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15.4
Powered Industrial Truck Safety

(Forktruck Safety)

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Recommended for approval by the ES&H Working Group

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Powered Industrial Truck Safety*

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Powered Industrial Truck Safety

1.0 Introduction

Various codes and standards govern powered industrial truck (PIT) safety. This document is based on those codes and standards adopted in the Work Smart Standard (WSS) set for PITs used for LLNL activities. It contains requirements for PITs with electric motors or internal combustion engines and non-powered manually operated lifts, as these have similar hazards and operating rules. These requirements do not apply to compressed air or nonflammable compressed-gas-operated industrial trucks, farm vehicles, or vehicles intended primarily for earth moving or over-the-road hauling.

Powered industrial truck(s) is defined as a mobile, power-driven vehicle used to carry, push, pull, lift, stack, or tier material. (Note that for purposes of this document, the terms "powered industrial truck(s)" and PITs are used interchangeably.) Appendix A contains other terms and definitions used in this document. Appendix B contains the tables used to determine PIT use in various locations. Appendix C is the Powered Industrial Truck Pre-operational Inspection Checklist. Appendix D contains procedures for propane tank removal and installation. Appendix E is the Powered Industrial Truck Operator Safety Guide Checklist. Appendix F is the Powered Industrial Truck Operator Qualification Form.

All workers must comply with the requirements set forth in this document. Any deviation from these requirements will require approval by the appropriate management chain. For deviations and exemptions, see Document 2.3, "LLNL Exemption Process," in the *ES&H Manual*.

2.0 Hazards

The following conditions can result in hazards from PIT operation:

- Mass-gravity responses to vehicle or load instability can cause material damage or personal injury up to and including death.
- Unapproved operation of an internal combustion engine vehicle indoors can cause asphyxiation or toxic exhaust gas exposure to personnel, leading to illness up to and including death.
- Unapproved environment or the use of inadequate controls for operations or maintenance activities can cause a fire or explosion, leading to material and facility damage or personnel injury up to and including death. In this case, a

fire or explosion can result from the fuel source of the vehicle or the vehicle's engine or motor.

3.0 Controls for Safe Use of PITs

Powered industrial trucks are divided into seven classes (see Table 1), which should be used only as a guide because some PITs may fall into more than one category. This section provides requirements and best management practices for the various types of PITs used at LLNL. When in doubt, default to the manufacturer's instructions for more detailed guidance.

Table 1. PITs, as categorized by the Industrial Truck Association.

Class	Powered Industrial Truck type
I	Electric motor rider trucks
II	Electric motor narrow aisle trucks
III	Electric motor hand trucks or hand/rider trucks
IV	Internal combustion engine trucks (solid/cushion tires)
V	Internal combustion engine trucks (pneumatic tires)
VI	Electric and internal combustion engine tractors
VII	Rough terrain lift trucks

3.1 General

All operators shall be licensed to operate PITs. Licensing requirements can be found in Section 3.12, "Training and Qualifications." Contractor personnel shall meet the requirements in 29 CFR 1910.178.

LLNL no longer separates PIT operators into categories (incidental or professional). Operators are qualified to lift loads to the rated capacity of the equipment for which they are licensed, trained, and evaluated. All lifts shall be made safely and in accordance with accepted work practices. Directorates may impose additional capacity restrictions on their operators as necessary.

Only qualified explosives handlers shall be permitted to use PITs to transport explosives.

Lifts designated as "critical" shall meet the criteria set forth in Chapter 2, "Critical Lifts," of *DOE Hoisting and Rigging* (DOE-STD-1090-99).

3.2 Mandatory Equipment

The use of safety and protective devices is an important factor in safe design and operation of PITs. The design of all PITs shall comply with the appropriate American National Standards Institute (ANSI) B56 series standard.

PITs need not be equipped alike; however, there are certain items found on all PITs:

- Nameplate(s) and markings (e.g. Capacity information; Limitations)
- Warning devices (e.g., Lights or blinkers, sound-producing devices, motion alarms)
- Overhead guards (required when a falling-object hazard exists for the operator)
- On-board, sealed fire extinguishers (10 ABC/BC) for PITs authorized to transport explosives or used in areas where there are explosives.

Section 10.1 of DOE-STD-1090-99 contains more detailed equipment requirements. In addition, the Hazards Control Department can assist work supervisors in determining the necessary safety and protective devices and design requirements for PITs.

Figure 1 shows a common PIT with some of the more common features.

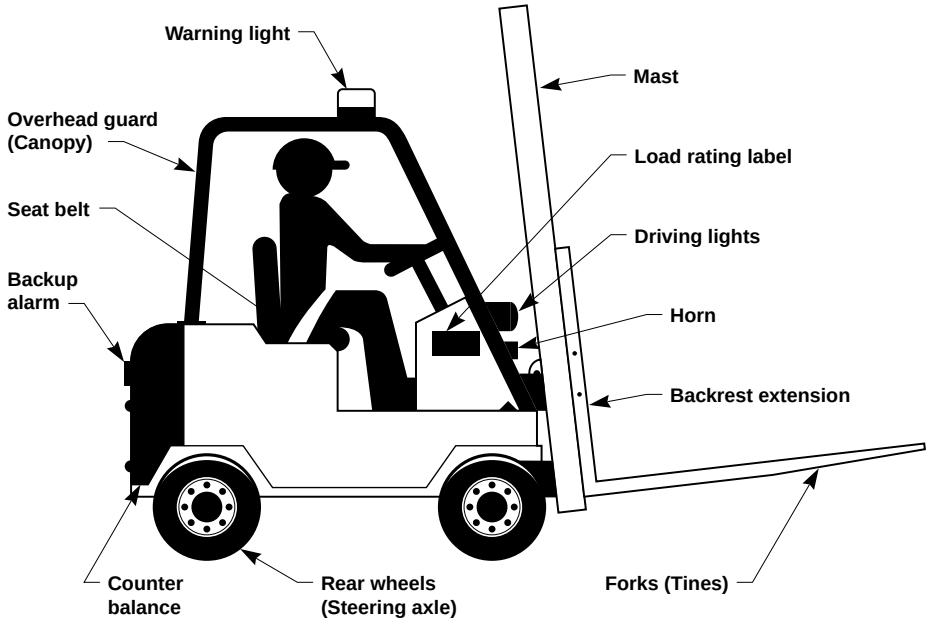


Figure 1. Proper design for PITs.

3.3 PIT Designation and Area of Use

In addition to the classifications (Class I through VII) established by the Industrial Truck Association, individual PITs have designated safety features. These are listed below.

3.3.1 Designation

PITs are designated for use in different environments, depending on how they are powered and safeguarded to mitigate hazards caused by exhaust, fuel, and electrical systems. Below are the 11 designations for PITs, which are subdivided according to their locations of use (i.e., non-hazardous and hazardous).

Nonhazardous Locations. The types of PITs listed below are for use only in non-hazardous locations. These PITs are not suitable for use in hazardous areas because they have minimum acceptable safeguards against fire hazards.

- Type D trucks—diesel-powered units having minimum acceptable safeguards against inherent fire hazards.
- Type E trucks—electrically powered units having minimum acceptable safeguards against inherent fire and electrical shock hazards.
- Type G trucks—gasoline-powered units having minimum acceptable safeguards against inherent fire hazards.
- Type LP trucks—liquefied petroleum gas-powered units having minimum acceptable safeguards against inherent fire hazards.

Hazardous Locations. The types of PITs listed below are for use in hazardous locations. Potentially hazardous locations are those where metal dusts, organic dusts, flammable vapors, and gases may be present in the atmosphere. Indoor use of internal combustion-powered PITs requires verification that safe limits of carbon monoxide emissions are not exceeded.

- Type DS trucks—diesel-powered units that are provided with all the requirements for type D units and that have additional safeguards for the exhaust, fuel, and electrical systems.
- Type DY trucks—diesel-powered units that have all the safeguards of type DS units except that they do not have any electrical equipment, including ignition. These trucks are equipped with temperature-limitation features.
- Type ES trucks—electrically powered units that are provided with all the requirements for type E units and have additional safeguards for the electrical system to prevent emission of hazardous sparks and to limit surface temperatures.

- Type EE trucks—electrically powered units that are provided with all the requirements for types E and ES units and have electric motors and all other electrical equipment completely enclosed.
- Type EX trucks—electrically powered units that differ from type E, ES, or EE units in that the electrical fittings and equipment are designed, constructed, and assembled so that the units may be used in atmospheres containing specifically named flammable vapors, dusts, and, under certain conditions, fibers. Type EX units are specifically tested and classified for use in Class I, Group D or for Class II, Group G locations as defined in NFPA 70 (National Electrical Code).
- Type GS trucks—gasoline-powered units that, in addition to all the requirements for type G units, are provided with additional safeguards to the exhaust, fuel, and electrical systems.
- Type LPS trucks—liquefied-petroleum-gas-powered units that, in addition to the requirements for type LP units, are provided with additional safeguards for the exhaust, fuel, and electrical systems.

Durable markers indicating the designation of the type of PIT for use in hazardous areas shall be applied to each side of the vehicle in a visible but protected area. In addition, the words "Explosives Approved" shall be stenciled in plain view on all PITs approved for use with explosives.

3.3.2 Area of use

The Hazards Control Department shall determine which class of PIT shall be used in specific locations. Tables B-1 through B-4 in Appendix B provide a general summary of the locations and types of PITs that may be used.

Hazardous Area Signs. The entrance to hazardous areas shall be posted with a sign identifying the type of PIT permitted, or the PIT shall be clearly marked indicating the area(s) it shall enter.

More information regarding the areas of use, specific markings for PITs, and hazardous area signs and markings can be found in Section 10.2 of DOE-STD-1090-99.

3.4 Pre-operational Inspection

At the start of each work shift during which the unit will be used, the operator on each work shift shall conduct a pre-operational inspection using the checklist in Appendix C (Powered Industrial Truck Pre-operational Inspection Checklist). If a second operator wants to use a PIT but cannot verify that this inspection has been done, he/she shall

complete the inspection prior to using the PIT. If any malfunctions or defects are found during the inspection, the PIT shall be parked (with the keys removed) and tagged "Out of Service" using the "Danger. Do not Operate" tag, pending repairs. Contact Fleet Management personnel for assistance, if necessary.

Each operator of a PIT is responsible for ensuring that a pre-shift inspection has been completed. This is a visual check of the equipment that is documented on the Operator's Pre-Shift Inspection form. The Responsible Individual shall maintain the completed form for a minimum of 30 days.

3.5 Rules for Operators

The requirements below apply to all PIT operators.

- Use seat belts where provided.
- Operate internal combustion engine PITs only in designated areas with adequate ventilation.
- Do not exceed the floor load rating. (Remember that the total weight of the PIT equals the PIT's plus the load and any attachments.)
- Secure (tie down) unstable loads before starting the vehicle.
- Keep arms and legs inside the PIT structure, except when signaling for turns or stops.
- Do not jump from a moving PIT.
- Make sure that there is adequate clearance before passing under or between structures.
- Maintain indoor speed under 5 mph (8 km/hr) and outdoor speed under 15 mph (24 km/hr).
- Yield to pedestrians.
- Do not carry passengers, except where **manufacturer-approved** seats are provided.
- Tilt the mast back before traveling (see Fig. 1).
- Stay at least three vehicle lengths back when following another PIT.
- Maintain forks about 4 to 6 in. (10–15 cm) off the driving surface when traveling.
- Do not attach slings, cables, or chains to the forks to lift materials or objects from underneath them.
- When forward vision is obscured, drive in reverse.
- Observe all traffic signals.

- Do not use a PIT to tow or push other PITs, another vehicle, or other equipment, unless it is specifically designed to do so.
- Use Class VII PITs for irregular or rough terrain.
- When traveling on LLNL streets, only use PITs that have been recommended by the manufacturer for road use.
- Solid tire PITs (such as a Class IV PIT) should be used indoors only. Solid tire PITs are not designed to operate on irregular surfaces or rough roads (also see Section 3.7.9 "Road Use of PITs").
- Place tines as wide as possible for the load and lock them in place to prevent sideways movement.
- Never add a counterweight. Know the weight of the load being lifted.
- Never exceed the PIT's rated capacity.
- Do not lift material or equipment with which you are unfamiliar.
- Maintain at least a 10-ft (3 m) separation from overhead power lines.
- When crossing rails or other irregular areas, slow down and approach on a diagonal.
- Use PITs for explosives handling only when lifting and moving items for a short distance.

3.6 Parking

The requirements below apply when parking PITs. Figure 2 shows a properly parked PIT.

- Park on level surfaces.
- Lower the forks to the ground.
- Tilt the mast forward.
- Set the parking brake.
- Place the controls in the neutral position.
- Turn off the engine.
- Chock the wheels if the PIT must be parked on a slope.
- Do not leave an unattended PIT running. A PIT is considered unattended if the operator is out of sight of the PIT or more than 25-ft (8 m) away.

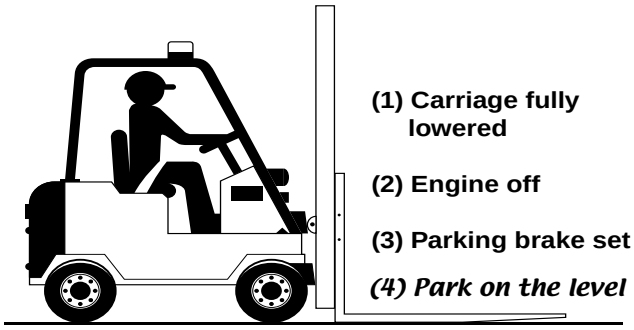


Figure 2. Properly set PIT for parking.

3.7 Special Conditions

3.7.1 Loading Docks and Trailers

When operating a PIT on a loading dock or in a trailer, the operator shall

- Secure all dock plates.
- Ensure that the total weight of the equipment, attachments, and load do not exceed the floor weight capacity of the trailer. Also make sure that the trailer floor is in good condition and is able to support the load.
- Ensure trailer wheels are chocked or dock clamps are in place before driving onto or into a truck trailer.
- Ensure that trailers not attached to tractors have trailer-jacks in place.
- Drive the PIT slowly on wet and slippery docks.
- Slow down and sound your horn when proceeding through doorways.

3.7.2 Ramps

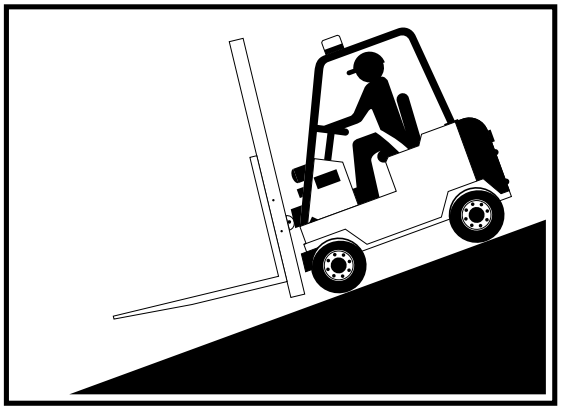
When operating a PIT on ramps, the operator shall

- Point the forks up the ramp when carrying a load, regardless of the direction of travel.
- Drive unloaded PITs with the forks pointing downhill for added stability.
- Obtain help to guide you when going up a ramp with a load and your vision is blocked.
- Never turn a PIT sideways on a ramp.

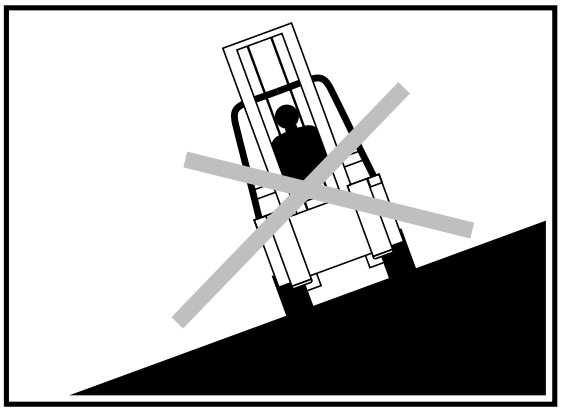
Exception: When operating a motorized hand truck (Class III PIT), always ensure that the load-engaging means are facing downslope (loaded or empty).

Figure 3 illustrates the correct way to operate a PIT on a ramp.

1. Always ensure the load is against the backrest. Drive a *loaded* forklift with the load on the *uphill* side. Back down.



2. Always drive an *unloaded* forklift with the forks on the *downhill* side. Back up and drive down forward.



3. Never turn a forklift sideways on a ramp.

Figure 3. Correct operation of PIT on ramps.

3.7.3 Work Platforms

Work platforms shall be used to lift personnel only when there is no other safer method. If a work platform is used for this purpose, specific precautions and equipment shall be in place prior to the lift. More information about using such devices to lift personnel can be found in Section 10.5.2 of DOE-STD-1090-99.

3.7.4 Refueling and Recharging Batteries

Refueling. The following requirements apply when refueling PITs:

- Gasoline, diesel, and propane PITs shall only be refueled outdoors.
- Propane bottles shall be filled only by Fleet Management personnel or others authorized and trained by Fleet Management.
- The valve on the propane bottle shall be closed while the PIT's engine is running to consume all gas in the line.
- Liquid propane bottles shall be transported only in vehicles designated for this purpose and shall be properly secured during transport. *They shall not be transported in closed vehicles*.

Appendix D contains more detailed procedures for refueling PITs.

Recharging Batteries. Recharge electric PIT batteries only in designated, posted, and well-ventilated areas. Do not smoke or conduct spark-producing operations near batteries being charged. Wear the appropriate PPE (e.g., aprons, goggles or face shields, and rubber gloves) when servicing batteries. In the event that an acid exposure is possible, an emergency eyewash or shower shall be available within 100 ft or a 10-second travel time from the battery system.

3.7.5 Indoor Operations

Following are the requirements for PITs operated indoors:

- Ensure that there is adequate ventilation for PITs powered by internal-combustion engines. Contact your area ES&H Team for an analysis of oxygen deficiency, carbon monoxide, and other contaminants in the atmosphere.
- Only use PITs with the appropriate classification in areas with explosives or flammable gases.
- Sound the horn when approaching intersections, pedestrians, doors, or corners. Slow down and sound the horn anywhere vision is blocked or impaired.

Electric PITs are preferred for indoor operations and required when working in confined spaces.

3.7.6 Pedestrian Areas

Pedestrians working near PIT operations should keep a safe distance from the operating equipment. This means staying clear of the PIT's turning radius and making sure that the PIT operator knows where you are at all times.

The PIT operator shall

- Yield the right-of-way to pedestrians.
- Prevent anyone from walking or standing under elevated forks.
- Slow down and sound the horn as a warning when approaching personnel.

3.7.7 Attachments

Special lifting attachments shall be approved by the manufacturer for use on powered and nonpowered industrial trucks or constructed according to an approved Engineering Safety Note (ESN). Attachments constructed locally in accordance with an ESN should only be used when commercial attachments from a recognized manufacturer are not available for specific applications.

The Industrial Safety discipline of the cognizant area ES&H Team shall be included in the ESN review process or the ES&H Team design and application review of special attachments fabricated locally.

The manufacturer's capacity plate shall be modified, or a second plate added, describing the attachment and any related weight capacity modifications. All special-lifting attachments that may be used with PITs shall either be load-tested and labeled to indicate the maximum rated capacity and the net weight, or have affixed to them a manufacturer's label indicating the maximum rated capacity. See Section 10.3 "Inspections" and 10.4 "Testing" of DOE-STD-1090-99 for more information.

Attachments shall have a positive means of being secured to the forks or mast. The rated capacity for the PIT and the attachment shall not be exceeded.

Attachments almost always affect the rated capacity of the PIT. When a PIT is equipped with an attachment, the manufacturer shall establish the rated capacity for the PIT and the attachment. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.

The user's organization is responsible for ensuring that attachments meet the requirements specified in this section.

More information about PIT attachments can be found in Section 10.1.4 of DOE-STD-1090-99.

3.7.8 Narrow-Aisle Equipment

Narrow-aisle equipment (e.g., rider-reach PITs, stock pickers, and stand-up counterbalanced PITs) may present unique safety hazards. This type of equipment is designed for specialized jobs and specific work environments. For example, there may be a need for a narrow-aisle stock picker in a warehouse for high-reaching racks.

Fall protection devices and other PPE may be required while operating narrow-aisle equipment. Before purchasing this type of equipment, contact the area ES&H Team for an evaluation of the equipment and work area.

3.7.9 Road Use of PITs

PITs present special hazards when operated on roadways. Therefore, the following requirements apply:

- Only PITs recommended by the manufacturer shall be used on roadways. Hard-rubber tire PITs or "warehouse PITs" should not be used on roadways. If hard tire PITs require refueling, repair or maintenance at other locations that necessitate travel on roadways or irregular surfaces, extreme care shall be used. The Responsible Individual shall make an assessment of this activity for the safety hazards associated with travel on these surfaces. An Integration Work Sheet can be used for this purpose.
- A "slow-moving vehicle" sign (orange triangle) shall be mounted to the rear of PITs recommended for road use.
- PITs shall not carry loads that are wider than the widest dimension of the PIT or attachment being used.
- PITs being driven to a refueling point shall not carry loads.
- All loads shall be properly secured on the PIT prior to operation on roadways to prevent inadvertent load shifting, slippage, or dropping. The Responsible Individual shall determine proper methods of securing loads after all safety concerns have been addressed.
- Compressed gas cylinders shall be carried only in approved racks or cages specifically designed for that purpose.

- PIT operators shall pay particular attention to motor vehicles and pedestrians while operating on roadways.
- PIT operators shall move to the right lane when traveling on roads to allow passing vehicles adequate clearance. Pull over and stop when necessary.

Note: The user's organization shall be responsible for determining the use of PITs on roadways. The use of PITs to traverse sections of roadways or parking areas, or areas between buildings, shall be determined by the user's organization—taking into consideration all safety concerns.

Note: When oversized loads are to be carried on roadways, the Responsible Individual shall determine the proper method of transport. PITs should only be used if safer methods (i.e. trailers, trucks, etc.) are not available. If trailers or trucks are not available for transport, and PITs are to be used, safeguards shall be implemented (i.e. observers, road guards, traffic escort, etc.) to ensure PIT operator and other vehicle operator safety.

3.8 Critical Lift Determinations

Critical lift determinations and procedures shall comply with requirements in Chapter 2 (Critical Lifts) of DOE-STD-1090-99.

3.9 PITs Used for Explosives Handling

3.9.1 Internal Combustion-Powered PITs

Type GS or DS PITs may be used to handle containerized or encased explosives on firing tables, outside magazines, and outside operating buildings. Gasoline or diesel-powered PITs that are not GS or DS rated may be used only in areas where all explosives are properly packaged or encased, and only if they are equipped in the following manner:

- Backfire deflectors shall be securely attached to the throat of the carburetor and be of the oil-bath or screen type. (Certain types of air cleaners will serve this purpose.) Contact Fleet Management for more information.
- A tight-fitting and properly vented cap shall be in place on the fill pipe at all times, except during refueling.
- A flame arrestor shall be installed in the fill pipe.
- If necessary, a deflector plate shall be installed to prevent any gasoline tank overflow from reaching the engine or the exhaust pipe.

- On gravity-feed systems or pump systems where siphoning might occur, a shutoff valve shall be installed on the fuel tank or in the feed line to shut off the flow of gasoline in the event of an emergency or a break in the fuel line or carburetor.
- Fuel lines shall be secured to prevent vibrational rupture.
- Diesel-powered equipment may be used if all of the precautions for gasoline-powered equipment are followed.
- Fuel-powered equipment will be refueled and stored at least 90-ft (27 m) away from explosives facilities.

3.9.2 Battery-Powered PITs

Battery-powered equipment used for handling explosives shall meet the criteria listed below.

- Battery powered equipment used in hazardous locations shall comply with the requirements in 29 CFR 1910.178. All equipment shall be appropriately labeled for easy identification.
- Types EE-, ES-, and EX-rated battery-powered equipment may be used to handle containerized or fully encased explosives on firing tables, outside magazines, and outside operating tables.
- Type E-, EE-, ES-, and EX-rated battery-powered equipment may be used to handle those explosives packaged in approved Department of Transportation (DOT) shipping containers.
- Type EE equipment, except for Type EX described in the next paragraph below, shall be used to handle exposed explosives (or assemblies with exposed explosives) in magazines, operating buildings, or other enclosed explosives structures.
- Type ES, EE, and EX trucks are the only battery-powered equipment approved for use in specifically named Class II, Division 2, Group G hazardous locations (see Table B-4 in Appendix B). Type EX trucks are the only equipment approved for use in areas where a specifically named Class II, Division 1, Group G operation is being performed. At this time, type EX equipment does not carry a dual rating and shall be used only in hazardous areas specifically approved by Hazards Control Department Explosives Safety technical leader.
- Type E trucks may be authorized for other use with explosives by the Hazards Control Department Explosives Safety on a case-by-case basis.

3.10 Testing, Maintenance, and Modification

Only trained and authorized personnel shall maintain and inspect PITs. All work shall be done in accordance with the manufacturer's and LLNL's specifications. Because PITs are used daily, it is particularly important to follow maintenance, lubrication, and inspection schedules. Special attention should be given to PIT control, safety, and lifting features such as brakes, steering, lift overload devices, safety equipment, and tilt/lift mechanism.

3.10.1 Testing and Maintenance

The testing and maintenance requirements for PITs are listed in Chapter 10 (Forklift Truck) of DOE-STD-1090-99.

3.10.2 Modification

Modifications or additions to PITs that affect their capacity or safe operation shall not be made without prior written approval from the manufacturer. Capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly. Consult Fleet Management prior to modifying any PIT.

3.11 Nonpowered Trucks/Lifts

Operators are not required to have a license to operate nonpowered trucks/lifts (e.g., pallet jacks, etc.). Work supervisors shall, however, only allow trained personnel to operate these units. At the start of each work shift during which the unit will be used, the operator shall conduct a pre-operational visual inspection. If any malfunctions or defects are found during this inspection, the truck shall be parked and tagged "Out of Service" using the "Danger. Do not Operate" tag, pending repairs.

Special lifting attachments approved by the truck manufacturer or constructed in accordance with an approved ESN may be used on these units. The truck manufacturer's capacity plate shall be modified or a second plate added describing the attachment and any related capacity modifications.

3.12 Qualification and Training

A key element of operator certification is the education and training received. To become a PIT operator and receive a PIT operator's license, candidates must successfully complete three phases of training: formal instruction, practical application (hands-on training), and a performance evaluation.

The LLNL PIT operator's license is valid for a period not to exceed 3 years from the date of issue (unless revoked sooner by the operator's manager). Upon expiration, operators may requalify for their license by meeting the requirements in Section 3.12.4.

3.12.1 Formal Instruction

The candidate shall

- Complete Course HS5620-CBT, "Powered Industrial Truck (PIT) Safety."
- Possess a valid California State driver's license.
- Successfully satisfy the requirements in Appendix E (Powered Industrial Truck Operator Safety Guide Checklist). The PIT proficiency instructor shall complete this checklist within six months of the performance evaluation.

3.12.2 Practical Application (Hands-on training)

Candidates shall successfully complete practical application (hands-on) training for equipment they operate in the workplace. The PIT proficiency instructor shall administer this instruction according to established training guidelines.

The organization authorizing the use of PITs is responsible for coordinating hands-on training with the appropriate PIT proficiency instructor. The length of this training varies, depending upon the level of skill, knowledge, and experience of the candidate. In any case, the candidate has six months to complete hands-on training and the performance evaluation prior to issuance of an LLNL operator's license. If more than six months has elapsed after beginning training, the candidate shall retake Course HS5620-CBT and begin the process over again. During the practical application (hands-on training) phase, the candidate may not operate a PIT unless he/she is working under the direct supervision and training of a PIT proficiency instructor.

Certification for the PIT proficiency instructor certification is achieved by completing Course HS5621-CERT. Authorizing organizations that prefer to have their own PIT proficiency instructor shall select and ensure the candidate takes Course HS5621-CERT. The candidate should have the knowledge, skills, and experience to train and evaluate PIT operators in the workplace. If a authorizing organization does not have its own PIT proficiency instructor, it may use the services of another authorizing organization's PIT proficiency instructor, as long as the training and evaluation is conducted in a work environment and on equipment similar to that which the candidate operates.

3.12.3 Performance Evaluation

Upon successful completion of formal and hands-on training, the candidate is eligible for a performance evaluation by the PIT proficiency instructor. This evaluation determines how safely the candidate operates PITs in the workplace.

Upon successful completion of the performance evaluation, the PIT proficiency instructor will forward the Powered Industrial Truck Operator Safety Guide Checklist (Appendix E) and the Powered Industrial Truck Operator Qualification Form (Appendix F) to the Safety, Education, and Training Section (Attn: Powered Industrial Truck Operator's License) of the Hazards Control Department. A license will then be issued for the appropriate PIT classification. The license must be in the possession of the license holder while operating this equipment.

Note: If the authorizing organization wants to have additional equipment (e.g., newly procured PITs or others) annotated on an operator's license, a new Powered Industrial Truck Operator Safety Guide Checklist (Appendix E) shall be completed and sent to the Hazards Control Department. This checklist should provide evidence that the operator has received training and has been evaluated on this new equipment. After review, the operator's license will be updated accordingly.

The topics listed below are presented during various phases of PIT training.

PIT Related Topics

- Operating instructions, warnings, and precautions for the types of PIT the operator will be authorized to operate.
- Differences between the PIT and the automobile.
- PIT controls and instrumentation (i.e., where they are located, what they do, and how they work).
- Engine or motor operation.
- Steering and maneuvering.
- Visibility (including restrictions due to loading).
- Fork and attachment adaptation, operation, and use limitations.
- Vehicle capacity.
- Vehicle stability.
- Any vehicle inspection and maintenance that the operator will be required to perform.

- Refueling, charging, and recharging of batteries.
- Operating limitations.
- Any other operating instructions, warnings, or precautions listed in the operator's manual for the type(s) of vehicle that the employee is being trained to operate.

Workplace-related Topics

- Surface conditions where the vehicle will be operated.
- Composition of loads to be carried and load stability.
- Load manipulation, stacking, and unstacking.
- Pedestrian traffic in areas where the vehicle will be operated.
- Narrow aisles and other restricted places where the vehicle will be operated.
- Hazardous (classified) locations where the vehicle will be operated.
- Ramps and other sloped surfaces that could affect the vehicle's stability.
- Closed environments and other areas where insufficient ventilation or poor vehicle maintenance could cause a buildup of carbon monoxide or diesel exhaust.
- Other unique or potentially hazardous environmental conditions in the workplace that could affect safe operation (for example, overhead power lines).

3.12.4 Requalification

To requalify for a PIT license, operators shall

- Complete Course HS5620-CBT.
- Have a performance evaluation conducted by a designated PIT proficiency instructor.

A record of training and skill evaluations shall be kept on file and made available upon request. The training organization is responsible for maintaining and archiving training records in accordance with the LLNL Training Program Manual and the LLNL records retention schedule.

3.12.5 Refresher Training

Refresher training in relevant topics shall be provided to the operator when

- The operator has been observed to operate the PIT in an unsafe manner.
- The operator has been involved in an accident or near-miss incident
- The operator has received an evaluation indicating that he/she is not operating the PIT safely.
- The operator is assigned to drive a different type of PIT.
- A condition in the workplace changes in a manner that could affect the safe operation of the PIT.

Refresher training consists of Course HS5620-CBT and a performance evaluation conducted by a designated PIT proficiency instructor. Emphasis in this course is on critical safety areas and newly presented material (e.g., training in different types of PITs).

A record of training and skill evaluations shall be kept on file and made available upon request.

4.0 Responsibilities

General responsibilities for all workers are described in Document 2.1, "Laboratory and ES&H Policies, General Worker Responsibilities, and Integrated Safety Management," in the *ES&H Manual*. Specific responsibilities for PIT safety are listed under each title.

4.1 Operators

- Take Course HS5620-CBT.
- Receive hands-on training and a performance evaluation from a qualified PIT proficiency instructor.
- Safely operate PITs
- Conduct and document daily pre-operational inspections, utilizing the Pre-operational Inspection Checklist in Appendix C.
- Have a valid California State driver's license and an LLNL PIT operator's license. These licenses must be in the possession of the license holder while operating PITs.

- Notify your work supervisor if you are unfamiliar with or believe a load is not safe to lift, or if you believe an environment is not safe to enter.
- Inform your work supervisor of any safety-related problems involving PITs or operations.

4.2 Hazards Control Department

- Provide Courses HS5620-CBT, "Powered Industrial Truck (PIT) Safety - CBT," Course HS5620-LIC, "Powered Industrial Truck Operators License," And HS5621-CERT, "Powered Industrial Truck Proficiency Instructor (PITPI) Course."
- Approve and issue PIT operator's license.
- Analyze accidents involving PITs, as appropriate.
- Determine hazard classifications of areas where PITs are used.
- Select and approve designations for PITs used indoors or in hazardous areas.
- Sample and approve the indoor work environment created by PITs with internal combustion engines.
- Make recommendations for PITs powered by alternate means.
- Approve PITs for use with explosives.
- Maintain training records of operator training and licensing.

4.3 Work Supervisors

- Select operators based on their experience and physical qualification.
- Assure that personnel under your supervision take the required training courses.
- Ensure that a designated PIT proficiency instructor provides practical application training and performance evaluations to applicants.
- Complete Appendix E (Powered Industrial Truck Operator Safety Guide Checklist) and Appendix F (Powered Industrial Truck Operator Qualification Form) within six months of the performance evaluation.
- Ensure that PIT operators under your supervision have a valid California State driver's license and a valid LLNL PIT operator's license.
- Monitor the performance of PIT operators to ensure they comply with safety rules.

- Ensure that PITs under your control are approved by a nationally recognized testing laboratory (e.g., Underwriters Laboratories or Factory Mutual Research Corporation) for the environment in which they are used.
- Ensure that unauthorized persons do not operate PITs under your control.
- Monitor daily shift pre-operational inspections. Maintain completed Pre-operational Inspection Checklists for a period of 30 days.
- Ensure that PITs are equipped with all applicable safety equipment (e.g., flashing lights and/or audible alarms) as required by the operating environment. Contact the area ES&H Team to determine the required warning equipment.
- Ensure that PITs are not operated if they are out of compliance with the applicable maintenance schedule.

4.4 Fleet Management

Fleet Management shall inspect, maintain, and repair LLNL PITs in accordance with the manufacturer's guidelines as well as the requirements in Section 5.0 (Work Standards) of this document.

5.0 Work Smart Standards

29 CFR 1910, Subpart I, "Personal Protective Equipment."

29 CFR 1910, Subpart N, "Materials Handling and Storage."

DOE-STD-1090-99, *Hoisting and Rigging (*March 1999).

DOE M440.1-1, *DOE Explosives Safety Manual*.

6.0 Resources for More Information

6.1 LLNL Contacts

For guidance or further information regarding this document, contact the following:

- Your supervisor—General PIT concerns.
- ES&H Team safety engineer—Specific concerns about PITs and work areas.
- Hazards Control Department, Industrial Safety technical leader—PIT classifications, designations, and work areas.

- Hazards Control Department, Safety, Education, and Training Section safety engineer—Training and licensing.
- Fleet Management—Garage Inspections, maintenance, and testing.
- Hazards Control Department explosives safety technical leader—Explosive Safety Explosive classifications and designations.

6.2 Other Sources

For lessons learned applicable to PITs, refer to the following Internet address:

http://www-r.llnl.gov/es_and_h/lessons/lessons.shtml

6.3 Other Sources

ANSI/NFPA 505-1992, "Fire Safety Standard for Powered Industrial Trucks-Type Designations, Areas of Use, Maintenance and Operation."

ANSI/NFPA 30-1993, "Flammable and Combustible Liquid Code."

ANSI/NFPA 58-1995, "Storage and Handling of Liquefied Petroleum Gases."

NFPA 70, latest edition, "National Electrical Code"

UL 583, "Standard for Safety for Electric or Battery-Powered Industrial Trucks."

UL 558, "Standard for Safety for Internal Combustion or Engine-Powered Industrial Trucks."

Appendix A

Terms and Definitions

Attachments	Devices (other than conventional forks or load backrest extensions) for a specific use, mounted permanently or temporarily on the elevating mechanism of the PIT. Common types include fork extensions, clamps, booms, rams, baskets, and personnel platforms. These devices may be commercially available equipment, or equipment that has been fabricated onsite, for special purposes (an ESN shall be generated for locally fabricated devices (see below).
Capacity	Used to designate the weight-handling ability of a particular PIT as equipped.
Dockboard	A portable or fixed device for spanning the gap or compensating for the differences in the height between the loading platform and carrier.
Engineering Safety Note (ESN)	An ME safety note is a management-approved (by division leader or higher) document that describes the anticipated hazards associated with a piece of equipment or a process. It also describes the responsible engineer's approach, analysis, and rationale used to assure the design safety of the equipment, system, or process. A technical evaluation of PIT modifications or attachments for the purpose of ensuring its safety.
Environment	Locations classified as hazardous or non-hazardous when considering the type of PITs required (see Appendix B).
Forklift truck	A self-loading PIT equipped with load carriage and forks for transporting and tiering loads (see Fig. 1 in this document).
Forks	Horizontal, tine-like projections, normally suspended from the carriage, that engage and support loads.
Narrow-aisle equipment	Specialized material-handling equipment for narrow aisles and high-reach use.
Operator	A trained and authorized person who controls any function(s) of a PIT.
Tiering	The process of placing one load on or above another.

Appendix B

Summary of Industrial PIT Use in Various Locations

Table B-1. Hazard Classifications.

Classes	Unclassified	Class I Locations	Class II Locations	Class III Locations
Description of classes	Locations not possessing environment described in other columns.	Locations in which flammable gases or vapors are (or may be) present in the air in quantities sufficient to produce explosive or ignitable mixtures.	Locations that are hazardous because of the presence of combustible dust.	Locations in which easily ignitable fibers are present, but are not likely to be in suspension in quantities sufficient to produce ignitable mixtures.

Table B-2. Hazardous Atmospheres.

Group within classes	None*	A	B	C	D	E	F	G	None
Examples of locations or environment in classes and groups	Piers and wharves inside and outside, general storage, general industrial or commercial properties	Acetylene	Hydrogen	Ethyl Ether	Gasoline, Naphtha, Alcohol, Acetone, Lacquer, Solvent, and Benzene	Metal Dust	Carbon, black; coal and coal dust	Grain dust, flour dust, starch dust, and organic dust	Baled waste, cocoa fiber, cotton, excelsior, hemp, istle, jute, kapok, oakum, sisal, Spanish moss, and synthetic fibers

* None - Not classified in other groups

Table B-3. Divisions within Groups

		1	2	1	2	1	2
Divisions (nature of hazardous condition)	**None**	**Above condition exists continuously, intermittently, or periodically under normal operating conditions.**	**Above condition may occur accidentally as due to a puncture of a storage drum.**	**Explosive mixture may be present under normal operating conditions, or where failure of equipment may cause the condition to exist simultaneously with arcing or sparking of electrical equipment, or where dusts of an electrically conducting nature may be present.**	**Explosive mixture not normally present, but where deposits of dust may cause heat rise in electrical equipment, or where such deposits may be ignited by arcs or sparks from electrical equipment.**	**Locations in which easily ignitable fibers or materials producing combustible flyings are handled, manufactured, or used.**	**Locations in which easily ignitable fibers are stored or handled (except in the process of manufacture).**

Table B-4. Authorized uses of PITs by type in groups of classes and divisions.

Groups in Classes	None**	A	B	C	D	A	B	C	D	E	F	G	E	F	G	None	None
Type of PIT Authorized:																	
Diesel:																	
Type D	D*																
Type DS									DS						DS		DS
Type DY									DY						DY	DY	DY
Electric:																	
Type E	E*																E
Type ES									ES						ES		ES
Type EE									EE						EE	EE	EE
Type EX					EX				EX		EX	EX			EX	EX	EX
Gasoline:																	
Type G	G*																
Type GS									GS						GS		GS
Lp-Gas:																	
Type LP	LP*																
Type LPS									LPS						LPS		LPS

* **PITs conforming to these types may also be used**

** None - Not classified in other groups

Appendix C

Powered Industrial Truck
Pre-operational Inspection Checklist

(Locally generated forms may be used in lieu of this form, as long as all required equipment is inspected according to the manufacturer's recommendations)

Powered industrial trucks to be operated shall be inspected every 8 hours (or daily). Do not operate the unit until all deficiencies have been corrected.

Unit No.: _____ Inspected by: _____ Date: _____

Check the following as appropriate:

	Satisfactory	Needs work
Overhead guard	❑	❑
Horn	❑	❑
Lights	❑	❑
Parking Brake	❑	❑
Service Brakes	❑	❑
Steering	❑	❑
Major fluid leaks	❑	❑
Mast and forks	❑	❑
Backup alarm	❑	❑
Tires (visual)	❑	❑
Seat belts	❑	❑
Fuel leaks (liquid or propane)	❑	❑
The following are applicable to explosives carrying PITs *only*		
Fire extinguishers (Current and sealed)	❑	❑
Fuel lines secure	❑	❑
Electrical lines	❑	❑
Exhaust	❑	❑

Additional information_____

_____

_____

Appendix D

Propane Tank Removal and Installation Procedures

To ensure adequate ventilation, propane powered industrial trucks shall be refueled outdoors in a designated refueling area. PITs that run out of fuel inside a building shall be towed outdoors to this designated refueling area. *Only* Fleet Management personnel or those authorized and trained by Fleet Management shall fill propane bottles.

D.1 Removing Empty Propane Tanks

Do the following to remove empty propane tanks:

1. Put on protective eyewear and gloves.
2. Use an approved quick-closing coupling to the fuel line—a type that closes in both directions of the line and does not allow any propane to escape—and/or turn the shutoff valve counterclockwise to ensure the propane tank valve is closed. Allow the engine to run until the trapped fuel in the line is exhausted.
3. If you are shutting off the valve at the tank, slowly unscrew the brass coupling from the tank.
4. Unstrap the two metal bands that secure the tank to the PIT and remove the empty tank.
5. Place the empty tank in the designated propane storage bin.

D.2 Installing A Full Propane Tank

Do the following to install a full propane tank:

1. Put on protective eyewear and gloves.
2. Obtain a full propane tank from the designated storage bin (ensure that the cylinder test date is current)
3. Place the tank on the PIT and secure (tighten) it to the PIT with two metal bands.
5. Re-connect the fuel line to the propane tank.
6. Slowly turn the valve clockwise to turn on the gas.
7. Before starting the PIT, check for leaks at the fuel line coupling. Use soap and water to clean off any excess fuel.

Appendix E

Powered Industrial Truck Operator Safety Guide Checklist

This appendix is to be used as a guide for evaluating a proposed operator's capability to operate a powered industrial truck safely. Answer all the questions if the employee uses Class 1, 2, 4–7 PITs, or answer questions 1–18 if the employee only uses a Class 3 Motorized Hand Truck.

Return the completed checklist to the Hazards Control Department Training Division, L-Code 386.

Note: The operator shall have a valid California driver's license to receive authorization to drive a PIT.

Name of proposed operator: _____

(Please print)

Yes	No		
☐	☐	1.	Does the operator know that he/she shall inspect a PIT before operating it? See Appendix C, "Preoperational Inspection Checklist."
☐	☐	2.	Does the operator know the required action if a PIT is found to be defective? (The operator should place a "Do not operate" tag on the PIT and report any defects to his/her supervisor.)
☐	☐	3.	Does the operator obey traffic rules (i.e., stop at stop signs, keep to the right on roadways, etc.)?
☐	☐	4.	Does the operator know if personnel can be transported in PITs? (Personnel should *never* be transported in a PIT, unless it is equipped with seats for two people and has a properly designed and approved safety platform [cage] for lifting only.)
☐	☐	5.	Can the operator find the maximum rated capacity on the PIT? (The operator should check the manufacturer label plate for this information.)
☐	☐	6.	Does the operator know if the maximum capacity can be exceeded? (The maximum capacity can never be exceeded, not even to load test.)
☐	☐	7.	Does the operator always look in the direction of travel? (The operator should always look in the direction of travel, especially when backing up after placing or picking up a load.)
☐	☐	8.	Does the operator use the horn to warn people or other PITs (i.e., when traveling in or out of buildings, at blind corners, passing doorways opening out to loading docks, etc.)?

☐ ☐ 9. Does the operator travel with forks down, with or without a load; and does he/she know how far the forks should be from floor level? (The operator should keep the forks approximately 4 to 6 in. from floor level at all times.)

☐ ☐ 10. Does the operator travel with the PIT's mast tilted back with a load? (When the operator is traveling with a load, the PIT's mast should be tilted all the way back so the forks are tilted up.)

☐ ☐ 11. Does the operator pick up load to clear the floor or pallet rack before tilting the mast back? (This is the correct method.)

☐ ☐ 12. Does the operator tilt the mast forward and level the load before placing the load down? (This is the correct method.)

☐ ☐ 13. Does the operator drive in reverse if a high load should obstruct his/her view driving forward? (If the view forward is obstructed, the operator should always drive in reverse.)

☐ ☐ 14. Does the operator observe overhead clearances and proceed with caution? (The operator should always exercise caution because overhead clearances are difficult to judge.)

☐ ☐ 15. Does the operator know when a load should be secured? (The operator should secure all unstable loads.)

☐ ☐ 16. Does the operator know that he/she shall proceed up or down a ramp (or incline) with a load always facing uphill? *(There is one exception; Motorized hand trucks shall be operated with the load engaging means facing downhill.)*

☐ ☐ 17. Does the operator know the floor capacity in a building when operating a PIT? (The operator should be aware of trench covers and pit covers in the building. These vary greatly in strength and are a significant safety concern because of the weight of the PIT and the load it may be carrying).

☐ ☐ 18. Does the operator park a PIT correctly? (The operator should have the forks flat on the ground, the parking brake set, all controls in neutral, the ignition off, and the keys removed from the ignition.)

☐ ☐ 19. Does the operator know standard arm signals? (The operator should know the arm signals for stop, left turn, right turn.)

☐ ☐ 20. Does the operator use arm signals when driving a PIT? (This is the correct method.)

☐ ☐ 21. Does the operator know the pivot point for turning on a PIT, either traveling forward or in reverse? (The pivot point for turning is the front wheels.)

❑ ❑ 22. Does the operator use the pivot point to maneuver the PIT effectively, especially in restrictive space areas? (This is the correct method.)

❑ ❑ 23. Does the operator know what will occur if sharp turns are made with a PIT traveling at too great a speed? (The operator should know that PITs can roll over very easily when making sharp turns at excessive speed.)

❑ ❑ 24. Does the operator feel it is proper procedure to lift an upright 55-gal drum by spreading the forks to fit the drum on each side and making the lift? (The operator should never use the forks to lift the drum. The proper method is to use an approved lifting device attached to the forks.)

❑ ❑ 25. Does the operator know that if a PIT runs out of fuel inside a building, it shall be refueled outside the building? (The PIT shall be towed outside to a safe location.)

❑ ❑ 26. Does the operator think it is safe to operate an internal combustion-engine PIT in a confined space? (The operator should never operate the PIT in a confined space because of the danger of carbon monoxide [CO] gas accumulation.)

❑ ❑ 27. Does the operator know that the mast should be vertical so that the forks are level when picking up or placing a load? (The operator should know that if the forks are not level, it is difficult to pick up or place a load without pushing or pulling the load out of position.)

❑ ❑ 28. Does the operator keep the forks spaced as far apart as possible for better stability? (Always spread forks as wide apart as possible for better stability.)

❑ ❑ 29. Would the operator allow anyone to place his/her hands in or around the PIT mast with the PIT's ignition on? (The operator should never let anyone put his/her hands anywhere near the PIT while it is running. There are too many shear and catch points.)

Powered Industrial Truck

Proficiency Instructor (Print): _____

Evaluation Date: _____**Indicate the class(es) of powered industrial truck this individual has been evaluated on, and is qualified to operate (check all that apply):**

❑ **Class I** ❑ **Class II** ❑ **Class III** ❑ **Class IV** ❑ **Class V** ❑ **Class VI** ❑ **Class VII**

LLNL supervisor signature: _____ **Date:** _____

Signature of Powered Industrial Truck

Proficiency Instructor: _____ **Date:** _____

Appendix F

Powered Industrial Truck Operator Qualification

HS5620-LIC

This appendix is to be used with the Practical Application phase of training. The operator's Powered Industrial Truck Proficiency Instructor (PITPI) shall complete this form within 6 months of the operator completing course HS5620-CBT. The Supervisor's signature is required. If the form is not completed within the time specified, the operator shall repeat the course.

Name of proposed operator: _____
(Please Print)

Job Title: _____ Dept./Div.: _____

Employee No.: _____ Telephone No.: _____ L-Code: ____

(or Contract No.) _____

Yes	No	
❑	❑	1. Is the above-named individual required to operate a Powered Industrial Truck as part of his/her job assignment?
❑	❑	2. Does this individual have a valid California driver's license? If yes, provide the license number: _____
❑	❑	3. Has this individual completed course HS5620-CBT. If yes, provide the date: _____
❑	❑	4. Has this individual been evaluated using the checklist in Appendix E, and does he/she meet the criteria to operate a Powered Industrial Truck safely?

LLNL Supervisor: _____ L-Code: _____
(Please print)

Supervisor signature: _____

Signature of Powered Industrial Truck
Proficiency Instructor: _____

Return the completed form to the Hazards Control Department, L-386, for approval.

Signature: _____ _____
(Authorized Hazards Control Department representative) (date)