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A Scenario Analysis of Ladder Fall Accidents

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Falls from ladders are second only to stairway falls as the most frequent source of injury involving falls from elevation. In this study, 123 ladder fall accident cases were investigated in-depth, using a human factors engineering (person-equipment-task-environment) investigative approach. Narrative data were collected through interviews with the victims of these ladder falls occurring on the job. These data were coded into accident scenarios and used to computer analyze the accidents by various factors including the type of ladder used, the activity being performed, and the resulting injuries. The accidents were categorized into the following reported patterns: a) overreaching; b) slipping on rungs; c) misstepping on rungs; d) failing ladder structure; e) being struck by or attempting to catch/avoid falling objects; f) applying excessive force; g) leaning step ladders against structure; h) transitioning onto or from ladders; i) standing on top rung; j) other miscellaneous ladder fall accidents. These accident patterns are discussed in detail, followed by general guidelines for reducing or eliminating the occurrence of such ladder falls.

The accidents analyzed in this study included falls from all portable ladders, i.e., straight, extension, step, and job-made, used on the job in a cross-section of industries. An in-scope accident must have involved either a slip, trip, misstep or fall from one of the above types of ladders while working on a job, resulting in admission to a hospital emergency room which is associated with the National Electronic Injury Surveillance System (NEISS) operated by the Consumer Product Safety Commission (CPSC). Through a notification and access procedure described in the companion epidemiological study, a total of 123 ladder fall cases were investigated during the 18-month data collection period of this study. All the narrative data collected through case interviews and in-depth accident investigations were coded in such a manner that allowed for thorough computerization, access, and retrieval. Such a procedure involved the narrative data being reformatted, but unchanged in content, into accident scenarios with a structured format that did not require the reclassification of the information. The scenario analyses in this report were based on the descriptions of accident events in such accident profiles.

Based on the analysis of accident scenarios, it was found that 60% of the fall accident cases occurred while the injured employees were standing on the ladder, 26% while descending, and 14% occurred while ascending the ladder. Stated another way, more than half of the reported accidents took place while employees were working on the ladder and there were nearly twice as many descending

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accidents reported as there were ascending accidents overall.

General activities frequently performed at the time of the accident included plant or building maintenance and repair (25%), building construction (25%), vehicle or equipment repair and maintenance (18%), equipment construction and installation (7%), and production and operation (7%). Approximately 57% of the accidents occurred while using stepladders, 30% extension ladders, 10% straight ladders, and 4% other ladders such as job-made. Most of the ladders were reported to be made of wood and aluminum. Ladders made of fiberglass accounted for nearly one-fifth of the cases. Victims of ladder fall accidents tended to have limited on-the-job experience (e.g., 17% had less than 12-months' experience and 47% had less than five-years' experience) and were frequent ladder users (e.g., 75% reported using ladders at least once a week). Interestingly, most of the accidents took place around morning or lunch breaks (from 9 a.m. to 11 a.m. and noon to 1 p.m.) and before afternoon break (from 2 p.m. to 3 p.m.). Such a phenomenon indicates that fatigue and inattentiveness may play important roles in the occurrence of the accidents (see results from companion epidemiological study).

Nearly one third of the accident cases resulted in sprains and strains, especially to the back and spine. Fractures and contusions represented an additional one-third and one-quarter of the reported injuries, respectively. Injured body parts mostly involved the upper and lower extremities, i.e., arms, elbows, wrists, knees, and ankles. Sixty-eight percent of the cases resulted in lost workdays, with an average of 24.15 days lost per lost workday case. Consequently, ladder fall accidents reported to hospital emergency rooms tended to be of reasonably high severity.

Table 1 shows the various categories of ladder fall accidents and the percentage of cases related to each category. The remainder of this report discusses the various ladder fall accident scenarios. An example of a coded narrative is provided after the description of each accident pattern. This is followed by some conclusions and recommendations warranted by the data and confirmed by available literature.

OVERREACHING (23 CASES)

Reaching overhead or overextending oneself beyond the rail of the ladder was the most common accident pattern across all ladder types, accounting for 19% of the cases — the

TABLE 1
LADDER FALL ACCIDENT PATTERNS

Reported Accident Pattern	Number of Cases (% Total Cases)
Overreaching	23(19%)
Slips on Rungs	17(14%)
Missteps on rungs	12(10%)
Failure of Ladder Structure	11(9%)
Being Struck by or Attempting to Catch/ Avoid Falling Objects	10(8%)
Applying Excessive Force	9(7%)
Leaning Step Ladders Against Structure	9(7%)
Transitioning Onto or From Ladders	8(6%)
Standing on Top Rung	7(6%)
Other Miscellaneous Ladder Fall Accidents	17(14%)
TOTAL	123(100%)

highest percentage among all ladder fall accident patterns. Such overreaching behavior often resulted in the shifting of the ladder user's body weight, loss of balance of the ladder or of the victim, and, in turn, falls from the ladders. Areas inadequate for appropriate ladder setup (e.g., confined work areas) were often the reason reported for overreaching and overextending. Such a condition tends to force employees to work in an awkward and uncomfortable position and, thus, any slight motion could easily throw them off balance. One injured employee's fall was the consequence of the combination of lifting objects above his shoulders and shifting his body weight from one foot to the other on the ladder. Other accident events which occurred in the process of overreaching included sudden release of objects or parts the injured employee was repairing, handling objects with both hands, unstable ladders, insufficient height of the ladder, using ladders without safety feet, and uneven floors. Several victims also reported not wearing appropriate footwear or not being properly trained to use ladders. One of the accidents may not have taken place if the co-worker who was securing the ladder did not leave to obtain equipment parts. Most of the injured employees involved in overreaching type ladder falls suffered contusions and sprains to upper body parts, such as their head, back, and shoulders.

Example of case:

Injured employee(s) who was standing on extension ladder(s) which was leaning against side of building (not elsewhere classified — (NEC) was located at church/synagogue. Injured employee(s) was performing plant\building maintenance/repair activity. Injured employee(s) was replacing light bulb(s) which was in light fixture(s) which was on side of building (NEC). Injured employee(s) was using both hand(s) to remove lens of light fixture(s) from light fixture(s). Injured employee(s) leaned beyond right rail of extension ladder(s). Extension ladder(s) slid to left side. Injured employee(s) lost balance. Injured employee(s) fell distance of 11 feet to ground. Right trunk of injured employee(s) struck against ground. Incident resulted in fracture to two rib(s). Light fixture(s) which was on wall(s) of church/synagogue was located distance of 15 feet from ground. Ground was covered with gravel. Extension ladder(s) was aluminum.

SLIPS ON RUNGS (17 cases)

Slips on rungs while descending accounted for 14% of the investigated cases. Most of the cases where the employee slipped on rungs involved extension ladders and stepladders. Adverse environmental conditions such as rain or snow were usually present at the accident site. Injured employees slipped on wet rungs or rungs covered with mud or ice. Sometimes, slips were the consequence of injured employees' footwear which had been worn in water, oil, or mud prior to the occurrence of the accident. One of the slip-on-rung accidents was specifically associated with the configuration of an extension ladder. An injured employee slipped on the overlapping rungs of two ladder sections. Most of the injured employees suffered fractures and contusions to, not surprisingly, their upper and lower extremities such as arms, wrists, ankles, and knees. Such injury patterns were often the result of slipping on the ladder rungs and attempting to catch themselves during such slips.

Example of case:

Injured employee(s) who was on stepladder(s) which was next to coal hopper was located at coal preparation center. Injured employee(s) was performing research/testing activity. Injured employee(s) was monitoring condition of coal in coal hopper. Injured employee(s) slipped on rung(s) of stepladder(s). Left leg(s) of injured employee(s) slid through rung(s) of stepladder(s). Knee(s) of injured employee(s) twisted. Knee(s) of injured employee(s) was injured by involuntary bodily motion. Incident resulted in sprain to left knee(s). Knee(s) of injured employee(s) had been injured previously. Stepladder(s) was covered with dust. Position of injured employee(s) was awkward. Injured employee(s) was overweight. Area which was next to coal hopper was confined.

MISSTEPS ON RUNGS (12 CASES)

Ten percent of the ladder fall accidents resulted from a misstep on the rung of a ladder

while descending. Injured employees were frequently carrying tools or materials (e.g., hammers, plywood, boxes, etc.) at the time of the accident and consequently were struck by such tools or materials during their falls. Missteps were often reported to result from employees' rushing, wearing inappropriate footwear (e.g., athletic shoes), and stepping on tools left on ladder rungs by co-workers. Once again, the overlapping rungs of an extension ladder, which were 6 inches apart from each other, were associated with one accident. It is also interesting to note that a few employees still misstepped on ladder rungs even though shoes with slip-resistant soles were reportedly worn at the time of the accident.

Example of case:

Injured employee(s) who was on job-made ladder was located at construction site. Injured employee(s) was performing material handling activity. Injured employee(s) was descending job-made ladder. Injured employee(s) was using right hand(s) to hold jack hammer(s). Injured employee(s) was using left hand(s) to hold bit and job-made ladder. Injured employee(s) attempted to step down rung(s) of job-made ladder. Injured employee(s) misstepped on rung(s) of job-made ladder. Injured employee(s) fell sideways toward ground. Injured employee(s) threw jack hammer(s) and bit from area of self. Injured employee(s) struck against ground. Incident resulted in contusion to right shoulder(s) and contusion to right elbow(s). Left shoulder(s) of injured employee(s) was struck by falling jack hammer(s). Incident resulted in contusion to left shoulder(s). Weight of jack hammer(s) was 30 pound(s). Weight of bit was 10 pound(s). Job-made ladder was wooden.

FAILURE OF LADDER STRUCTURE (11 CASES)

Falling from ladders with defective or loose parts accounted for 9% of the investigated cases. For instance, loose securing pins, broken hinges, broken rails (especially rear rails of stepladders), or broken rungs (usually made of old wood), and bent aluminum rails were the types of structural defects often mentioned. One interesting accident profile involved use of a disposed ladder. Negligence with respect to instituting appropriate disposal procedures apparently contributed to the occurrence of the accident.

Example of case:

Injured employee(s) who was standing on top section of extension ladder(s) which was leaning against wall(s) of pit was located at waste dump. Injured employee(s) was performing production/operation activity. Injured employee(s) was operating control(s) (NEC) of trash compactor. Injured employee(s) attempted to climb extension ladder(s) to monitor garbage which was in trash compactor. Section of extension ladder(s) began to slide down wall(s). Injured employee(s) fell between rung(s) of extension ladder(s). Hand(s) of injured employee(s) was caught between extension ladder(s). Incident resulted in avulsion to fingernail. Section of extension ladder(s) did not have safety feet. Injured employee(s) was working overtime. Wall(s) was concrete. Garbage was covering area which was next to control(s)(NEC) of trash compactor. Extension ladder(s) was defective. Extension ladder(s) had been cut in two piece(s) to dispose of extension ladder(s). Extension ladder(s) was wooden.

BEING STRUCK BY OR ATTEMPTING TO CATCH/AVOID FALLING OBJECTS (10 CASES)

Accidents falling into this category were usually not reported to be the direct consequence of using ladders. Injured employees frequently lost balance in an attempt to avoid dislodging of hand tools or objects (e.g., tree limbs, falling signs, beams, ducts, etc.) sometimes dropped by co-workers. Falls due to releasing hands from rails often occurred when injured employees tried to catch falling objects (e.g., light bulbs or extension cords). One injured employee was reported to be struck by an automatic garage door which opened unexpectedly while he was painting it.

APPLYING EXCESSIVE FORCE (9 CASES)

Sudden shift of the center of gravity due to injured employees' applying excessive

force (e.g., forcefully pushing or pulling boxes or hand tools) and the sudden release or slip of the object as a result of such force were triggering factors in this type of ladder fall accident. Hand tools commonly used included wrenches, crowbars, powered drills, and rebars. Additional factors which precipitated the occurrence of such accidents included overreaching, wearing shoes with high heels, inadequate work space, and slipperiness of ladder rungs.

LEANING STEPLADDER AGAINST STRUCTURE (9 CASES)

Using a stepladder inappropriately as an ordinary straight ladder was a typical behavior pattern involved in this type of ladder fall accident. Injured employees often leaned stepladders against the side of a building structure as they would straight ladders. Consequently, any slight motion would result in the rails of the ladder either sliding down the wall or slipping on the floor. One of the injured employees leaned the ladder against a post, which is obviously not a safe point of support for any ladder, not to mention a stepladder used as a straight ladder. Other factors, directly or indirectly, contributing to the occurrence of the accident included areas inadequate to set up a stepladder, unavailability of an appropriate ladder type (e.g., straight ladders or extension ladders) using ladders not equipped with safety feet, and the slipperiness of the floor due to precipitation or the finish of the flooring surface.

Example of case:

Injured employee(s) who was standing on fourth rung(s) of stepladder(s) which was leaning against round post(s) was located at service island of a gas station. Injured employee(s) was performing equipment construction/installation activity. Injured employee(s) was hanging sign(s). Injured employee(s) was using hammer(s) and chisel(s). Injured employee(s) stopped to rest. Injured employee(s)' weight shifted. stepladder(s) slid sideways. Injured employee(s) lost balance. Injured employee(s) fell sideways distance of 4 feet onto pavement. Head of injured employee(s) struck against ground. Incident resulted in sprain to neck and contusion to head. Service island of gas station was not adeqaute to properly set up ladder(s). Stepladder(s) had not been secured. Straight ladder(s) was not available. Stepladder(s) was aluminum. Pavement was concrete.

TRANSITIONING ONTO OR FROM LADDER (8 CASES)

A horizontal force created by transitioning onto or from ladders was often the primary reason for ladders overturning or moving. In addition, the combination of such a force and the fact that the injured employee did not secure the top or bottom of a straight ladder or used a wrong type of ladder (e.g., a stepladder instead of a straight ladder) often resulted in the occurrence of this type of accident. Climbing from the ladder onto an unstable structure or jumping from the ladder to the ground were also accident scenarios often mentioned. Another common scenario involved missteps while dismounting from the ladder to the ground, which often resulted in sprains or strains of the ankles or knees. The environmental conditions of the accident site were often reported to be inadequate, i.e., confined space, inadequate lighting, or surface slipperiness.

Example of case:

Injured employee(s) was located on roof of medical products manufacturing plant which was in building(NEC). Injured employee(s) was performing equipment construction/installation activity. Injured employee(s) attempted to mount stepladder(s) which was standing next to roof of building(NEC). Injured employee(s) stepped from roof of building(NEC) onto stepladder(s). Stepladder(s) overturned. Injured employee(s) lost balance. Injured employee(s) fell from roof of building(NEC) onto ground. Injured employee(s) struck against ground. Incident resulted in fracture to back. Extension ladder(s) was not available. Coworker(s) had set up stepladder(s). Height

of stepladder(s) was not adequate. Floor of building(NEC) was concrete. Stepladder(s) was wooden.

STANDING ON TOP RUNG (7 CASES)

Accidents in this category usually took place while injured employees attempted to descend from the top rung of the ladder. Ladders consequently shifted or slid as soon as the injured employees moved or stepped down onto the next rung. Unfortunately, the lack of handhold due to standing on the top rung of the ladder eliminated any opportunity for the injured employees to break their fall. In some cases, factors such as overreaching, using ladders without safety feet or any other securing devices, and using defective ladders also contributed to the accident. It was also found that some injured employees stood on the top rung of the ladder because the height of the ladder was insufficient and the appropriate ladder for the job was not available. The best solution to this problem is to provide all necessary equipment for the job. The following example depicts a ladder fall accident resulting from the combination of standing on the top rung of the ladder and some other accident patterns previously described, including overreaching, leaning a stepladder against a structure, and using a defective ladder.

Example of case:

Injured employee(s) who was standing on top rung(s) of stepladder(s) which was leaning against duct of air conditioner was located at retail store. Injured employee(s) was performing material handling activity. Injured employee(s) was putting object(NEC) onto shelf. Injured employee(s) was reaching upward to move object(NEC) which was on shelf(s). Injured employee(s) pushed object(NEC) which was on overhead shelf(s). Stepladder(s) which was leaning against duct of air conditioner slid. Injured employee(s) lost balance. Injured employee(s) struck against object(NEC) which was attached to shelf(s) and stepladder(s) lying on floor. Incident resulted in fracture to right wrist(s) and injury (unknown — UNK) to back. Floor was concrete. Duct of air conditioner was slippery. Rail of stepladder(s) had been cut previously. Length of rail(s) of stepladder(s) were not even. Stepladder(s) was not stable. Stepladder was wooden.

OTHER MISCELLANEOUS LADDER FALL ACCIDENTS

An additional 17 investigated cases resulting in ladder fall accidents did not fit into any of the primary fall accident categories described above. They are summarized as follows:

Falls from ladders due to unevenness or slipperiness of the surface where ladders were set up accounted for six reported cases. The ground was either too soft to hold the weight of the ladder or was covered with snow, mud, or a slippery floor finish. Ladders not equipped with safety feet were also a triggering factor in such accidents.

Means of securing ladders also played a vital role in the occurrence of several ladder fall accidents. The consequence of co-workers releasing ladders, which accounted for two reported cases, could be worse than using ladders with no safety securing device at all. Other causes of ladder fall accidents included excessive angle of inclination, breathing of toxic fumes or vapors present in the work area, using ladders with rear rail removed, not wearing personal protective devices (e.g., fall arresters), and not properly securing the top section of an extension ladder which slid down while the injured employee was on it.

CONCLUSIONS AND RECOMMENDATIONS

The accident scenarios described in this article repeatedly involved significant factors and precipitating events which were shared in common. This finding strongly suggests that, regardless of accident scenario, guidelines and principles can be developed on the basis of such commonality to eliminate or at least reduce to some extent the occurrence of ladder falls. General guidelines and possible solutions to ladder accident problems identified in the scenario analysis and available literature are as follows.

Choosing the Right Equipment

Generally speaking, a portable ladder is a piece of rather hazardous equipment, compared with elevated work platforms or scaffolds. For example, work which requires frequent lateral motions or two hand operations makes a ladder an unsuitable working device. Falls from ladders due to overextending beyond the rail of the ladder, applying excessive force, or using portable powered hand tools are typical cases of choosing the wrong equipment since the exertion of such a force could easily upset the stability of the ladder. Fatigue and inattentiveness resulting from working for a prolonged period of time on the ladder or repeatedly climbing from one level to another can be minimized if elevated platforms or scaffolds are made available. In general, ladders should only be used for minor repairs which can be done in a short period of time.

Another one of the common behavioral errors workers make is to use ladders for purposes not anticipated in design, e.g., use of ladders as braces, platforms, hoist supports, etc. In some cases, the failure of such a structural arrangement contributes to the occurrence of ladder fall accidents. When jobs require transitioning between different levels, fixed ladders, stairways, or stairs with handrails are a safer means of access than portable ladders, especially if such transitioning is performed frequently. Thus, workers can devote their attention to other matters rather than those specifically associated with use of a portable ladder. In addition, workers in an area which is too confined to set up a ladder with an appropriate angle of inclination should consider using other equipment instead of risking their personal safety.

Safe Use of Ladders

Choosing Ladders. Choosing the right type of ladder is the first and most important step toward safe ladder use. Using a stepladder as a straight ladder by leaning it against a wall or other building structure is a behavioral pattern identified in numerous accident profiles. Such unsafe practices often cause ladders to slip or fall because of the lack of securing devices. Another example of using the wrong ladder which was frequently associated with accidents took place while injured employees attempted to reach overhead due to the inadequate height of the ladder. However, it should be noted that such a behavioral pattern is not necessarily always the injured employees' fault. The availability of appropriate ladders was often the origin of such accidents.

Materials chosen for ladders should depend on the conditions under which they are to be used. Wooden ladders tend to warp, split or rot, and are combustible, which could potentially result in the collapse of the ladder structure and, in turn, the occurrence of fall accidents. Thus, a wooden ladder used for conditions which may expose a ladder to frequent changes of atmospheric humidity may not be a wise decision. Steel or aluminum ladders are largely unaffected by temperature and humidity. However, they have high thermal and electrical conductivity, which could be intrinsically deadly under certain work environments. In addition, steel ladders need to be regularly painted (with a rust proofing compound if used outdoors). The ladder should be constructed in accordance with established standards, recommendations, and regulations (e.g., 29 CFR 1910, Subpart D) to minimize the potential of fall accidents due to structural failure of the ladder.

Setting up Ladders. The ladder should always be placed in an area which is free of traffic or other potential risk of being knocked over. Placing the ladder against a garage door, as described in one of the accident profiles, is an example which violates such a basic guideline. The ladder should also be placed on firm and level ground on which the base of the ladder has a good grip and no tendency to slip or sink. However, environmental factors, such as precipitation, often change the condition of the ground surface and, in turn, the friction between the feet of the ladder and the ground. Under such circumstances, additional measures for securing ladders should be utilized whenever possible. Using ladders fitted with retaining hooks, lashing ladders to the point of support at the top, or footing the ladder with cleats or wooden battens fixed onto the floor are ways to prevent ladders from slipping or falling.

In addition to the safe base for a ladder, the angle of inclination and upper point of contact are two major factors which determine safe ladder placement. The top of the ladder should be placed against a flat and firm structure with both rails resting securely. Placing the ladder at least 3 feet above the point of support provides an adequate handhold for ladder users. Placing a ladder too straight up or too sloping, or against a post would potentially result in the top of the ladder falling backward or the feet of the ladder sliding. The appropriate angle of the inclination has been the subject of some previous studies. However, the recommended angles, such as 75^{o} by Occupational Safety and Health Administration (OSHA) or 70^{o} and 71.9^{o} by Dewar (1976), and Irvine and Vejvoda (1977), respectively, are difficult to apply in actual practice in the work place. Therefore, Irvine's study recommends a technique used by the National Fire Prevention Association (NFPA) Fire Service Training Committee for safe individual ladder setup instead of adopting a specific angle. This method calls for standing erect with the toes abutting the ladder rails and extending the hands outright. If the hands fall on the ladder rung at shoulder height in a grasping position, the proper angle of inclination has been determined. However, sometimes the improper angle is the consequence of a confined work area or using a ladder which is too short or too long for the job. In such cases, other equipment, such as scaffolds or work platforms, may be a better choice than ladders.

Working on Ladders. The ladder has been used as a means of access for hundreds of years. Consequently, there is a mistaken impression, shared by most people, that no special knowledge is required to use a ladder. However, as indicated by Rosen (1983), ladders are simple devices, and yet the simplicity of design is where much of the origin of ladder falls rests; that is, the design does not anticipate or provide for reaching out, turning, side movements, etc., which are types of body motions reasonably foreseeable in ladder use. Such a phenomenon is, once again, confirmed by the fact that more accidents investigated in this study took place while injured employees were working on ladders than during ascending or descending. Therefore, knowledge of safe practices when working on ladders is essential for workers prior to use of ladders. The basic rule of thumb for reaching is that the buckle of the worker's belt should always stay within the rails. However, the effectiveness of such rules or any training is usually limited. Furthermore, "no overreaching" usually means descending a ladder, moving it to a suitable location, and ascending again — a procedure relatively bothersome for most people. Some effort, however, has been made toward recommendations for the ergonomic redesign of ladder rungs (e.g., rung surface composed of an elastic material, attaching rungs at a gentle curve to rails) in an attempt to facilitate workers' tactual feedback for allowable reach extension and foot balance of a ladder (Dewar, 1976).

Standing on the top rung of the ladder sometimes is the consequence of using ladders of insufficient height. Such a posture often moves the worker's center of gravity too far to the rear and the worker often falls backward when losing balance. However, it is believed that some modifications of the ladder design can be done in addition to using a ladder with adequate height. For example, painting the top three rungs a different color as a reminder to workers or redesigning top rungs such that they look different from other rungs and are obviously not for foot stepping may be viable solutions. Of course, the structure of top rungs should be strong enough to withstand foot stepping if ladder users choose to use the top rung regardless of the potential danger.

Facing away or jumping from the ladder when descending not only increases the danger of slipping or missing a rung, but also reduces the potential for recovering from a slip or misstep. This also applies when ascending or working on a ladder. Using shoes with slip-resistant soles could reduce the occurrence of many slips and missteps. However, safety shoes soiled with dirt, mud, or grease defeat the purpose of such footwear. Other personal protective devices, such as fall arresters, should be worn when climbing heights such as aerial and high voltage pylons. Carrying tools or materials in one's hands up and down the ladder was also the precipitating event identified in several accident profiles. Tools should be carried in

a holster attached to a belt or in a tool box, or even safer, hoisted or lowered on a rope. Such a practice also reduces the possibility of leaving tools on the steps or rungs which would potentially fall or be stepped on by ladder users.

Ladder Inspection/Maintenance

Regular inspection can prevent the occurrence of certain fall accidents resulting from structural failure of the ladder. A checklist containing all possible defects is an effective tool for ladder inspections and inventories on a regular basis. Defective ladders should be tagged, put away and serviced in an area separated from the equipment storage area. Ladders which are irreparable (e.g., with damaged rails) should be scrapped immediately; otherwise, such a ladder may be used by workers whenever a suitable ladder is not conveniently available.

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