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FLUID POWER SAFETY INSTITUTE™

Pass-Along-Learning™ (PAL) Fluid Power Safety Series

Is a Fork-Lift a Safe Substitute for an Aerial Platform?

A warehouse worker suffered serious injuries when he fell as a result of using a forklift as an aerial platform. Here's his story . . .

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FLUID POWER SAFETY INSTITUTE™

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Description of the Accident:

An electrician suffered serious back injuries and multiple bruises after crashing to the ground on the fork-lift platform he was riding (Fig.1).

Figure 1

How the Accident Occurred:

1. An electrician asked the forklift driver to hoist him to the ceiling to attend to a defective light, which was at an elevation of approximately 20 feet from the factory floor. He used a pallet as a work platform.

   The driver was sitting in the forklift receiving instructions from the electrician.

2. While the electrician was busy attending to the light, the forklift driver apparently struck up a conversation with a colleague.

   A short while later, the electrician shouted to the forklift driver to lower him to the ground. The driver, without looking up, responded by activating the lever to lower the platform. However, he continued with the conversation.

3. A minute or so went by and the electrician repeated his request for the driver to lower him to the ground.

   This prompted the driver to glance forward. To his horror, the lift mechanism's cylinder rod was completely lowered while the platform remained aloft.

4. The forklift driver, realizing the gravity of the situation, (the slightest movement could cause the platform to come crashing down) immediately activated the control valve hoping to raise the cylinder rod to meet the platform.

5. Unfortunately, the electrician became impatient and turned around to see why the operator was not responding to his commands. His movement caused the mast sections to re-align. The driver watched in horror as the platform came crashing down to the concrete floor below.

WARNING On certain forklift models, mast wear guides can wear out and cause the mast section(s) to temporarily seize while the lift-mechanism is at maximum elevation.

This situation can leave the "rider" vulnerable to a serious "free-fall" accident because the lift-mechanism's lift cylinder(s) can lower independently of the lift-mechanism.

Why Are Fork-Lifts Used as Aerial Platforms?

Regulatory groups and manufacturers have developed, what they refer to as, "safe" methods for lifting personnel with a forklift (ref. OSHA 1926.602) – or if you will, "licensing" forklift owners and operators to use their forklifts as "crossover" vehicles, i.e. in addition to transporting cargo, they can be used as "aerial platforms."

These committees did however, make a few stipulations, some of which are extremely vague:

1. The work platform must be equipped with standard guardrails or equivalent means, and must be firmly secured to the lifting carriage or forks.
2. The hydraulic system must be designed such that the lift mechanism will not drop faster than 135 feet per minute in the event of a failure in any part of the system.
3. The operator must be in the driving seat while workers are on the platform.
4. The operator must be in the driving seat while raising or lowering the platform.
5. The forklift must not travel from point to point with the work platform elevated at a height greater than 4 feet while the platform is occupied. When necessary, an occupied platform can be moved as long as the forklift is "inched" at a very low speed.
6. The area between the personnel on the platform and the mast must be guarded to prevent contact with chains or other pinch points.

The preceding stipulations are well founded. However, could the regulatory groups and manufacturers have overlooked a number of critical elements associated with forklift design and ownership, which could either cause, or contribute to, the uncontrolled descent of a forklift's lift or tilt mechanisms while the mast is elevated?

Is a Fork-Lift a Safe Substitute for an Aerial Platform?

The OSHA "descent-rate" rule appears to apply to all forklifts regardless of type, age, or condition. Many forklifts do not have hydraulic safety valves (velocity fuses) integrated in the lower port of the mast cylinder/s. Consequently a hose failure, for whatever reason, can cause the lift mechanism to "free-fall," leaving the rider susceptible to severe injury or death.

The regulatory groups and manufacturers appear to have overlooked problems associated with an unexpected failure of a forklift's mast tilt mechanism, which also operates with hydraulic cylinders.

A forklift's tilt angle averages 3° forward and 3° backwards from center. The distance of lateral travel at the top of a fully raised mast is approximately six feet (varies according to maximum lift-mechanism height and maximum tilt angle).

The unexpected failure of a tilt cylinder hose or mechanical part could result in a very serious accident. For example; a forklift is being used to elevate a person to a height in a building to replace a broken light bulb. While the person is working overhead one of the hydraulic hoses in the tilt cylinder circuit unexpectedly fails causing the mast assembly to lurch forward uncontrollably throwing the lift mechanism against the structure. The person cannot be thrown from the device because, according to OSHA regulation, he/she is securely harnessed. However, his/her body is thrown against the side of an adjacent structure violently, which could cause severe injury or death.

PROBLEM - Fork-lifts are not primarily designed to be personnel lifters or carriers.
The fundamental purpose of a forklift is to transport cargo with the added convenience of self-loading and unloading with the aid of hydraulics.

Conversely, the fundamental purpose of an aerial platform or "mobile personnel elevator" is to elevate and transport personnel (transport within the guidelines of safe operation).

Both forklifts and aerial platforms share similar hydraulic components from an operational point of view. However, an aerial platform designer has an additional design responsibility – to make sure the "platform" cannot fail under any circumstances.

Needless to say, an aerial platform has a number of hydraulic "safety valves," which are not usually incorporated in conventional forklift hydraulic system design. This makes a forklift inherently unsafe for use in elevating and/or transporting personnel; and, forklift manufacturers aren't shy about warning of the consequences of using their products for this purpose.

There are always inherent risks associated with riding "outside the confines of a mobile vehicle's frame."

Forklifts do not have redundant safety components and/or systems for the specific purpose of protecting the "rider" in the event of the unexpected failure of a critical hydraulic or mechanical component.

On the other hand, aerial platform designers focus very heavily on platform reliability and machine stability, which makes safety the nucleus of aerial platform design.

Accordingly, aerial platforms do have redundant safety components/ systems for the specific purpose of protecting the "rider" in the event of the unexpected failure of a critical hydraulic component.

What the regulatory groups and manufacturers have apparently done is to give industry permission to use a forklift as a "crossover" vehicle – in addition to it being used as a forklift; it can also be used as an aerial platform.

Unfortunately, due to conventional forklift design objectives, a forklift cannot perform the latter with any guarantee of safety and thus, there are, and always will be, inherent risks associated with using a forklift for any purpose other than what it was specifically designed to do – transport cargo.

PROBLEM - Lack of qualified maintenance personnel education and training.
The issue of forklift safety extends beyond the boundaries of forklift design. It relies heavily on the qualifications and training of forklift maintenance personnel.

The most powerful argument against using a forklift as an aerial platform has to do with the education and training – or the lack thereof – of maintenance personnel.

Equally as critical is the poor state of maintenance, in general, in the forklift industry. These issues will be addressed separately.

Safe and predictable forklift operation (Ref. OSHA 29CFR1910.178O) can only be achieved if a forklift is expertly maintained.

The safe and efficient operation of any machine can only be realized through the implementation and execution of a world-class proactive maintenance program, which is only effective if executed by well-trained technicians; the one cannot exist without the other!

It is virtually impossible to meet these requirements if the people who are responsible for performing the maintenance services are untrained - especially on critical systems like hydraulics.

Ironically, over 98% of the people in the U.S. who maintain, service, and, repair hydraulic systems and components are not properly trained.

OSHA has passed a law (ref. OSHA 29CFR1910.1780) that makes it mandatory for a forklift operator to be certified in the safe operation of a forklift.

Moreover, the law requires them to receive both hands-on and formal classroom training.

Ironically, the people who have the lion's share of responsibility for the safe and proper operation of a forklift - the mechanics - are completely ignored by all regulatory groups, including the owners and operators of forklifts.

So, why aren't mechanics held to the same standard as operators? Moreover, why do the regulatory groups and manufacturers "look the other way" with respect to the training and certification of mechanics?

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PROBLEM - Poor maintenance of fork-lift equipment.
Needless to say, the quality and consistency of any maintenance program cannot rise above the level of competence or training of the maintenance workforce, or maintenance management, for that matter.

Another compelling reason why a forklift should never be used to elevate personnel – the maintenance is often less than adequate!

Here are just a few of the problems:

1. The vast majority of forklifts operate on the basis of "if it ain't broke don't fix it!" In a nutshell, forklift maintenance is generally performed on the basis of "crisis management!"

   They are typically "run into the ground" and only then do they get the attention they need – maybe! Repairs are seldom properly done because maintenance personnel are generally not empowered to make decisions on the quality of their work.

2. Less than 1% of the hydraulic components on a forklift are removed on a proactive maintenance basis. They are "maintained" on a "fail-first" basis.

NOTE: This problem is not unique to the forklift industry. The vast majority of hydraulic systems operating in plants and on mobile machines operate on the basis of "run-to-destruction."

3. When a forklift is "sidelined" due to an unexpected problem, production is usually unaffected. Besides, most plants have a "fleet" of forklifts – there is usually a back-up. If all else fails a telephone call to the local rental facility solves the problem.

Maintenance and production supervisors and managers are usually well aware of their options so their attention is focused on the "squeaky wheel."

They are usually so busy "putting out fires" on production machines that little time is left to schedule service on the "non-critical production machines" such as forklifts!

A visit to most truck loading facilities is tantamount to visiting a forklift proving ground. Forklift operators routinely "spin the tires," select reverse (or forward) while the vehicle is traveling in the opposite direction, overload, etc.

Most forklifts exhibit severe body damage from constant collisions with whatever is in their respective paths. In short, a forklift is arguably one of the most neglected and abused machines in a plant.

Here are a few examples of failures which could lead to the "unrestricted" descent of a forklift's lift mechanism (Fig.2) :

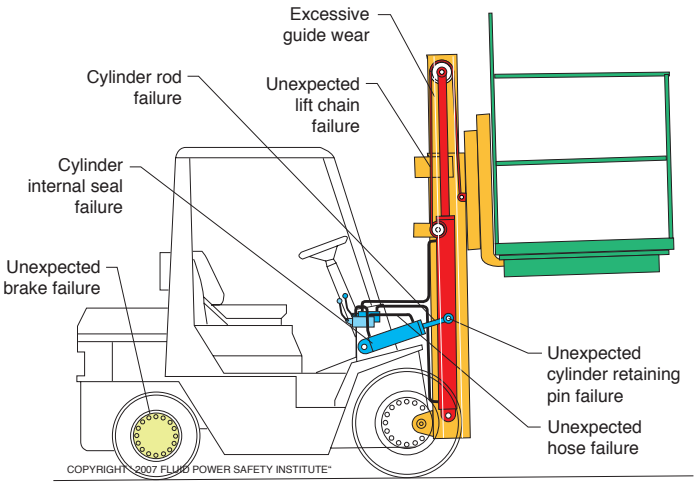

Figure 2

Is a Fork-Lift a Safe Substitute for an Aerial Platform?

1. Lift chain failure.
2. Cylinder retaining pin failure.
3. Cylinder internal seal failure.
4. Cylinder rod failure.
5. Mast guide wear-plate wear.
6. Hose failure.

There are also additional factors that could cause an accident, such as brake failure, inattentive operator, etc.

Unlike fork-lift trucks, a conventional aerial platform is designed to permit the "rider" to control all vehicle functions including wheel drive and steering.

Suggestions On How To Prevent This Type Of Accident:
Based on the facts, the Fluid Power Safety Institute™ cannot agree with the regulatory group's and manufacturer's decision to permit fork-lifts to be used as "substitutions" for aerial platforms, and thus offers the following warning:

WARNING Using a forklift as a "work platform" is inherently dangerous and can lead to accidents, which could result in severe injury, death, and/or substantial property damage.

The regulatory groups and manufacturers appear to have ignored critical safety elements in their haste to cow-tow to industry. There are, and will always be, inherent risks associated with using a forklift for any other purpose than what it's designers intended it to be – a cargo carrying vehicle - unless, of course, it undergoes an extensive design change and incorporates all the "bells and whistles" needed to make it "fail-safe."

Moreover, it is high time the regulatory groups and manufacturers focused on the pathetic state of forklift, crane, and aerial lift maintenance training – to mention just a few areas that need urgent attention!

It doesn't take a "rocket scientist" to figure out that regardless of how well a vehicle driver is trained, his/her safety, and the safety of those who work around the equipment, lies squarely on the shoulders of the maintenance mechanic.

A forklift is as safe and reliable as the people who service and repair it, regardless of how well the operator is trained!

Is a Fork-Lift a Safe Substitute for an Aerial Platform?

PAL's SAFETY QUIZ

(FPSB-03-01)

Name: _____ Employee #: _____

Instructor: _____ Date: _____

1. A forklift can be used as a personnel lifting mechanism if a steel rather than a wood pallet is safely secured to the forks:

   Yes No

2. If I see a worn hydraulic hose on a forklift I must report it to my supervisor:
   a) Immediately
   b) At the end of the shift
   c) When it starts to leak

3. A forklift can be used as a personnel lifting mechanism - with limitations – if it is equipped with an OSHA approved personnel lifting device:

   Yes No

4. If a person is working in an OSHA approved lifting mechanism the forklift driver can exit the driver's compartment to do other work as long as the brakes are applied:

   Yes No

5. If the person working in the OSHA approved lifting mechanism is only going up one or two feet the person does not have to wear a harness:

   Yes No

6. A forklift can carry a person in an OSHA approved lifting mechanism while in motion, if the lifting mechanism is no more than four feet off the ground:

   Yes No

7. A forklift operator can operate the hydraulic control levers to position an occupied OSHA approved lifting mechanism while standing alongside the forklift:

   Yes No

8. The area between the OSHA approved lifting mechanism and the mast must be guarded to prevent:
   a) Damage to the forklift's lift cylinder in the event that a person occupying the lifting mechanism drop an object from above.
   b) To prevent a bystander for reaching in between the lifting mechanism and the OSHA approved lifting mechanism.
   c) To prevent the person occupying the OSHA approved lifting mechanism from contacting chains or other pinch points.

9. When traveling form one area to another the forklift speed can be as fast as circumstances allow if the OSHA approved lifting device is properly secured and the person occupying the OSHA approved lifting mechanism is safely harnessed to the lifting mechanism:

   Yes No

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PAL's SAFETY QUIZ

10. The maximum travel speed of a forklift with an OSHA approved lifting device occupied by a person is:
    a) Maximum safe speed according to company policy.
    b) "Inching"(moving extremely slowly).
    c) Maximum speed in first gear.

11. The guardrail on the OSHA approved lifting mechanism has been removed. The lifting mechanism can be used if the person occupying the lifting mechanism is safely harnessed to the forklift's mast assembly:

    Yes No

12. A person is using a forklift, which is equipped with a pallet (or some other unapproved device) as a work platform. He/she loses balance and falls to the floor suffering fatal injuries:
    a) The victim is fully responsible for the accident.
    b) The forklift driver and the victim are responsible for the accident.
    c) The forklift driver is responsible for the accident.
    d) The company, which owns the forklift, is responsible for the accident.

13. This hydraulic safety presentation taught me:
    a) That a forklift can only be used for personnel lifting if it is equipped with an OSHA approved lifting mechanism.
    b) If an occupied lift is in motion, the lifting mechanism must be no higher than four feet off the ground and the ground speed must be extremely slow.
    c) The person occupying the lift mechanism MUST be securely harnessed to the lift mechanism's guardrail.
    d) The operator must be in the operators seat while lowering or lifting the platform.
    e) The operator must not leave the drivers seat while the lift mechanism is occupied.
    f) All of the above.

Comments: _____

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FPSB-01-01 "Quit Screwing Around!" - Don't make haphazard component adjustments.

FPSB-02-01 Irreconcilable Differences! - Don't make cross-brand connections.

FPSB-03-01 Is a Fork-Lift a Safe Substitute for an Aerial Platform?

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FPSB-06-01 Troubleshooting? Or Just Shooting for Trouble?

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