “Handling Material.”

OSHA 1910.178, “Powered Industrial Trucks.”

OSHA 1926.602 (c) and (d), “Material Handling Equipment.”

1.7 Reference Materials

OSHA 2236-Materials Handling and Storage
US Department of Labor
61 Forsyth St SW, Room 6T50
Atlanta, GA 30303

EPRI-Material Handling Application Guide
Electric Power Research Institute
1300 West WT Harris Blvd
Charlotte, NC 28262

2.0 MATERIAL HANDLING PROGRAM STRUCTURE AND RESPONSIBILITIES

The Material Handling Program consists of the Program Administration, Program Owners, Managers, Supervisors of Teams with Material Handling Tasks, Support Groups and Users.

2.1 Material Handling Program Administration Responsibilities

The Material Handling Program is managed by a team consisting of:

- Duke Energy Nuclear Material Handling Program Administrator
- Maintenance Lifting Coordinator from each nuclear plant
- Any other interested parties as appropriate including supply chain personnel, Fossil-Hydro plant lifting contacts, and Fleet Services contacts.
- Site Services distribution supervisor

The team manages the Material Handling Program, ensures consistent implementation and adherence, measures the program's effectiveness, evaluates safe material handling practices, solicits user comments and feedback, and revises, updates, and distributes the Material Handling Program Manual.

2.1.1 Material Handling Program Administrator Responsibilities

Safety Professional or Subject Matter Expert (SME) who provides guidance and support and assures the following:

- Distribution of all new/updated OSHA Regulations.
- Evaluates user concerns or feedback regarding the Material Handling Program requirements.
- Ensures material handling equipment, inspection and operating parameters are current.
- Ensures Lifting and Material Handling Coordinators and other interested parties communicate periodically.
  Establishes criteria for consistent inspection, testing and operation for all material handling equipment.

2.1.2 Maintenance Lifting Coordinator Responsibilities

The Lifting Coordinator shall be the single point contact for material handling needs and shall coordinate with maintenance groups to ensure that responsibilities assigned to maintenance groups are performed. The Lifting Coordinator is responsible for:

- Shall own and take responsibility for all rigging, lifting and material handling activities performed on site.
- Shall know the purpose, scope and requirements of the Duke Energy Nuclear Lifting Program.
- Shall be the site's lifting program subject matter expert (SME) and the single point of contact for all questions, issues or concerns related to the Duke Energy Nuclear Lifting Program.
- Ensure that all rigging, lifting and material handling activities are performed in compliance with the Duke Energy Nuclear Lifting Program and the Safe Work Practices Manual.
- Shall be knowledgeable of and provide interpretations of all the OSHA codes and ANSI/ASME standards listed in Sections 1.5 and 1.6 of the Duke Energy Nuclear Lifting Program.
- Shall stay abreast of any new changes to the applicable OSHA codes and ANSI/ASME standards.
- Shall, when requested to do so, provide technical support in lift plan development and the execution of lifts to all personnel who perform rigging, lifting or material handling activities on site.
- Shall be the site's representative and take an active role on the Duke Energy Nuclear Rigging and Lifting Continuous Improvement Team (CIT)
- Shall work closely with the Lifting Program Administrator to determine any new revisions needed to the Duke Energy Nuclear Lifting Program Manual or to implement and new programmatic changes at the site.
- Shall work closely with and support the site Lifting Coordinator, Management, Training and other support groups to perform the duties and responsibilities described is section 2 of the Duke Energy Nuclear Lifting Program.
- Shall interface and communicate with other industry peers to share lessons learned and best practices.
- Shall represent the site during site INPO/WANO evaluations and assessments.

- Shall use the Problem Investigation Process (PIP) to address and correct any rigging, lifting and material handling problems, issues, concerns and events.

2.1.3 Manager Responsibilities

Management of individuals who perform material handling tasks have the responsibility to:

- Understand and support the Material Handling Program Processes
- Ensure adherence to the Material Handling Program requirements, responsibilities and processes
- Ensure financial and individual resources are allocated to maintain quality material handling equipment and development and training of individuals to support business needs
- Encourage individuals to provide feedback to identify concerns and personal skills needed to perform material handling tasks
- Follow-up on Lifting Program concerns
- Ensure vendor and non-site individuals are qualified to perform lifting tasks and participate in lifting activities before being assigned to teams with lifting tasks
- Ensure "Continuing Education" is developed, incorporated and implemented
- Ensure material handling equipment inspection, testing, operation and maintenance are performed in accordance with Material Handling Program Requirements
- Ensure accidents and near misses are reported/investigated using the Incident Investigation Process when material handling equipment is involved
- Ensure Material Handling Program effectiveness evaluations are performed

2.1.4 Managers of Teams with Material Handling Tasks

Management individuals (Supervisor/Team Leader to the Maintenance Manager/Service Manger or equivalent) are responsible for activities that include material handling tasks.

Supervisors are to:

- Understand and support the Material Handling Program Processes
- Ensure adherence to the Material Handling Program requirements, responsibilities and processes
- Encourage individuals to provide feedback to identify concerns and personal skills needed to perform material handling tasks
- Follow-up on Material Handling Program concerns
- Ensure vendor and non-site individuals are qualified to perform material handling tasks
- Ensure "Continuing Education" is developed, communicated and implemented

- Ensure material handling equipment inspection, testing, operation and maintenance are performed in accordance with Material Handling Program Requirements
- Ensure individuals are qualified and proficient for material handling tasks
- Ensure that reported material handling equipment discrepancies are resolved
- Ensure Material Handling Checklist is utilized in the performance of material handling tasks (Appendix 4 of the Integrated Process Guide).
- Ensure material handling equipment that does not comply with current standards or inspection criteria is evaluated, discrepancies identified and corrective actions developed or equipment is removed from service
- Ensure accidents and near misses involving material handling equipment are reported and documented using the Incident Investigation Process
- Review Material Handling Program for improvements and forward comments to the Maintenance Lifting Coordinators

2.1.5 Site Services Distribution Supervisor

Site Services Distribution Supervisor is responsible for activities that include material handling tasks.

- Understand and support the Material Handling Program Processes
- Ensure adherence to the Material Handling Program requirements, responsibilities and processes
- Encourage individuals to provide feedback to identify concerns and personal skills needed to perform material handling tasks
- Follow-up on Material Handling Program concerns
- Ensure vendor and non-site individuals are qualified to perform material handling tasks
- Ensure “Continuing Education” is developed, communicated and implemented
- Ensure material handling equipment inspection, testing, operation and maintenance are performed in accordance with Material Handling Program Requirements
- Ensure individuals are qualified and proficient for material handling tasks
- Ensure that reported material handling equipment discrepancies are resolved
- Ensure Material Handling Checklist is utilized in the performance of material handling tasks (Appendix 4 of the Integrated Process Guide).
- Ensure material handling equipment that does not comply with current standards or inspection criteria is evaluated, discrepancies identified and corrective actions developed or equipment is removed from service
- Ensure accidents and near misses involving material handling equipment are reported and documented using the Incident Investigation Process
- Review Material Handling Program for improvements and forward comments to the Maintenance Lifting Coordinators

2.1.6 Non-Powered Material Handling Equipment Operators

Personnel performing material handling activities will adhere to the following:

- Be approved to perform materials handling activities by their supervisor.
- Have demonstrated proficiency in the use of material handling equipment as observed by the supervisor.
- Provide instruction for teammates.
- Use the appropriate procedures and other reference documents, as needed.
- Obtain weight and center of gravity of the load by drawings, engineering, or conservative estimating, as appropriate.
- Understand limits of the equipment and ensure that limits are not exceeded.
- Use material handling equipment within its design capabilities and features.
- Determine and understand the specific requirements for material handling in specific or local surroundings (environment, site procedures, and unique characteristics).
- Ensure clear movement path for material handling equipment (carts, dollies, pallet jacks, hand trucks, etc.).
- Determine appropriate lifting points for materials that will provide the best stability and not damage the load.
- Ensure compliance with Material Handling Program requirements for the task(s) being performed and the equipment being utilized.

2.1.7 Powered Material Handling Equipment Operators

- Maintain current certification on the equipment being operated.
- Understand the operating functions and limitations of the equipment.
- Perform a preoperational inspection to determine the operating condition of the equipment.
- Stop or do not commence material handling activities when there is a concern relative to the safety of the activity. The responsible supervisor will be notified if the concern cannot be resolved or corrected by the equipment operator or material handling personnel.
- Ensure that equipment operations are followed in accordance with all applicable safety procedures and the requirements established by the material handling program.
- Ensure the material to be moved is within the rated capacity of the equipment used.
- Obtain the weight and center of gravity of the load by drawings, engineering, or conservative estimating, as appropriate.
- Maintain communication with the signal person (if applicable). Ensure that standard hand signals are used unless voice communication equipment is used. Signals will be visible or audible to the equipment operator at all times.
- Verify that preoperational inspection documentation is posted within view of the equipment operator’s position.
- Request work assignments to stay proficient.

- Provide instruction for equipment operator trainees during the training process.
- Review the equipment manufacturer's operator manual and become familiar with the operating features of the equipment prior to operating.
- Review unique equipment operating characteristics.

2.1.8 Spotter Responsibilities

Spotter Responsibilities when moving or transporting loads:

The spotter shall be utilized when:

- Backing equipment were there is no direct line of sight for the operator
- Working in a congested area where contact with other equipment, materials, structures or components may occur
- Working in an area that contains any sensitive equipment
- The equipment operator does not have a clear view of the load or travel path

The spotter (where utilized) shall be responsible for:

- Watching the separation between the load and any interference or unsafe condition that may impede load
- Ensuring there is a clear travel path
- Communicating with the flagger/crane or equipment operator through a pre-determined means of communication (i.e., had or voice communications)
- Stopping load movements at any point where the load cannot be moved/transported safely.

2.1 Material Handling Program Administration Responsibilities

2.2.1 Material Handling

Material handling is defined as the movement of non-suspended loads using of forklifts, carts, rope, and pulley systems that transport material directly related to nuclear power plant operations.

2.2.2 Common Loads

Common loads are loads that:

- Have a known center of gravity
- Can be easily balanced and secured to the material handling device
- Do not pose a risk of tipping over

2.2.3 Complex Loads

Complex loads are loads that:

- The vertical center of gravity is higher than the horizontal base/wheel dimensions of the material handling device
- The center of gravity is unknown
- Are difficult to handle, balance and/or secure
- Require specialized equipment to transport the load

Complex material handling activities require additional oversight and can only be performed by or under the direction of a qualified Riggers or Advanced Riggers. Common material handling activities can be performed by personnel that have been trained in the requirements of Nuclear Material Handling Program.

2.2.4 Heavy Loads on Wheeled Carts

Heavy loads are loads that:

- The weight of the load is more than 400 lbs.

3.0 MATERIAL HANDLING EQUIPMENT TECHNICAL DESCRIPTION

3.1 Forklifts, Powered Lift Trucks and Tele-Handler Extending Boom Lifts

3.1.1 Forklift Truck Components

Regardless of power source or specific design, most forklift trucks have the major components shown in Figure 3-1.

Figure 3-1
Forklift Truck Major Components
Photo Courtesy of Cat Lift Trucks

Descriptions of the components shown in Figure 3-1 are as follows:

- **Carriage –** The carriage is a support structure for the forks or other attachments. It travels vertically within the mast of a cantilever truck.
- **Counterweight –** The counterweight is a heavy casting that is attached to the very rear of the forklift truck for the purpose of offsetting the weight of the load on the forks and keeping the forklift truck stable. It should be noted that on many electric forklift trucks, the vehicle's battery pack is used as a large portion of the required counterweight needed for vehicle stability when loaded. Therefore it is extremely important to always replace an electric forklift truck's battery pack with one of same weight and dimensions.
- **Drive Wheels –** The drive wheels are the wheels that are connected to the forklift truck's transmission or drive motors. On most forklift trucks, only the front wheels provide the

power to move the vehicle; however, there are some "all terrain" forklift trucks that are all wheel drive, in which case the steering wheels at the rear **also** provide power to drive the vehicle.

- **Lift Chains –** Lift chains work in conjunction with the hydraulic lifting cylinder(s) to raise and lower the carriage on the mast while at the same time providing for sequential extension of each mast segment.
- **Load Forks –** The load forks are attached to the carriage and are the equipment that actually contacts the load and lifts it. The load forks are also the one piece of equipment most easily damaged due to misuse or abuse and should be closely inspected for any bending or cracking prior to every use of the forklift truck. Most forklift trucks include the capability to adjust the width or horizontal spacing between the forks. Adjusting the fork width is usually done manually by unlatching the lock on the top of each fork and sliding it horizontally until the appropriate locating slot is reached, then re-latching the fork in its new position. Ideally, forks should not be offset to one side of the carriage or the other, and they should be spaced as far apart as possible for the greatest possible load stability.
- **Mast –** The mast is the vertical assembly that does the work of raising, lowering, and tilting the load. Most forklift trucks have one or two extendable mast segments with interlocking rails. The mast is fitted with one or more hydraulic cylinders that work in conjunction with lift chains and sprockets to sequentially raise the carriage and each mast segment. The mast is attached at its base with a pivot that allows it to tilt fore and aft. Mast tilt is usually controlled by two hydraulic cylinders that attach to the rear of the mast and are anchored to the forklift truck's frame.
- **Overhead Guard –** The overhead guard is a required piece of safety equipment for all forklift trucks capable of lifting a load to any height greater than 6 feet (1.83 m). The purpose of the overhead guard to provide some level of protection for the operator from falling objects. The overhead guard is not designed to provide any level of rollover protection for the operator.
- **Steering Wheels –** Forklift trucks are rear-steer vehicles. This provides for a number of advantages when maneuvering a load, but can also provide for handling characteristics significantly different from those of a front-steer vehicle. The steering wheels are usually turned side to side by means of a tie rod connected to a hydraulic cylinder. Hydraulic pressure to either extend or retract the cylinder, thus turning the wheels either right or left, comes from hydraulic actuator valves that are connected to the steering column inside the forklift truck cab. Most three-wheeled forklift trucks use a hydraulic motor and gearbox to actually rotate the steering wheels about a vertical center point. This feature permits the steering wheels to swivel 90 degrees, giving the forklift truck a zero turning radius and extreme maneuverability.

3.1.2 Forklift Design and Stability

All forklift trucks have a designed "load center." This is an assumed distance from the face of the carriage to the load's center of gravity. All weight ratings and load capacities are based upon this designed load center distance. Figure 3-2a shows a case where a load has been placed too far forward of the designed load center. Typically, forklift trucks with capacities of less than 30,000 pounds are designed with a 24-inch load center. Certain forklift truck attachments (drum loaders, for example) can place the load in front of the designed load center and may not address the issue of reduced vehicle capacity that results from use of the attachment.

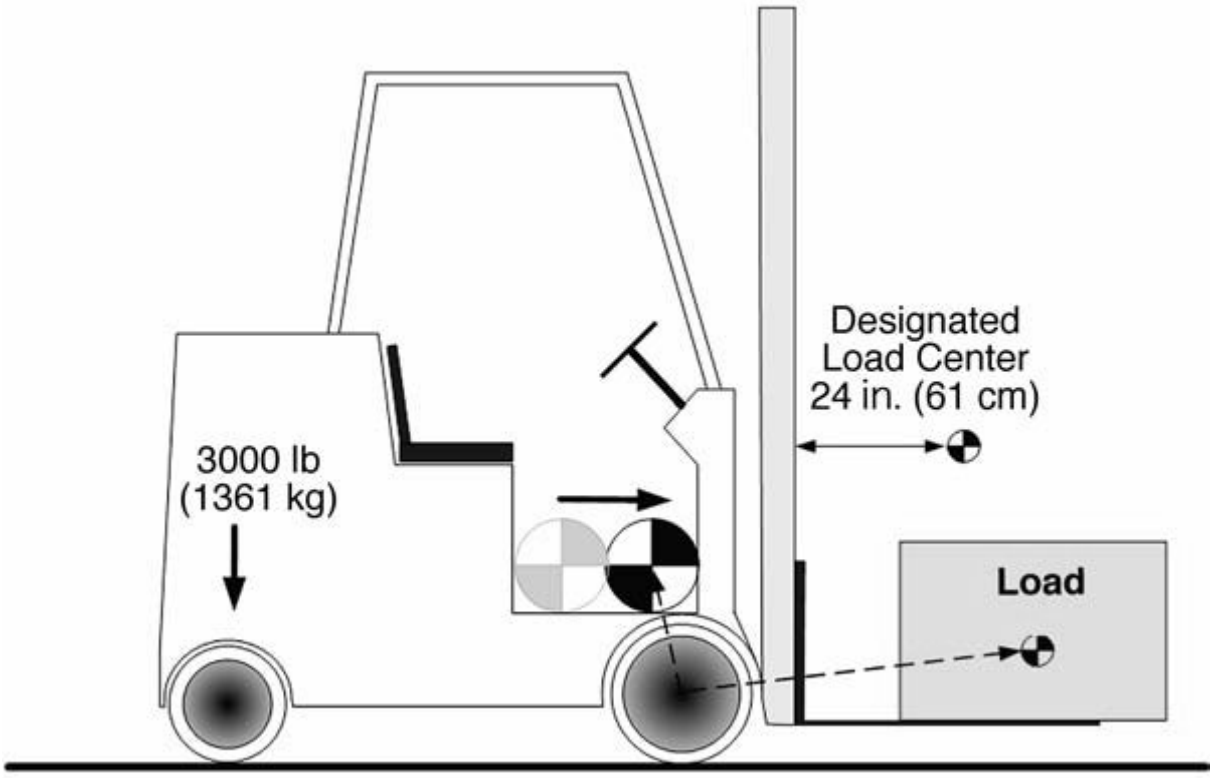

Figure 3-2a
A Load Placed Too Far Forward of the Designed Load Center

Note: As a general rule of thumb, for every 1 inch the load is moved away from the load center, you lose 3.3% of the rated load capacity. On a 3000-pound load, that's 100 pounds per inch.

3.1.3 Forklift Truck Power Sources

Forklift trucks can be powered by an internal combustion engine or a battery (electric). Forklift trucks include self-loading trucks, equipped with load carriage and forks for transporting and tiering loads. A forklift truck is a powered industrial truck equipped with a mast and an elevating load carriage. A pair of fork arms or another load-holding device is attached to the carriage. Some further details regarding the two categories (in terms of power sources) are as follows:

- **Electric –** Electric forklifts are powered by large, heavy, lead-acid batteries—the same kind found in an automobile, but considerably bigger and more powerful. The batteries typically provide enough power for one standard eight-hour shift, which translates into five or six hours of constant usage.
- **Internal Combustion –** Internal combustion (IC) engines run on a variety of fuels: gasoline, diesel fuel, liquefied petroleum gas (LPG), or compressed natural gas (CNG). The main benefit of IC forklifts is their ability to be refueled quickly. They can simply be filled up at a gas pump or a new LPG canister can be loaded, and they are ready to continue working. Their price points are the inverse of electric forklifts—they are cheaper to buy initially, but cost more per hour to run.

3.1.4 Commonly Used Lift Trucks

Figure 3-2 is an example of a propane-fueled internal combustion-powered forklift with cushion tires. Cushion tires are impervious to flats but perform poorly on anything other than smooth flat surfaces such as concrete or asphalt. Cushion tires also typically have poor wet surface traction compared with pneumatic-tired forklifts. Although fueled by clean-burning propane, the internal combustion engine requires adequate ventilation to safely operate indoors.

Figure 3-2
Propane-Fueled Forklift with Cushion Tires
Photo Courtesy of Cat Lift Trucks

Figure 3-3 is an example of a diesel-powered internal combustion-powered forklift with pneumatic tires. Forklifts equipped with pneumatic tires often have greater ground clearance compared with cushion-tired forklifts, and although susceptible to punctures as with any pneumatic tire, these tires perform much better on uneven terrain such as gravel, dirt, or grass. Pneumatic tires typically offer better wet-surface traction compared to cushion tires, as well. The diesel engine provides excellent power and fuel efficiency, but the exhaust from a diesel engine makes anything other than brief and intermittent operation indoors impractical.

Figure 3-3
Diesel-Powered Forklift with Pneumatic Tires
Photo Courtesy of Mitsubishi Forklifts

Figure 3-4 shows a three-wheeled forklift. Three-wheeled forklifts offer zero-radius turning capability, making them excellent for use in tight quarters with their superior maneuverability. Independently powered drive wheels are specially controlled at tight turning angles to provide asymmetrical torque that assists with the turning maneuver. Three-wheeled forklifts lack the stability of comparable four-wheeled examples.

Figure 3-4
Three-Wheeled Forklift
Photo Courtesy of Crown Equipment Corporation

Figure 3-5 shows a stand-up forklift. Stand-up forklifts provide quick and easy access for the operator into and out of the unit. Typically featuring a three-wheel chassis, they are small and highly maneuverable. This type of forklift is best suited for environments where usage is frequent and the lengths of the trips are short. Stand-up forklifts are not suitable for rough or uneven terrain where the operator could lose his or her balance or possibly be thrown from the vehicle.

Figure 3-5
Stand-Up Forklift
Photo Courtesy of Crown Equipment Corporation

Figure 3-6 shows a specialized type of lift truck known as an *order picker*. Order pickers (also called *stock pickers*) have a unique design whereby the operator rides up and down with the carriage. This permits the operator to stock or retrieve individual parts or small boxed items by hand, unlike a conventional forklift that can only stock and retrieve palletized loads. It is this feature that also makes the order picker one of the most dangerous types of lift trucks to operate unless all of the required safety practices are strictly followed.

Figure 3-6
Order Picker Lift Truck
Photo Courtesy of Crown Equipment Corporation

3.1.5 Telehandler Extending Boom Lift Trucks

Figure 3-7 is an example of a diesel-powered telehandler or extending boom lift truck. Telehandlers have telescoping extendable booms which can be fitted with various lifting or manipulative devices such as pallet forks. The most common attachment for a telehandler is pallet forks and the most common application is to move loads to and from places unreachable for a conventional forklift. For example, telehandlers have the ability to remove palletized cargo from within a trailer and to place loads on rooftops and other high places. The latter application would otherwise require a crane, which is not always practical or time-efficient.

The advantage of the telehandler is also its biggest limitation: as the boom extends or raises while bearing a load, it acts as a lever and causes the vehicle to become increasingly unstable, despite counterweights in the rear. This means that the lifting capacity quickly decreases as the working radius (distance between the front of the wheels and the centre of the load) increases. A vehicle with a 5,000lb capacity with the boom retracted may be able to safely lift as little as 400lb with it fully extended at a low boom angle. The same machine with a 5,000lb lift capacity with the boom retracted may be able to support much more than the rated capacity with the

boom raised to 70°. The operator is equipped with a load chart which helps him determine whether a given task is possible, taking into account weight, boom angle and height. Failing this, most telehandlers utilize a computer which uses sensors to monitor the vehicle, and will warn the operator and/or cut off further control input if the limits of the vehicle are exceeded. Some machines are also equipped with front outriggers which extend the lifting capability of the equipment while stationary.

Figure 3-7
Telehandler Extending Boom Lift Truck
Photo Courtesy of JLG Industries

3.2 Forklift Truck Attachments

CAUTION*: Use of aftermarket attachments and/or conventional sling rigging requires written approval from the fork truck manufacture* OR *If manufacturer's approval cannot be obtained, a qualified engineer may evaluate and approve the use of forklift attachments and/or conventional sling rigging attachments.*

> Note: Forklift capacity shall be de-rated and labeled in accordance with applicable OSHA and ANSI/ASME requirements.

Forklift attachments nearly always affect the rated capacity of the truck. When a forklift truck is equipped with an attachment, the rated capacity of the truck-attachment combination should be established by the truck manufacturer. Capacity, operation, and maintenance instruction plates, tags, or decals should be changed accordingly. The rated capacity of an attachment-truck combination should not be exceeded. Attachments should be maintained and lubricated based upon the recommendations of the manufacturer or a qualified person.

Attachments shall be inspected on an annual basis. The inspection shall be documented and include the following actions:

- Hooks included as part of attachments should be inspected as specified for hooks on cranes and hoists in ANSI/ASME B30.10.
- Load-bearing components should be examined for deformation, and load-bearing welds should be visually examined for cracks.

The load capacity of an attachment should be verified by the manufacturer or by a load test at 100% capacity. The load test should be performed on-site. Load tests are not routinely required because a catalog cut, user's manual, decals on the attachment, or other manufacturer's data serve as capacity verification.

3.2.1 Free Rigging

Free rigging is the direct attachment to or placement of rigging equipment (slings, shackles, rings, etc.) onto the forks of a powered industrial truck for a below-the-forks lift. This type of lift does not use an approved lifting attachment. Although free rigging is a common practice, it could affect the capacity and safe operation of a powered industrial truck.

Free Rigging performed using ANY industrial fork truck requires prior approval from MCE/CIVIL Engineering.

3.2.2 Types of Forklift Truck Attachments

There are several types of forklift truck attachments. The types covered in this section are sleeves, hoisting hooks, pallet dumpers, pallet pullers, and drum lifters.

3.2.2.1 Sleeves

Sleeves are sheaths that fit over the carbon steel forks on a forklift truck. They may be made from nonferrous metals such as stainless steel, brass, or aluminum, or they may be made from nylon or some other high-strength plastic. Sleeves are used for a variety of reasons but are usually selected of a material that will prevent marring, scratching, or contaminating the load. In the case of stainless steel sleeves, these are used when moving stainless steel items (such as pipes or structural pieces) that would be contaminated by contact with carbon steel. Sleeves may also be used to artificially "extend" the length of the forks on a forklift. Extension sleeves must be used with extra caution, because they can significantly reduce a forklift's rated capacity. All sleeves, regardless of their purpose and material type, must be fitted with clamps, clips, pins, or bolts that properly secure them to the fork they are covering.

Figure 3-8 shows a protective sleeve attachment.

Figure 3-8
Forklift Protective Sleeve Attachment
Photo Courtesy of Liftingsafety

3.2.2.2 Hoisting Hooks

A forklift truck can be converted into a hoist with a swivel hook in a matter of seconds. Typically, this sort of attachment does not require the use of any special tools. It is secured to the fork truck by safety chains and/or screw clamps. Designs vary to include either single-fork or double-fork configurations (a double-fork design is shown in Figure 3-9).

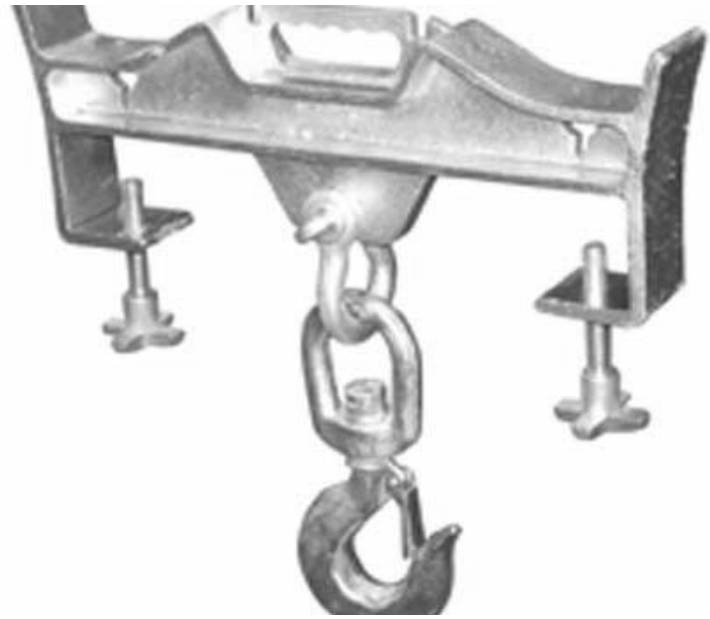

Figure 3-9
Hoisting Hook Forklift Truck Attachment
Photo Courtesy of SJF Material Handling Inc.

3.2.2.3 Pallet Dumpers

Pallet dumpers permit the forklift operator to dump loaded pallets easily. This type of attachment slides over the existing forks and is secured by a safety chain. Two retainers hold the pallet in place while dumping the contents into the hopper or dumpster. Once the retainers have cleared the opposite end of the pallet, the forks are raised, and the retainers will hold the pallet on the forks. The pallet can then be lifted to the dumping height. The forklift is positioned to rest the rear edge of the pallet on the edge of the dumpster. The operator then pulls the release latch chain, releasing the fork carriage and allowing the pallet to tilt and dump the load.
Figure 3-10 provides an example of a typical pallet dumper.

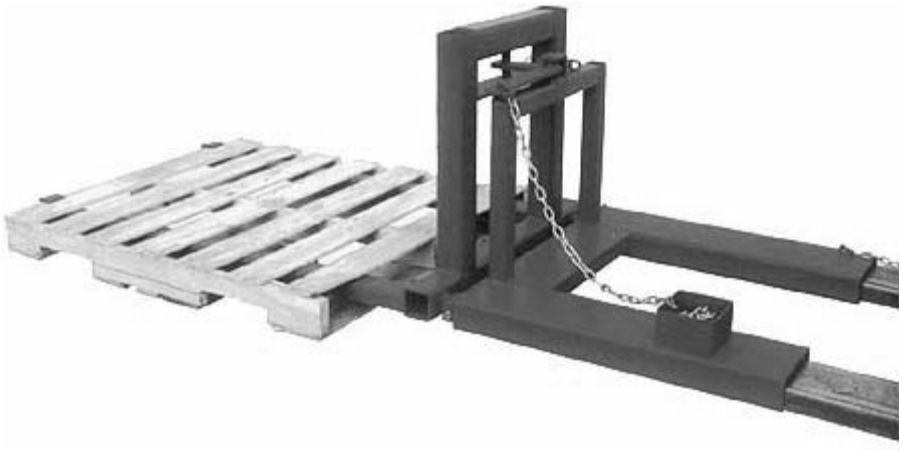

Figure 3-10
Pallet Dumper Forklift Truck Attachment
Photo Courtesy of SJF Material Handling Inc.

3.2.2.4 Pallet Pullers

Because the flooring of many tractor trailers cannot support the weight of a forklift, pallet pullers are used to pull pallets to rear of trailers for easy forklift access. Pallet pullers are constructed with steel jaws lined with serrated teeth. They are designed in such a manner that their gripping force increases as greater pulling force is applied. Pallet pullers are **not** designed for lifting. Figure 3-11 shows two examples of pallet pullers. Figure 3-12 shows a pallet puller attached to a forklift truck while pulling a pallet.

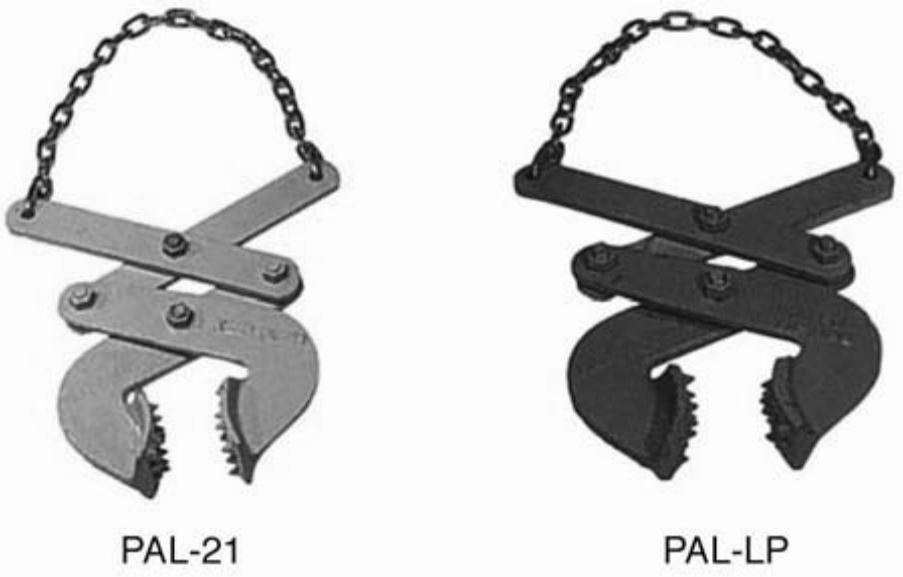

Figure 3-11
Pallet Pullers Forklift Truck Attachments
Photo Courtesy of SJF Material Handling Inc.

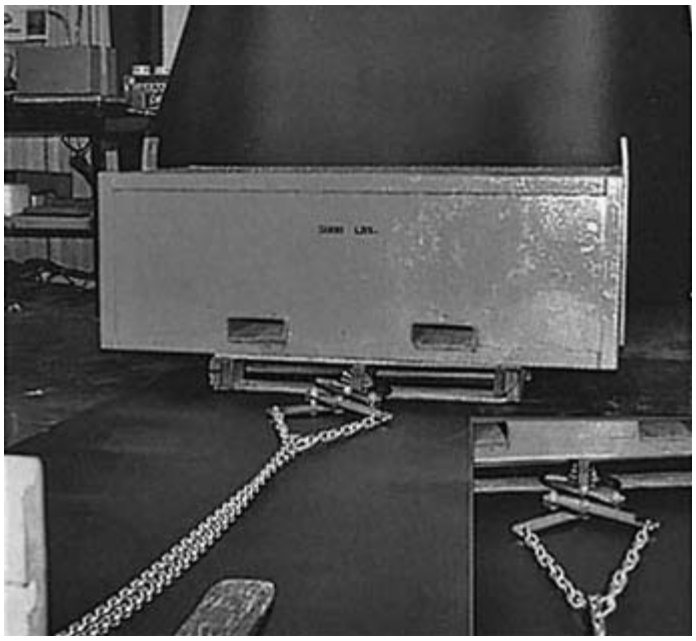

Figure 3-12
Pallet Pullers Attached to a Forklift Truck
Photo Courtesy of SJG Material Handling Inc.

3.2.2.5 Drum Lifters

Drum lifters are used for lifting and transporting storage drums. There are specific types of drum lifters for either metal or plastic drums in 30-gallon (113.6-l) or 55-gallon (208.2-l) sizes, as well as universal types that can safely lift both metal and plastic drums. Maximum load capacities vary by drum type but are typically about 800 pounds (363 kg). Figure 3-13 shows a drum lifter for metal drums, and Figure 3-14 shows a universal drum lifter that will work with either metal or plastic drums.

Figure 3-13
Drum Lifter for Metal Drums
Photo Courtesy of SJG Material Handling Inc.

Figure 3-14
Universal Drum Lifter for Metal or Plastic Drums
Photo Courtesy of SJG Material Handling Inc.

3.3 Pallet Trucks

Pallet trucks (also referred to as *pallet jacks* or *walkies*) are used to move materials, especially pallets, from one place to another. They can be broadly classified into two types: manually operated and electrically operated. Load capacities typically range from 2000 pounds (907 kg) to 5500 pounds (2495 kg). Pallet trucks incorporate tines like a forklift, but they are specially designed for the purpose of lifting pallets sufficiently off the ground that they may be wheeled from one location to another. Their design incorporates specially wheeled forks that are designed to go between the top and bottom boards of a double-faced pallet. All pallet trucks incorporate essentially the same design. There is a centrally located steerable wheel (or pair of wheels) at the leading end of the truck that is connected to a hydraulic ram. Linkage is also connected between the hydraulic ram and mechanical jacking devices for small outrigger rollers located under each tine. Pumping the steering handle extends the hydraulic ram, thereby raising the steerable wheel and extending the jacking linkage on each of the outrigger rollers. Although most pallet trucks have a maximum lift height of only about 6 inches (15.25 cm) and are designed only to lift the pallet high enough to transport it, some pallet trucks are designed with a scissors mechanism permitting the pallet to be raised to a height of approximately 30 inches (76.2 cm) for easier load access by material handling personnel. Most power-operated pallet trucks still utilize manual hydraulics and mechanical linkage to raise the load, but the steerable wheel is driven and brakes applied by an electric motor.

3.3.1 Manually Operated (Hand) Pallet Trucks

Manually operated pallet trucks should be used only on smooth, level surfaces. Their ability to transport loads weighing over two-and-a-half tons make them potentially dangerous to operate on any incline or uneven surface, because the operator could easily lose control of the unit. Even when a pallet truck is used on smooth, level surfaces, operators should exercise extreme care when making turns and should allow safe distances for stopping. Any time an operator experiences difficulty controlling a pallet truck, the operator should immediately lower the pallet to the floor. Figure 3-15 shows a manually operated pallet truck.

Figure 3-15
Manually Operated Pallet Truck
Photo Courtesy of Mitsubishi Forklifts

3.3.2 High-Lift Pallet Trucks

High-lift pallet trucks are excellent tools for placing loads at a more convenient height for material handling personnel. However, extreme care must be taken to prevent tip-over when in the raised position. Many high-lift pallet truck designs include stabilizing feet that lower automatically, preventing movement of the pallet truck when in the raised position. Due to the location of the scissors mechanism, this design will not work with double-faced pallets. Figure 3-16 shows a high-lift pallet truck.

Figure 3-16
High-Lift Pallet Truck
Photo Courtesy of Wesco Industrial Products, Inc.

3.3.3 Electric Pallet Trucks

Electrically powered pallet trucks offer the benefits of reduced operator fatigue, greater controllability, and the more efficient movement of materials, especially with heavier palletized loads. As with most pallet trucks, electric pallet trucks should be used only on smooth, level surfaces. Figure 3-17 shows an electrically powered pallet truck.

Figure 3-17
Electrically Powered Pallet Truck
Photo Courtesy of Crown Equipment Corporation

3.3.4 Specialty Pallet Trucks

Specialty pallet trucks encompass a variety of design modifications and enhancements. These include:

- **Trans Roller (Sidewinder) Pallet Trucks –** These pallet trucks incorporate a second, laterally mounted set of tine rollers that can be lowered into position, permitting the pallet truck to literally be rolled sideways. This feature can be quite useful when transporting long and awkwardly shaped loads, such as lengths of pipe. Figure 3-18 shows a sidewinder pallet truck.
- **Stainless, Galvanized, or Chromium-Plated Pallet Trucks –** These specially built pallet trucks are intended for use in corrosive environments or in the food service industry and are virtually never used in nuclear power material handling applications.

- **Scale-Equipped Pallet Trucks –** These trucks feature an integral electronic scale that reads the weight of the load on the pallet jack. This eliminates the need for having a separate floor scale in the warehouse to determine shipping weights. The disadvantage is that the scale mechanism adds cost and complexity to the pallet truck. Figure 3-19 shows a scale-equipped pallet truck.
- **All-Terrain Pallet Trucks –** These pallet trucks typically incorporate a straddle design featuring a wide track and large pneumatic tires for stability and ease of use on rough or uneven terrain. A number of these designs are also gasoline powered. Figure 3-20 shows an all-terrain pallet truck.

Figure 3-18
Sidewinder Pallet Truck
Photo Courtesy of Vestil Manufacturing Company

Figure 3-19
Scale-Equipped Pallet Truck
Photo Courtesy of Wesco Industrial Products, Inc.

Figure 3-20
All-Terrain Pallet Truck
Photo Courtesy of Vestil Manufacturing Company

3.4 Stackers

Stackers are integral equipment on shop floors. As the name suggests, these machines carry and stack materials on shelves or on each other.
There are many types of stackers available in the market. They are broadly classified by power sources (manual, battery, or ac power) or by the load lifting mechanism (counterbalanced, forkover, or straddle). While selecting the stacker, one should consider technical factors such as load lifting capacity, highest lifting height, power source, and lifting mechanism. There are also special stackers available that can lift smaller loads up to 800 pounds (363 kg) to the height of 20 to 24 feet (6 to 7.3 m). These are known as *super tower stackers*, but they are not typically used in the nuclear power industry. Another type of stacker is the container tilter. This type of stacker is equipped with a mechanism to tilt the materials it carries to up to 150 degrees. Container tilters are useful for carrying drums and emptying their content when required. Figure 3-21 shows two types of walkie pallet stackers.

Figure 3-21
Straddle-Type Walkie Pallet Stacker and Fork-Over Walkie Pallet Stacker
Photos Courtesy of Crown Equipment Corporation

Both the straddle and fork-over designs offer the benefits of excellent maneuverability due to their cantilever design; however, the fork-over design offers additional benefit by eliminating the outrigger space required for straddle stackers.

By eliminating the front outriggers, counterbalanced walkie pallet stackers offer the capability of working directly abutted to vertical obstructions. Figure 3-22 shows a counterbalanced walkie pallet stacker.

Figure 3-22
Counterbalanced Walkie Pallet Stacker
Photo Courtesy of Wesco Industrial Products, Inc.

3.5 Industrial Trucks

Industrial trucks (more commonly called *carts*) are typically used by a variety of material handling and maintenance personnel to transport tools, parts, equipment, and supplies around different areas of the plant.

3.5.1 Types of Industrial Trucks and Dollies

Industrial trucks, by definition, include platform carts, multi-shelf carts, dump carts, and dollies. Most are manually operated, but some designs are self-powered.

Platform carts have good weight-carrying capacity and low centers of gravity. With these carts, it is important to exercise caution when stacking loads and to be sure to place the heaviest items on the cart first to keep the load from becoming top-heavy. Figure 3-23 shows a metal platform cart.

Figure 3-23
Metal Platform Cart
Photo Courtesy of Vestil Manufacturing Company

Figure 3-24 shows an example of a tiered stock cart. Care must be taken to ***never load heavy items on the upper or top shelf*** because this can make these carts top-heavy and unstable.

Figure 3-24
Light-Duty Tiered Metal Stock Cart
Photo Courtesy of Global Equipment Company

3.5.1.1 Air Casters

Although not technically considered a cart or dolly (since it has no wheels), the air caster is another means of moving materials and equipment from one location to another. Air casters work by suspending the load with a cushion of air. Although limited to use on smooth, nonporous surfaces, air casters are capable of lifting extreme amounts of weight while providing

extremely low friction with the ground. Air casters can be configured for a variety of applications to replace a number of different types of industrial carts and dollies. Air casters come in a variety of sizes, and with lift capacities from 250 to 250,000 pounds. Figure 3-25 shows examples of air casters.

Figure 3-25
Air Casters
Photo Courtesy of AeroGo, Incorporated

Figure 3-26 shows an air shuttle, which employs air casters configured to function as a platform truck or pallet jack. This particular device is capable of lifting 5000 pounds, yet it can be moved across the floor with only one hand.

Figure 3-26
Air Shuttle
Photo Courtesy of AeroGo, Incorporated

3.5.1.2 Roller Casters (Hilman Rollers)

Roller casters are industrial rollers used for moving heavy loads ranging from 1 to 1000 metric tons and beyond. Many roller casters are all steel. They operate based on the principle of the re-circulating chain. This chain is constructed with a series of connected rollers that rotate around a central load plate set into a framework. The frame acts only to hold the load plate in place and can include a top plate to ease connection to the load.
The rollers spread the load evenly on the load surface, thus providing a larger area to share the loading. The result is a low-height, low-friction, easy-to-control, high-capacity moving device. Roller casters are used in industrial, civil engineering, and heavy construction fields, where they are used as machinery dollies, load skates, slides, low-profile wheels or casters, guides, linear bearings of sorts, or even heavy-duty conveyors. They are equally functional right-side-up, upside-down, or vertical and are widely used for permanent and semi-permanent load moving or temporary one-time moves. Figure 3-27 illustrates a variety of roller caster designs.

Figure 3-27
Example of Various Roller Caster Designs
Photo Courtesy of Hilman, Incorporated

3.5.1.3 Pipe Stock Rollers

Under certain circumstances it may be advantageous to use sections of heavy pipe stock as rollers on which to move loads. Surfaces such as cracked, rough, or uneven concrete that are

unsuitable for dolly wheels or air casters may be adequate for using multiple lengths of pipe to support and move the load. It is important to note that before using this method, a material handling engineer should evaluate the surfaces, load, piping material, and overall environment before approving its use. See Figure 3-28 for an example illustration of this method.

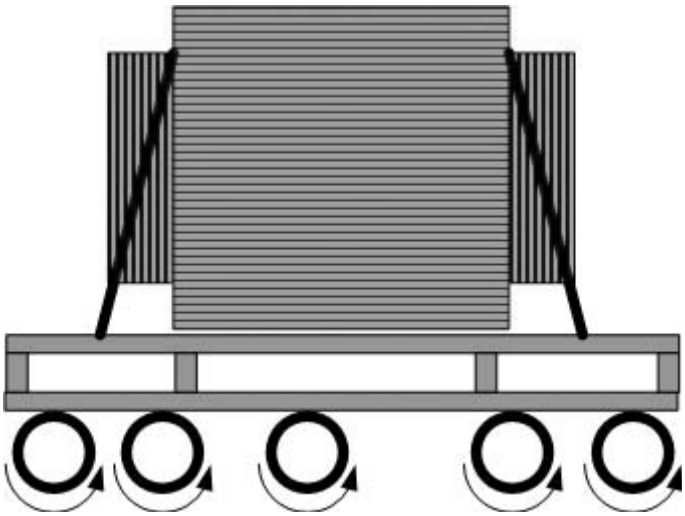

Figure 3-28
Use of Pipe Stock as Rollers

3.6 Hand Trucks

Hand trucks are simple wheeled devices that are operated without power. They are used to transport various types of small loads over short distances. Hand trucks are usually made of steel or aluminum tubes or angles. They have small to medium-size wheels that can be made of rubber, plastic, or metal, with a band of rubber. A suitable harness or restraints can be used to bind the load being transported to keep it firmly in place. A long handle ensures that less effort is required to move the load. Hand trucks are classified by the load they can carry, the wheel size, the type of handle, the construction, the overall dimensions, and so on.

3.6.1 Types of Hand Trucks

A standard hand truck is made up of six basic parts: the frame, the handle, the nose, the wheels, the stair crawler, and the nose extension. The frames are vertical and are usually made of a lightweight material such as aluminum, nylon, or glass-filled nylon. Convertible hand trucks offer the versatility of functioning as either a conventional (vertical) hand truck, or as a horizontal platform truck. A variation of this design is the 3-in-1 convertible hand truck. In addition to functioning as both a conventional hand truck and a platform truck, it also has the capability to be configured as an incline truck (see Figure 3-29). Convertible hand truck frames

may be constructed from tubular steel or aluminum. Frames are available in straight-back and curved-back designs and might include a vertical steel strap for added strength.

The handles of a hand truck are usually made of steel or aluminum for strength and durability. There are various types of handles available, such as continuous, dual-handle, single-loop or P, tall-pin, pin, and dual-loop. The nose is made of either extruded aluminum or cast aluminum, depending on the truck's operational load. Noses usually range in width from 14 to 26 inches.

Figure 3-29
3-in-1 Convertible Hand Truck
Photo Courtesy of Global Equipment Corporation

3.7 Scissor-Lifts

The capacity of scissor-lifts can range from 500 to 100,000 pounds. Scissor-lifts fall into two basic categories: equipment lifts and personnel lifts (man-lifts). For the purpose of material handling, only equipment lifts will be discussed. Equipment lifts are typically much smaller and are designed primarily to lift equipment being worked on to a more comfortable height. These lifts are ideal workstations for assembly or welding processes and provide an economical means of decreasing worker fatigue and injury. They may also be used to raise or lower equipment and material to storage shelves. Equipment lifts may be either stationary or fitted with wheels

enabling them to be manually moved from one location to another. Figure 3-30 shows an equipment scissor-lift.

Figure 3-30
Equipment Scissor-Lift
Photo Courtesy of Pentalift Equipment Corporation

3.8 Winches and Hoists for Pulling Loads

Occasionally it is necessary to rely on the use of winches, cable pullers (come-a-longs), block and tackles, and other such rope and pulley systems to move equipment and materials within the plant. Typically, these moves involve relatively short distances but are complicated by confined spaces and limited access. The six most critical determinations when using rope and pulley systems are:

- The amount of pulling force required to move the object
- The load's stability and center of gravity
- The capacity of the winch mechanism
- The rated capacity of the winch attaching point on the load
- The rated capacity of the anchor attaching point for the winch
- Any special environmental considerations, such as inclines, floor loading, and varied floor surfaces

Failure to give proper consideration to any of these six items could result in equipment damage and injury or death to personnel. Special considerations for the nuclear power environment include the proximity of critical plant systems and equipment that could be damaged in the event of an accident. Refer to Section 5-17 for guidelines on how to use winches and hoists properly when pulling or rolling loads.

Note that cable ratchet lever hoists are intended **only** for the movement of materials and equipment. Use caution to keep hands and feet clear of the ratchet mechanism, cable, and pulleys. **Never** straddle a winch or hoist when in use. Figure 3-31 shows a cable puller ratchet lever hoist.

Figure 3-31
Cable Puller Ratchet Lever Hoist
Photo Courtesy of Lug-All

3.9 Lifting Jacks

Lifting jacks are devices that are used to raise heavy loads. Jacks are often needed to raise loads for the purpose of inserting a dolly underneath the load, placing a scale under the load, or leveling and stabilizing a load so that cribbing or a pallet may be placed under the load.

3.9.1 Lifting Jack Design

Lifting jacks come in a variety of configurations and capacities and may be operated by means of a mechanical rack and ratchet mechanism, an incline plane (screw mechanism), or a hydraulic piston. Jacks may be either hand-operated or electrically powered. Figure 3-32 shows various jack types and their major components.

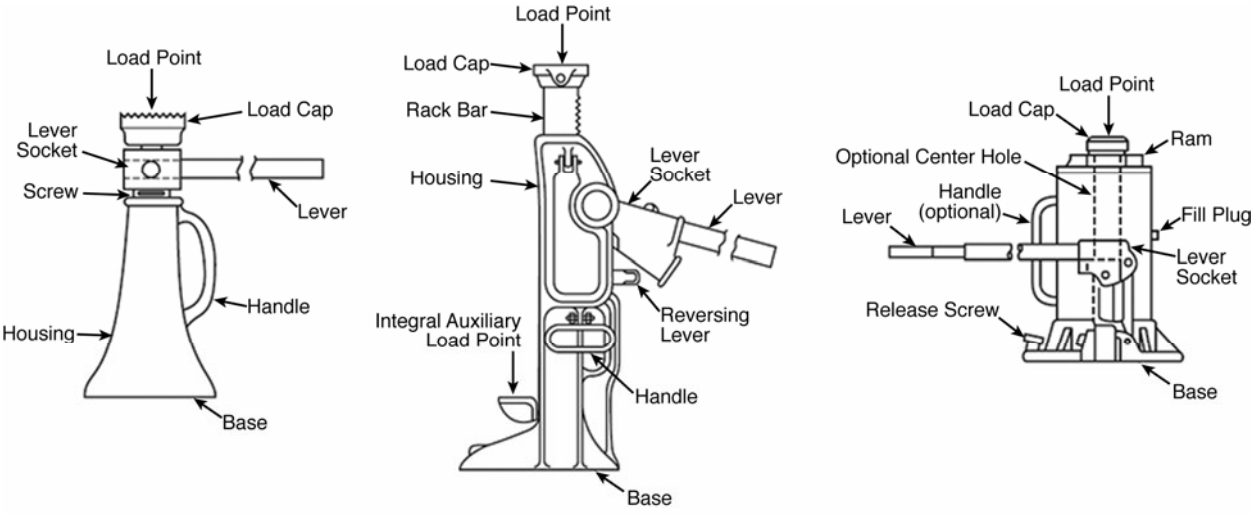

Figure 3-32
Examples of Screw, Ratchet, and Hydraulic-Type Jacks (ASME B30.1)

4.0 MATERIAL HANDLING EQUIPMENT INSPECTION CRITERIA

4.1 General Inspection of Forklift Trucks, Stackers, Telehandlers and Order Pickers

4.1.1 Checklist for Visual Pre-Use Inspection

Although forklifts are designed to perform rugged tasks, each time they are used they can get damaged in any number of ways. For this reason, inspection is of critical importance. At the start of each shift, perform a visual inspection of the general condition and cleanliness of the lift truck as well as an operational check to test its proper functioning. Inspection checklist can be found in *Attachment A*. If you notice anything that may affect the normal operation of the forklift, the supervisor should be alerted.

At the beginning of each shift and before operating the truck, check its condition, giving special attention to the following:

- Condition of tires; if pneumatic, check for proper inflation
- Engine oil level, fuel level, radiator water level (LPG, gas, and diesel forklifts)
- Battery plug connections not loose, worn, or dirty (electric forklifts)
- Forks not bent or cracked
- Positioning latches in good working condition
- Carriage teeth not broken, chipped, or worn
- Chain anchor pins not worn, loose, or bent
- Bolts, nuts, guards, chains, or hydraulic hose reels not damaged, missing, or loose
- No drips or spots on the floor indicating oil, hydraulic, or coolant leaks
- Hoses held securely, not loose, crimped, worn, or rubbing
- Seat belt condition, if equipped
- All operating checklists and warning placards present and legible

Note: Inspections shall be documented on the appropriate checklist. Immediately report and correct any defects found during the inspection. Remove from service any power-operated industrial truck not in safe operating condition.

4.1.2 Checklist for Operational Pre-Use Inspection

Once the visual pre-use inspection has been completed an operational inspection needs to be performed to ensure that all of the forklift's mechanicals are functioning correctly. If you notice anything that may affect the normal operation of the forklift, the supervisor should be alerted.

- **Area Around the Forklift –** Check for any overhead obstructions or items on the floor that could cause an accident. Remember that this inspection involves fully raising the forks, so verify sufficient overhead clearance accordingly.

- **Engine or Main Power –** Start or turn on.
- **Dash Control Panel –** Make sure all lights and gauges are operational.
- **Horn –** Verify that it is working and loud enough to be heard in the work environment and that any other warning devices are operational.
- **Steering –** Confirm that it moves smoothly.
- **Clutch and Gearshift –** Make sure that shifting occurs smoothly with no jumping or jerking.
- **Floor Brake –** Make sure that the pedal holds and the unit stops smoothly.
- **Parking Brake –** Verify that it holds against slight acceleration.
- **Dead-man Seat Brake –** Check that it holds when the operator rises from the seat (where applicable).
- **Lift Mechanism –** Verify that it operates smoothly (check by raising the forks to their maximum height then lowering them completely). Note the condition of chains and cables at this time.
- **Tilt Mechanism –** Make sure that it moves smoothly and holds (check by tilting the mast all the way forward and backward).
- **Cylinders and Hoses –** Check that there is no leaking after the above checks.
- **Sounds Produced by the Forklift –** Listen to verify that there are no unusual sounds.
- **Additional Items or Special Equipment –** Perform any additional checks specified by the user and/or manufacturer.
- **Travel Path –** Before driving away, be sure you have established a safe travel path. If the truck is found to be in need of repair or is in any way unsafe or contributes to an unsafe condition, the matter should be reported immediately to the user's designated authority, and the truck should not be operated until it has been restored to safe operating condition. Permit only qualified people to service and maintain forklift trucks. Before operating any truck, truck operators should have read and should be familiar with the operator's manual for the particular truck being operated, and they should also abide by the safety rules and practices in Sections 5.2 through 5.5 of ASME B56.1-2004.

Before operating any truck, the operator should be familiar with unusual operating conditions that may require additional safety precautions or special operating instructions.

4.1.3 Post-Use Inspection

A powered industrial truck is unattended when the operator is more than 25 feet (8 m) from the truck, which remains in his view, or whenever the operator leaves the truck and it is not in his view. The following are recommendations for the operator when leaving a fork truck.

- Before leaving the operator's position:
  1. Bring truck to a complete stop.
  2. Place directional controls in neutral.
  3. Apply the parking brake.
  4. Fully lower the load-engaging means, unless supporting an elevated platform.

- When leaving the truck unattended:
  1. Stop the engine or turn off the controls.
  2. Remove the operating key from the switch where applicable.
  3. If the truck must be left on an incline, block the wheels.
  4. Fully lower the load-engaging means.

4.1.4 Inspection Criteria for Propane Cylinders on IC Forklifts

Internal combustion engine forklift trucks fueled by propane (liquefied petroleum gas or LPG) are fitted with fuel storage cylinders that conform either to U.S. Department of Transportation (DOT) standards or American Society of Mechanical Engineers (ASME) standards. By far the most common types of cylinders are those that are designed to meet the DOT standards. These cylinders are not built to the same robust requirements as the ASME standards and therefore require periodic inspections beginning 12 years after the date of manufacture. Cylinders that reach 12 years in service require that the relief valve be replaced and that one of three types of inspections be performed prior to return to service:

- **Visual Inspection –** Cylinders satisfactorily passing a visual inspection performed by a qualified individual may be returned to service for a period of five years before they must be re-inspected. (Reference: Compressed Gas Association, "Standards for Visual Inspection of Steel Compressed Gas Cylinders," ID # C-6.)

- **External Hydrostatic Inspection –** Cylinders satisfactorily passing an external hydrostatic inspection may be returned to service for a period of seven years before they must be re-inspected. (Reference: Compressed Gas Association, "Methods for Hydrostatic Testing of Compressed Gas Cylinders," ID # C-1.)

- **Volumetric Inspection –** Cylinders satisfactorily passing a volumetric inspection may be returned to service for a period of twelve years before they must be re-inspected. (Reference: Compressed Gas Association, "Personnel Training and Certification Guidelines for Cylinder Re-qualification by the Volumetric Expansion Method," ID # C-1.1.)

4.1.5 Inspection of Batteries and Charging Stations for Powered Industrial Trucks

The condition of batteries shall be verified daily during the pre-operational check and prior to charging.

WARNING: Hydrogen fires have resulted from failures seen in the industry that would cause a battery to overheat and produce hydrogen gas at a higher rate would be cell failure within the battery. A dead cell prevents the battery from attaining a full charge which would allow that cell to boil thus overheating and venting contents. A second failure is possible with the same results if the charging system fails to sense full capacity and automatically shut down.

Requirements for Battery Charging Stations

1. Ventilation in the charging area shall be sufficient to disperse vapors from batteries.
2. Battery charging installations shall be located in areas designated for that purpose.
3. Charging apparatus shall be protected from damage by powered industrial truck traffic.
4. Post warning signs in battery charging areas to ensure the following are NOT allowed:
   - Smoking
   - Open flames
   - Sparks
   - Electric arcs
5. A conveyor, overhead hoist, or equivalent material handling equipment shall be provided for handling of batteries.
6. Reinstalled batteries shall be properly positioned and secured in the powered industrial truck.
7. Ensure that powered industrial trucks have the brakes set when changing or charging batteries.
8. Ensure that the battery or compartment cover is open during charging operations.
   Note: Care shall be taken to assure that vent caps are functioning by examining battery for signs of bulging.
9. A carboy tilter or siphon shall be provided for handling electrolyte.
10. When charging batteries, acids shall be poured into water. Water shall not be added to acids.
    Note: This refers to the initial addition of electrolyte only. Adding a small amount of water to a battery that is currently in use is an acceptable practice.
11. A spill kit shall be provided in the charging area for neutralizing spilled electrolyte.
12. Emergency eyewash facilities shall be provided in the charging areas.
13. Tools and other metallic objects shall be kept away from the tops of uncovered batteries.
14. An appropriate fire extinguisher shall be provided at each charging location for Fire Brigade use.
    Note: In the event of a fire, call 4911. Do not use a fire extinguisher unless you have been trained to do so.

4.2 General Inspection of Hand Trucks, Carts and Dollies

Prior to each use hand trucks, carts, and dollies should be inspected to determine if their condition is suitable for service:

- Check the frame and attachments for damage or deformation.
- Verify that the handle (if equipped) is secured to the frame and not damaged.
- Inspect the wheels, tires, and axles for damage and security. If the tires are pneumatic, check them for proper inflation.
- Inspect the securing straps for cuts, abrasions, and deterioration.
- Verify that the manufacturer's label is legible, if present, showing the manufacturer's name, equipment model number, and rated load capacity. If no manufacturer's label is present verify the rated capacity is clearly labeled.

4.3 General Inspection of Lever Hoists and Come-a-Longs

The Nuclear Lifting Program provides detailed guidance on inspection classification for manually lever operated hoists that employ chain, wire rope, and web straps. For each type, criteria are provided describing initial inspections and inspection intervals for both frequent and periodic inspections.

For frequent inspections, the following items should be inspected:

- Operating mechanisms for proper operating, proper adjustment, and unusual sounds, such as but not limited to binding noise of the chain/wire rope and bearing squeal
- Hooks in accordance with ASME B30.10, "Frequent Inspections"
- Hook latches, if used for proper operation
- Load chains, wire rope, and web straps in accordance with ANSI/ASME B30.21
- Load chain/wire rope/web strap reeving for compliance with recommendations of the hoist manufacturer or a qualified person
- Hoist lever for bends, cracks, or other damage
- Support of the hoist, for damage

For periodic inspections, the following items should be inspected:

- All items listed for a frequent inspection
- Fasteners for evidence of loosening
- Load blocks, suspensions housings, levers, chain attachments, clevises, yokes, suspension bolts, shafts, gears, bearings, pins, rollers, and locking and clamping devices for evidence of wear, corrosion, cracks, and distortion

- Hook retaining nuts or collars and pins as well as welds or rivets used to secure the retaining members for evidence of damage
- Load sprockets or idler sprockets for evidence of damage and wear
- The brake mechanism on friction brake hoists for evidence of worn, glazed, or oil-contaminated friction discs; worn pawls, cams, or ratchets; or corroded, stretched, or broken pawl springs
- Supporting structure or trolley, if used, for evidence of damage
- Safety information, as required by ANSI/ASME B30.10, for legibility and replacement
- End connections of load chains for evidence of wear, corrosion, cracks, damage, and distortion including over-travel restraints; end connections of wire rope/web strap for evidence of deterioration
- The hoist and hoist mounting for evidence of missing items

4.4 Inspection of Lifting Jacks

The following need to be checked for during the inspection of lifting jacks:

- Improper engagement or extreme wear of pawl and rack (ratchet-type jacks)
- Chipped, cracked, or broken rack teeth (ratchet-type jacks)
- Cracked or damaged housing
- Excessive wear, bending, or other damage to threads (screw-type jacks)
- Leaking hydraulic fluid (hydraulic jacks)
- Scored or damaged plunger (hydraulic jacks)
- Improperly functioning swivel heads and caps
- Loose bolts or rivets

4.5 Truck and Trailer Inspection

The following items shall be inspected prior to use at the beginning of the shift for all truck and trailer combinations:

Note: *Circle for Safety shall be performed prior to entering the vehicle at all times.*

- Ensure there are no fluid leaks.
- Check wheels and rims for damage, bent or cracked lock rings and weld repairs.
- Visually inspect tires for proper inflation, tread separation and cuts or cracks.
- Check electrical and air line fittings for proper connection and operation.
- Check all lights: headlamps, turn signals, brake lights and clearance markers.
- Check coupling system for proper connection.
- Check the condition of the load and ensure cargo is properly secured.

- Check landing gear on trailers to ensure they are fully raised, with no damage and the crank handle in place and fully secured.

5.0 MATERIAL HANDLING EQUIPMENT OPERATION

5.1 Operation of Industrial Trucks

No one should ever ride or operate a forklift truck other than a trained forklift operator who is able to maintain control of the forklift and operate it smoothly when stopping, starting, lifting, and tilting.

- Follow all traffic regulations, including authorized facility speed limits.
- Maintain a safe distance (approximately three truck lengths) from the powered industrial truck ahead.
- Keep the powered industrial truck under control at all times (i.e., hands on the steering wheel, feet on correct pedal / in correct position, eyes on road, etc.).
- Yield the right of way to ambulances, fire trucks, or other vehicles in emergency situations.
- Do not pass other powered industrial trucks traveling in the same direction at intersections, blind spots, or other dangerous locations.
- Do not approach anyone standing in front of a bench or other fixed object (i.e., do not drive towards personnel in such a manner as to trap them between the powered industrial truck and a wall, another vehicle, a fence, etc.).
- Ensure that there is sufficient clearance under overhead installations such as lights, pipes, sprinkler systems, etc.
- Look in the direction / maintain a clear view of the path of travel.
- Under all travel conditions, operate the powered industrial truck at a speed that will permit it to be brought to a stop in a safe manner.
- Stunt driving and horseplay shall not be permitted.
- Slow down for wet and slippery surfaces.
- Slow down and sound the horn at cross aisles and other locations where vision is obstructed.
  Note: If the load being carried obstructs forward view, the driver shall be required to travel with the load trailing or use a spotter.
- Grades shall be ascended or descended slowly.
- Enter elevators, or other confined areas, with the load end forward.
- Avoid running over loose objects on roadway surfaces.
- When negotiating turns, speed shall be reduced to a safe level by means of turning the hand steering wheel in a smooth, sweeping motion. Except when maneuvering at a very low speed, the hand steering wheel shall be turned at a moderate, even rate.
- Ensure that loads are stable and safely arranged before moving.
- Ensure loads are placed with the center of gravity as close to the mast as possible.

- Ensure all loads are secure.
- Ensure top-heavy, loose, or otherwise unstable loads are adequately secured to the forks and make stable. Methods of securing a load can be included but are not limited to:
    - Ratchet type tie-down straps
    - Shrink wrapping
    - Banding
    - Baskets
    - Approved gripping attachments.
- Adjust long or high (including multiple-tiered) loads which may affect capacity.
- Do not operate combustion engine trucks in the vicinity of building air intakes, as dangerous emissions (e.g., carbon monoxide, polycyclic aromatic hydrocarbons) may be drawn into the ventilation system.
- Watch carefully for pedestrians. Do not assume a pedestrian is aware of your presence until you have made eye contact with him / her.
- Wherever possible, cross railroad tracks diagonally.
- Consider making a "trial run." This will allow you to observe pedestrian traffic patterns and unusual travel-path situations (e.g., uneven pavement, cables routed across pathways, storm drain depressions, etc.).
- No electronic devices are to be used while operating powered industrial trucks (i.e., cell phones, iPods, and mp3 players, etc.)
- Radios shall not be used by the lift operator at anytime while in lifting operation mode. If the lift operator has a need to communicate by radio when in lifting operation they must cease operation during the communication phase.
- When a forklift is not in use perform the following:
    - Fully lower the lifting mechanism
    - Set controls to neutral
    - Shut off power and remove key
    - Set the brakes
    - Chock the wheels when the forklift is parked on an incline.
    - Remove the keys.

5.1.1 Hand Signals

The operator should respond to signals only from the designated signaler, except that the operator should **always obey a STOP signal, no matter who gives it.**
For operations not covered by standard hand signals shown in, special signals should be agreed on in advance by both the operator and the signal person. These special signals should not conflict with any standard signals.

5.2 Operation of Push Carts and Dollies

A basic principle for the safe operation of push carts and dollies is whenever possible; push the load instead of pulling it (see Figure 5-25). There are several reasons:

- The cart can run over your feet or strike your ankles when you are pulling it.
- If you pull a load while facing the direction of travel, your arm is stretched behind your body, placing your shoulder and back in an awkward position that increases the likelihood of injury.
- If you pull a load while walking backwards, you can't see where you are going.
- Most people can develop higher push forces by leaning the body weight into the load.

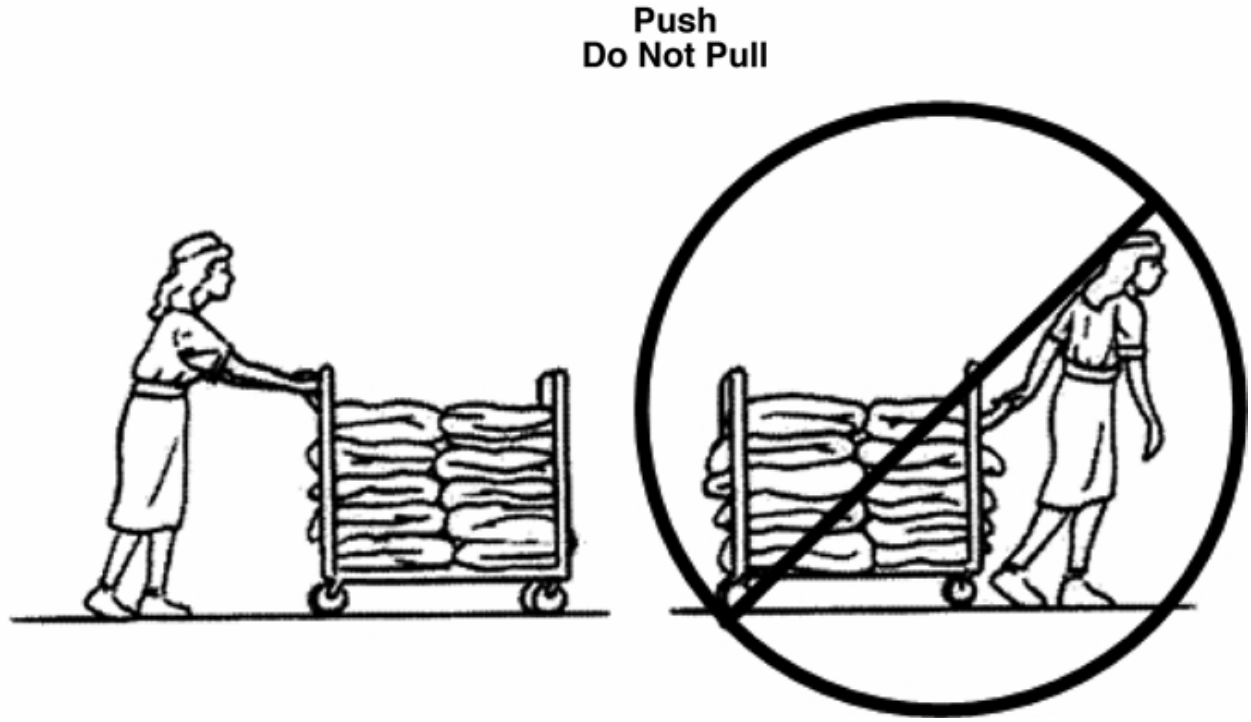

Figure 5-25
Proper Method to Move a Push Cart

Additional recommendations for safely operating push carts and dollies are the following:

- Ideally, the height of the handle should be between your elbow and hip. If circumstances require pulling the load, the handle should fall at or slightly below hip height. If pushing

will not cause the load to shift or slide off the cart or dolly, you can push on the load instead of the handle.
- Keep rolling surfaces clear of debris, fluids, and other contaminants. Avoid rough or uneven surfaces.
- Always remember that carts and dollies are intended for use on level surfaces only. Use extreme caution when going up or down inclines, and never do so with heavy loads or loads with high centers of gravity.

5.2.1 Heavy Loads on Carts

- Ensure that all activities where wheeled carts are used to move heavy loads have an appropriate safety plan.
- Ensure that all activities where wheeled carts are used to move heavy loads have appropriate management oversight.
- Ensure that individuals who use wheeled carts for heavy loads are trained on the limitations of these carts.

5.3 Use of Winches and Hoists

Winches and hoists are often used to position loads within confined areas where it is not practical to use a forklift. Movement of the load in these circumstances involves using one or more winches or hoists to drag or roll a load along its supporting surface. It is important to stress that these types of movements **do not** involve suspending the load at any time. Nevertheless, it is critical to determine the forces involved in order to select the proper equipment and procedures.

5.3.1 Determining the Pulling Force Required (Object Weight Versus Incline and Surface Coefficient of Friction)

When dragging or rolling a load, especially on an incline, it is necessary to first calculate the pulling forces involved in order to determine the necessary equipment capacities required to safely perform the task. Contact the Maintenance Lifting and Rigging Coordinator or Engineering to evaluate this type of move.

5.4 Hand Truck Operations

The following are requirements for the safe operation of hand trucks:

- When using hand trucks, keep your feet clear of the wheels.
- Do not exceed the manufacturer's load rated capacity. Read the capacity plate on the hand truck if you are unsure.
- The size and strength of the individual operating the hand truck play a large role in determining the maximum size of the load to be carried. Never attempt to move a load

that is difficult to tilt and maintain balance. It is always better to make two smaller loads than to attempt one large load and risk personal injury or damage to the load.
- Place the load so that it will not slip, shift, or fall. For tall or top-heavy loads, always use straps to secure the load to the hand truck. If the hand truck is not equipped with securing straps, use tie-down straps and turnbuckles.
- Gas cylinders may only be transported on a hand truck when securely strapped or chained to the hand truck. Safety caps must be installed.
- Tip the load slightly forward so that the tongue of the hand truck goes under the load as far as possible.
- Keep the center of gravity of the load as low as possible by placing heavier objects below lighter objects.
- Push the load so that the weight will be carried by the axle and not the handles.
- Do not walk backward with the hand truck, unless going up stairs or ramps.
- When going down an incline, keep the hand truck in front of you so that it can be controlled at all times.
- Move hand trucks at a walking pace only.
- Store hand trucks with the tongue under a pallet, shelf, or table.

5.5 Operation of Lifting Jacks

The following are requirements for the safe operation of lifting jacks:

- Jacks should be visually examined for general conditions before each use.
- Never use a jack that is missing the manufacturer's data plate or placard. The plate should include the manufacturer's name, model of jack, capacity rating, and serial number.
- A determination of the load should be made to ensure that it is within the load rating of the jack.
- The jack should be firmly supported at the base so that it is stable under load.
- Operators should be instructed in the proper use of the jacks.
- Always jack only one end or one side of a load at a time, while the opposing end/side is stabilized and resting on cribbing.
- Never attempt to lift a load using four mechanical jacks simultaneously because cross-corner overloading and instability can occur.
- Never use a jack to raise a load from a surface that has a grade greater than 4%. (A 4% grade equals 4 inches [10.16 cm] of elevation change over a span of 100 inches [254 cm].)
- Never leave a load supported by a jack unattended. Lower the load onto suitable cribbing before leaving the area.
- For lever-operated jacks, ensure that the correct operating lever (handle) for that jack is used, and that it is properly seated in its socket.
- Operators should never straddle the operating lever of a mechanical jack. Should the ratchet mechanism fail, the handle could be driven rapidly upward with significant force.

- Remove operating levers when not in use to avoid accidental dislocation of the jack and reduce the tripping hazard.
- Take precautions to ensure that all personnel are clear of the load before lowering.
- Take measures to prevent personnel from placing any part of their body under the load
- (especially hands and feet) until the load is secured by cribbing, blocking, or other means.
- Ensure that there is sufficient swing area for the operating lever(s).
- Follow the load with cribbing or blocking where practical.
- Ensure that all operators are instructed as to signals and other procedures when multiple jacks are used simultaneously.
- Off-center loading of jacks should be avoided.
- Extenders on operating levers should not be used unless authorized by a qualified person.
- On hydraulic jacks, only jack fluid that is compatible with the jack manufacturer's specifications should be used.
- Any altered or repaired jack must be tested at rated load by a qualified person prior to being returned to service.

5.6 Truck and Trailer Operation

The following are requirements for the safe operation of trucks and trailers:

- Always use seat belts.
- Operate vehicles at a safe speed and in compliance with site wide speed limits.
- Any time you are driving in close quarters check your mirrors often. Make sure you have enough clearance. Use a spotter when necessary or required.
- In turns, check your mirrors to make sure the rear of your vehicle will not hit anything.
- Be alert to pedestrians and other traffic in yards and roadways.
- Know the capabilities of the truck and trailer combination you are operating.
- Always use a spotter when backing. Use a spotter when backing in areas where other work activities are being performed or when there is a risk of intrusion from pedestrian traffic.
- When operating trucks and yard tractors inside the protected area secure the vehicle and remove the key prior to dismounting or leaving the vehicle.
- When securing a truck or yard tractor set the parking brake and chock the wheels.

5.7 Safe Handling of Pipe

The following are requirements for the safe handling of pipe while loading and unloading:

- Standards and/or straps shall be used on all boom trucks and flat bed trailers when transporting pipe and pipe shall always be placed on cribbing.

- A safe work zone will be established before loading or unloading pipe.
- A spotter is required anytime pipe is being loaded or unloaded in areas where other work activities are being performed or when there is a risk of intrusion from pedestrian traffic.
- When unloading multi layered pieces of stock material (pipe, channel iron, conduit, flat bar, etc) the forklift driver shall designate a spotter. Material shall be picked up and forks tilted back to ensure material does not roll off forks, driver then backs up and positions the material on cribbing. The driver shall evaluate levelness of ground and if necessary material shall be secured by means of scotching or wedging before backing out from under the load.

Note: If standards are not adequate to support the load, secure layers that are not going to be picked up.

- A boom truck, flat bed or gooseneck trailer is the preferred means for hauling small quantities of pipe from remote locations. Double slings shall be used to avoid material from tipping/slipping out. When picking up single pieces it is acceptable to use a single sling if material is double wrapped and load is balanced.
- If using a forklift, position the boom truck, flat bed/gooseneck trailer in area to be loaded and secure truck (set brake and chock wheels). Remove/position standards to allow forklift to safely access the bed of the truck. Forklift operator shall pick up the load, tilt forks back and approach trailer bed being careful not to contact boom mast or mast support located at rear of truck bed. Slowly tilt forks forward to allow load to rest on cribbing and reposition standards. Forklift operator will then back out and load shall be secured prior to movement.

6.0 MANUAL HANDLING OF MATERIALS

6.1 Personal Protective Equipment

- Approved personal protective equipment (PPE) and accessories, including gloves, face shields, goggles, and safety shoes, should be used as required when handling materials and equipment. Refer to applicable materials safety data sheets (MSDSs) for a listing of the necessary PPE.
- Gloves should also be worn by assisting personnel when handling loads.

6.2 Pre-Handling Considerations

- Check for handholds.
- Determine the weight and dimensions of the object/material.
- Confirm that the load is balanced and secured.
- Check objects/materials for slivers, jagged edges, burrs, and rough or slippery surfaces.
- Check for potential pinch points, especially when setting material down.
- If unable to see over or around the load being handled, use another person to observe and assist in guiding the movement of the load.
- Check positioning of materials for situations that could place undue strain on personnel.
- Ensure that the travel path is clear and the lay-down area is acceptable to eliminate potential personnel hazards while transporting materials.

6.3 Personnel Handling of Materials

- Do not lift more than you can handle comfortably. Recommended maximum weight-per-person is 50 pounds. If necessary, enlist the assistance of others.
- When two or more workers are handling materials, if possible, the workers should do all of the following:
  – Face the direction of travel
  – Walk one behind the other
  – Each carry the material on the same-side shoulder
  – Walk in unison
- Use of shoulder padding will prevent material cutting into shoulders and reduce fatigue.
- Keep fingers away from pinch points.
- Finger rings should **not** be worn.
- Wipe off greasy, wet, slippery, or dirty objects before handling. Keep hands free of oil and grease.
- Exposed nails or staples should be removed from boxes, crates, or other containers before handling. When removal is not possible, nails or staples should be hammered down flush to the surface.

- When handling lumber, pipe or other long objects, keep hands away from the ends of the objects to prevent them from being pinched.
- Wherever practicable, materials should be moved in a horizontal plane or with the aid of gravity.

6.4 General Guidelines for Safe Lifting

- Stand close to the load with feet slightly apart and solidly placed.
- Keep your back straight and nearly as vertical as possible.
- Make sure you have a firm grip and solid footing.
- Lift with your legs while keeping your back as straight as possible.
- In order to maintain better balance and to prevent injury to the spine and knees, do not twist your body while carrying heavy objects.
- To minimize strain on your body, always carry the load as close to your body as possible.
- If the load needs to be carried over a long distance, consider the use of hand trucks, carts, or dollies to reduce fatigue and strain.
- Never carry a load that obstructs your view without someone to assist you and provide warning of hazards.

6.5 Guidelines for Safe Handling of Boxes, Cartons, and Sacks

- The safest way to handle boxes or cartons is to grasp the alternate top and bottom corners and to draw a corner between the legs.
- Sacked materials are also grasped on opposite corners.
- Upon reaching an upright standing position, let the sack rest against the hip and stomach, then swing the sack to one shoulder.
- As the sack reaches the shoulder, stoop slightly so the sack rests partly on the shoulder and partly on one arm and the back, with the other hand holding the front corner of the sack.
- Figure 6-1 properly illustrates this technique.
- To set the sack down, slowly swing it from the shoulder until it rests against your hip and stomach, then lower it with your legs flexed and your back held straight.

Figure 6-1
Proper Technique for Carrying a Sack

6.6 Guidelines for Safe Handling of Drums and Barrels

- Check the drum or barrel to see that it is properly closed before transporting it.
- Seek help from another person or use a mechanical device.
- Drum tilters and two-wheeled dollies should be used whenever possible to move drums or barrels.
- Never drop drums or barrels from loading platforms or trucks.
- When it becomes necessary to roll a drum or barrel, push against the sides with your hands (gloves should be worn).
- To change direction of the roll, grasp the edge and push. Never kick a drum or barrel with your feet.
- To lower a drum or barrel from an incline, turn the drum and slide endwise. Rope and pulley systems should be used to control its motion (see Sections 3.8 and 5.17). Never roll a drum or a barrel down an incline.
- When handling full or empty drums near other drums, place your hands and position your body to avoid getting caught in pinch points.

7.0 TRANSPORT AND HANDLING OF SERIES 1 ISO FREIGHT CONTAINERS

Note: Prior to moving any Series 1 ISO Freight Container ensure that the container is loaded evenly and the load is within the capacity of the container. All containers shall be moved in accordance with manufacturer's literature, the Nuclear Material Handling Program and the Nuclear Lifting Program.

7.1 Transport and Handling Series 1 Containers Using Forklifts

Forklifts are sometimes used to pick up and move Series 1 freight containers (often referred to as *Sea-Land containers*). Only containers fitted with forklift pockets as specified in may be moved in this fashion (see Figure 7-1). **Under no circumstances should containers with or without forklift pockets be lifted by forks under the base.** The pockets are cavities, formed crosswise in the floor structure, that allow insertion of the forks from the side. These forklift pockets generally only allow handling of **empty** containers. Packed containers must not be picked up in this way unless specifically permitted by the container manufacturer. It is strongly recommended that box containers equipped with forklift pockets have those pockets **clearly marked** as to whether or not those lift points are suitable for **loaded** lifts or only for **empty** lifts.

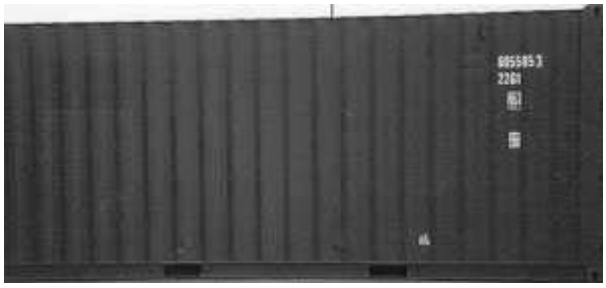

Figure 7-1
A Freight Container Fitted with Forklift Pockets

Ideally, forklift trucks should be equipped with forks at least equal in length to the width of the container. Under no circumstances should they extend less than 71.85 inches into the forklift pockets. Furthermore, forks must be fully inserted into the pockets. Forks that are too short, or not inserted fully into the pockets, may severely damage the floor of the container.

Figure 7-2 illustrates how forklift pockets should be clearly marked with their intended use.

Figure 7-2
Forklift Pockets Clearly Marked for Empty Lifts Only

Sometimes box containers may have forklift pockets marked "tare." The term *tare* refers to the weight of a container and/or packing materials without the weight of the goods it contains, so therefore these forklift pockets are suitable only for use with empty containers. In the case of the container shown in Figure 7-3, the outboard forklift pockets are intended for lifting the container when loaded, and they actually should be marked as such.

Figure 7-3
The Word "Tare" Used to Indicate Pockets Intended for Empty Lifts

7.2 Transport and Handling Series 1 Containers Using Cranes

Containers moved using a crane will be lifted with a Spreader or Lifting Beam that meets ANSI B30.20 standards.

For Top Lift Applications:

- The container is lifted by means of a spreader designed to lift containers by the top apertures of the four top corner fittings, the lifting forces being applied vertically.
- Lifting devices shall be properly engaged. Gathering devices shall impinge on corner fittings only.
- For open top boxes sling angles will be no less than 60 degrees.

For Bottom Lift Applications:

- The container is lifted by means of a spreader or lift beam designed to lift containers from the bottom apertures of the four bottom corner fittings.
- The hoisting connections shall bear on the corner fittings only, making no other contact with the container.
- The angles of the four bridle legs shall not be less than 30 degrees to the horizontal for 40-foot containers; 37 degrees for 30-foot containers; and 45 degrees for 20-foot containers.

7.3 Moving Shipping Containers Using a Roll Back Trailer

- The driver is responsible for inspecting the roll back trailer to ensure the trailer is clear from debris also for inspecting the winch, cable, tires and yoke.
- The driver shall have designated person(s) while doing the following:
  1. Spotting while positioning the trailer.
  2. Assisting in hooking up the yoke mechanism, and
  3. Maintaining control of the truck while the shipping container is being pulled onto the trailer.
- Prior to movement the driver shall ensure the shipping container is secured to the trailer.
- Before off-loading the shipping container the driver shall evaluate the lay down area to ensure area is level and free from obstructions. Once the driver positions the roll back trailer at the unloading site the driver shall ensure brake is set and truck is in neutral before exiting the cab. Driver shall then safely unload the shipping container by using the hydraulic controls.

8.0 HANDLING AND TRANSPORT OF LARGE CABLE REELS

8.1 Securing Large Cable Reels for Transport

- Cable reels prepared for transport on trailers or trucks must be properly secured. The approved method for properly securing cable reels shall be followed unless permission has been granted for an alternate method by the site Material Handling Coordinator.
- Reels shall be transported upright resting on the flanges of the spool.
- Chains are to be placed through the center hole of the spool and secured with binders. The chains shall be spread at least 30 degrees from vertical in each direction and secured to the truck/trailer with binders.

Figure 8-1
Correctly Secured Reel Ready for Transport

8.2 Handling of Large Cable Reels with a Fork Truck

- Cable reels shall be picked up from the flange side with both flanges resting on the forks.
- Cable reels shall be secured to the mast with a ratchet binder prior to transport with a forklift.

APPENDIX A - DAILY INSPECTION FOR POWERED INDUSTRIAL TRUCKS

Date_____ Vehicle #_____ "Check" box if OK. "NA" if doesn't apply

Truck Type_____ Warehouse_____ "X" if needs repair/attention

(If items in the shaded area do not pass inspection, the equipment MUST be removed from service immediately).

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Obvious Damage																														
Decals/Name Plate																														
Lights, Warning																														
Battery																														
Gauges																														
Check Fuel																														
Check Oil																														
Fire Extinguisher																														
Fluid Levels																														
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Steering																														
Brakes																														
Hydraulic Controls																														
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Inspecting Person's Initials																														
Hour Meter Reading																														

DATE	DISCREPANCIES	DATE REPAIRED

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