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with more very important Transportation News!!****ATRI Survey Shows Drivers' CSA Concerns**

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Verification of Calibration for Direct-Reading Portable Gas Monitors

This Safety and Health Information Bulletin is not a standard or regulation, and it creates no new legal obligations. The Bulletin is advisory in nature, informational in content, and is intended to assist employers in providing a safe and healthful workplace.

Introduction

Gas monitoring instruments are designed to protect personnel from unseen hazards that may exist in workplace environments, including confined spaces. It is vital to worker safety that these instruments are maintained and calibrated properly.

Instrument inaccuracy due to improper or irregular calibration can lead to serious accidents. Exposure to excessive levels of toxic gas or an oxygen-deficient environment can cause workers serious illness and even death. Combustible gas explosions are often catastrophic, injuring or killing personnel and destroying property.

The International Safety Equipment Association (ISEA), founded in 1933, is a trade association for manufacturers of protective equipment, including environmental monitoring instruments. The ISEA recommends, at a minimum, verification of sensor accuracy before each day's use.

The only way to guarantee that an instrument will detect gas accurately and reliably is to test it with a known concentration of gas. Exposing the instrument to a known concentration of test gas will show whether the sensors respond accurately and whether the instrument alarms function properly.

Calibration: The Key to Accurate Readings

Gas detection instruments are used to detect the presence of toxic and combustible gases, as well as oxygen deficiency or oxygen enrichment (a fire and explosion hazard). Workers cannot rely on their sense of smell to alert them to odorless hazards, necessitating the use of gas detectors whenever a worker enters an area with potential atmospheric hazards.

"Calibration" refers to an instrument's measuring accuracy relative to a known concentration of gas. Gas detectors measure the concentration of a gas in an air sample by comparing the sensor's response to the response generated by a calibration gas of a known concentration. The instrument's response to the calibration gas serves as the measurement scale or reference point.

The responsiveness of electrochemical sensors will vary with environmental conditions. Sensor response will be different (lower or higher) depending on the actual environmental conditions. Therefore, as much as possible, the monitors should be calibrated at environmental conditions that are the same as (or similar to) actual field conditions. Calibration at locations where the equipment is to be used is always preferable.

Most instruments are equipped with two levels of alarms – warning and danger. The warning alarm alerts the user that the environment has a detectable concentration of gas and is therefore potentially hazardous. The danger alarm indicates that the gas concentration exceeds the programmed "hazard" threshold, and the area is approaching a hazardous level. Whether an instrument warns and/or alarms at the proper time depends on its detection abilities and its ability to translate its findings into an accurate reading.

If the instrument's reference point has shifted, the reading will shift accordingly and be unreliable. This is called "calibration drift" and it happens to all detectors over time. An instrument that experiences calibration drift can still measure the quantity of gas present but it cannot convert this information into an accurate numerical reading. Regular calibration with a certified standard gas concentration will update the instrument's reference point, ensuring that the instrument will produce continued, accurate readings.

Causes of Calibration Drift

Over time, the accuracy of gas detection instruments can diverge from their calibration settings in several ways:

- Gradual chemical degradation of sensors and drift in electronic components that occur naturally over time.
- Chronic exposures to, and use in, extreme environmental conditions, such as high/low temperature and humidity, and high levels of airborne particulates.
- Exposure to high (over-range) concentrations of the target gases and vapors.
- Chronic or acute exposure of catalytic hot-bead LEL sensors to poisons and inhibitors. These include: volatile silicones, hydride gases, halogenated hydrocarbons, and sulfide gases.
- Chronic or acute exposure of electrochemical toxic gas sensors to solvent vapors and highly corrosive gases.
- Harsh storage and operating conditions, such as when an instrument is dropped onto a hard surface or submerged in liquid. Normal handling/jostling of the equipment can create enough vibration or shock over time to affect electronic components & circuitry.

Often, after **exposure** to the more **extreme conditions** above, when **calibration is attempted**, the detector will either **display a failure message** or it will **not allow the user to fully adjust the display reading**. At this point, the **severely damaged sensor must be replaced** and/or the **detector serviced by qualified personnel**.

Worker Safety: The Number One Reason for Proper and Regular Calibration

The **primary reason** for **proper, regular instrument calibration** is to **prevent inaccurate gas concentration readings** that could **lead to injury or to death**. Correctly **calibrating an instrument** helps to ensure that the instrument will **accurately respond** to the **gases** that it is **designed to detect**, warning users of **hazardous conditions** before they **reach dangerous levels**. In **addition to detecting and correcting for calibration drift**, regular calibration assures the user that the **instrument is functional**.

Gas detection instruments are **often subjected to harsh operating and storage conditions** where they can be **damaged**. Both of these factors can **affect instrument performance**, leading to **inaccurate readings** or even **instrument failure**.

While a unit may **appear to be sound** during a visual inspection, it **actually could be damaged internally**. **Regular calibration** is the only **way to be certain** that a detector is **fully functional**. Moreover, a **standing policy for regular calibration** sets the tone for a **safety-conscious work environment** and indicates to workers that **safety is a priority**. As a result, workers **may be more likely to keep safety principles** in mind throughout the workday.

A **written record of calibration** should be kept for the **life of each instrument**. This record **allows users to quickly identify an instrument** that has a **history of excessive maintenance/repair** or is **prone to erratic readings**.

Bump Tests vs. Full Calibration

There are **two methods of verifying instrument accuracy**: a **functional or bump test** and a **full calibration**, each **appropriate under certain conditions**.

A **bump test verifies calibration** by exposing the instrument to a **known concentration of test gas**. The instrument reading is **compared to the actual quantity of gas present** (as indicated on the cylinder). If the instrument's response is **within an acceptable tolerance range** of the **actual concentration**, then its **calibration is verified**. (*Note: It is recommended that users check with the detection equipment manufacturer for the acceptable tolerance ranges.*)

Instruments should be "**zeroed**" before the bump test in order to give a **more accurate picture** of the bump test results. When performing a **bump test**, the test gas concentration **should be high enough to trigger the instrument alarm**. If the bump test results are **not within the acceptable range**, a **full calibration** must be performed. A **full calibration** is the **adjustment of the instrument's reading to coincide** with a known concentration (generally a certified standard) of test gas.

For **verification of accuracy**, calibration gas should **always be certified** by and **traceable to the National Institute of Standards and Technology (NIST)**. In most cases, a **full calibration** is only necessary when an **instrument fails a bump test** or after it has been serviced. The **full calibration and bump test** should be conducted in a **clean fresh air environment**.

When to Bump Test and When to Calibrate

In the past, there often has been **confusion** regarding **proper calibration procedures and frequency**. To clarify this issue, the **International Safety Equipment Association (ISEA)** issued a position statement on instrument calibration that states, "**A bump test or full calibration of direct-reading portable gas monitors should be made before each day's use in accordance with manufacturer's instructions, using an appropriate test gas.**" If the instrument **fails a bump test**, it must be **adjusted through a full calibration** before it is used.

ISEA recommends **more frequent testing** if environmental conditions that could affect instrument performance are **suspected, such as sensor poisons**. The **ISEA** allows for **less frequent calibration verification** under certain conditions (see below), but the **interval between testing should never exceed 30 days**.

According to the **ISEA**, less frequent verification **may be appropriate** if the **following criteria are met**:

- *During a period of initial use of at least 10 days in the intended atmosphere, calibration is verified daily to ensure there is nothing in the atmosphere to poison the sensor(s). The period of initial use must be of sufficient duration to ensure that the sensors are exposed to all conditions that might adversely affect the sensors.*
- *If the tests demonstrate that no adjustments are necessary, the interval between checks may be lengthened, but it should not exceed 30 days.*
- *When calibrating an instrument, always follow the instrument user's manual for the manufacturer's recommended calibration frequency and procedure.*

Calibration Rules

The **following** are a **few basic instrument calibration rules** to ensure a **clear path to health and safety**.

- *Follow the manufacturer's guidelines for proper calibration.....*
- *Only use certified calibration gas before its expiration date.....*
- *Train workers on the proper methods of calibration.....*

Conclusion

There is an **inherent risk** in many workplaces of **injury or illness** from **respiratory hazards** such as **oxygen deficiency** and the **presence of toxic gases**. Detection technology and products **exist to minimize such risk**. **Properly verifying the accuracy** of gas detection equipment **before each day's use** will help to ensure that each worker **finishes the job safely**.

Visit [OSHA](#) for additional information regarding "**Calibration Rules**" and **links to related sites**.

On-Line Resources:

[International Safety Equipment Association](#)

ATRI Survey Shows Drivers' CSA Concerns

The American Transportation Research Institute (ATRI) released a report detailing the extent to which **CSA** has exerted an influence on the daily lives of commercial drivers.

ATRI's report also describes and analyzes driver attitudes toward and comprehension of **FMCSA's** new



regulatory program, based on survey data collected from 4,555 U.S. truck drivers.

While findings reveal that truck drivers continue to have a **myriad of concerns** related to **CSA**, ATRI discovered that drivers **may not have a solid understanding** of what **CSA** is and does.

Nearly **80% of drivers surveyed** said they believed the **FMCSA's CSA** system would not reduce the **number of truck-involved crashes**, according to ATRI. In addition, more than 98% of drivers **could not correctly identify** which five **Behavioral Analysis and Safety Improvement Categories (BASICs)** scores are publicly available.

Among the findings, **over 77 percent of drivers incorrectly believe** that a trucking company **inherits past violations** from new hires. **Job security concerns still exist**, with **nearly two-thirds** of drivers somewhat or **extremely concerned** that they will **lose their jobs as a result of CSA**.

Other survey findings:

- *About 22% said safety awareness had increased among their peers, 10% reported a decrease in safety behaviors and 68% observed no changes.*
- *One in four said they refused to drive less well-maintained vehicles since the **CSA** program began in December.*
- *More than 83% expected the **CSA** program to exacerbate the driver shortage.*
- *About 25% expected take-home pay to be reduced as a result of **CSA**, while only 20% expected pay to increase.*

Other myths identified:

- *87% of drivers falsely believed that traffic tickets and convictions are part of **FMCSA's** safety measurement calculations.*
- *68% of drivers incorrectly believed that **CSA** takes into account a driver's personal driving record.*

Conversely, more than 95% **realized** that **all violations** — and **not just** out-of-service violations — **count against drivers and carriers** under **CSA**, and 82% **were aware** a carrier **cannot remove violations** simply by **firing the responsible driver**.

These areas are **explored** in full depth, and **recommendations** are presented for enhancing driver knowledge and support through **multiple training and education sessions**, as well as other **sources of familiarization**.

ATA's Stephenson said the ATRI survey showed the **more educated drivers** are about **CSA**, the **more likely they are to support it**.

"**One session is probably just enough to scare the drivers** as to how this **could interfere** with their ability to **make a living**," he said, "**but multiple sessions can delve into the depths and really show how it can be a net win for a driver.**"

Stephen Keppler, executive director of the **Commercial Vehicle Safety Alliance**, said he was **not surprised by the results**.

"I think there's a **lot of effort going into education** of the program," Keppler told Transport Topics, "**but it's clear from the ATRI results that we still have a long ways to go**. There are a lot of people that I think **may still be in denial** about the program, **but it's here to stay.**"

Responses from about **60 owner-operators** who took the survey showed that **more than one-third** considered their **services to be requested less** since **CSA** began, and **23% reported higher post-CSA insurance rates**.

Norita Taylor, a spokeswoman for the **Owner-Operator Independent Drivers Association**, said, "We hear from our members **less and less often** over time **expressing concerns** about **CSA**, but as with any new system, **we are not surprised** that there is **still a learning curve taking place**."

FMCSA said it is **still reviewing the study** and "**is committed to continuing its educational outreach to drivers on the safety benefits**" of **CSA**. The agency also said it was **encouraged** that **drivers surveyed understood** many of the **critical aspects of the program**.

"**ATRI's study** clearly points out that motor carriers, state trucking associations and **FMCSA** **collectively** need to do **more to educate drivers** about **CSA** and what **it does and doesn't mean** for their jobs," commented Ed Crowell, Georgia Motor Trucking Association President and CEO.

"**CSA still represents a new and challenging government program**, with **varying degrees of understanding** throughout the **trucking community**," the survey concluded.

See the [ATRI CSA Driver Survey Report](#)

Changes Coming to CSA

It's been said all along that **Comprehensive Safety Accountability**, the electronic tracking and enforcement tool used by **FMCSA**, was a **work in progress**. And, true to the agency's word, **changes are coming**.

Whether you are a motor carrier or a driver, the **Federal Motor Carrier Safety Administration** is moving forward with some modifications to the **CSA** program.

Motor carriers

FMCSA has ranked motor carrier safety performance with a "**Carrier Safety Rating**" for years under the **SafeStat** system that **CSA** is in the **process of replacing**. Motor carriers would receive these ratings – and still currently do – **only after a compliance review**.

The **lengthy, manpower-intensive process** has resulted in **less than 4 percent** of the motor carriers in the United States ever being inspected and receiving a safety rating.

One of the **key components** of **CSA** from the start was to **identify at-risk motor carriers electronically** through **collected data**, eliminating the **majority** of need to go **on-site** with motor carriers, except for those with the **worse performance records**.

Assessing the safety performance of motor carriers is **done roughly on a monthly basis**. Motor carriers are **currently ranked in seven Behavioral Analysis and Safety Improvement Categories** – dubbed "**BASICs**" by **FMCSA**.

The agency is **getting ready to move forward** on a **rulemaking** that, if finalized, will **allow the agency's monthly updates to include the carrier safety rating**.

So, rather than **wait for the unlikely event of a compliance review**, motor carriers will have a **publicly distributed safety rating** that will determine their **ability to continue to operate**.

The **goal of the agency** was to **proceed this month** on the **rulemaking** granting the agency **authority to assess those safety ratings monthly**. To date, the **notice of proposed rulemaking** has not been sent to the **secretary of transportation** for approval.

Drivers

It's **not even a secret** that **FMCSA** wants to **rank drivers** in the **BASICs** as well. It has been a **part of the plan** since 2004 when **CSA** was announced. And the **methodology is already in place**.

The **problem, yet again**, for the agency is that current regulatory authority **does not allow** for the agency to **rank individuals** in the **BASICs**.

The **agency's intention** became **crystal clear** in a February 2011 GAO report to Congress, which clearly stated, "**FMCSA** is seeking to **gain new authority to regulate drivers** through the next **surface transportation reauthorization bill**; if it gains this authority, the **agency plans to make driver safety data public as well**."

True to the GAO report, a **leaked copy** of the Obama administration's **proposed highway bill** hit the streets. The **proposed bill included a complete section of regulatory directives targeted at drivers**. Within that section is a **proposed provision addressing CSA and driver enforcement**.

Detailed under the "**Driver Safety Fitness Ratings**" section is a **plan for individual drivers** to have a **safety score assigned to their compliance history**. While not expressly stated, it's **apparent that system would occur under Compliance Safety Accountability** – or the **CSA enforcement program**.

The **program is already set up to track driver performance** for use **exclusively by enforcement personnel**. However, this **adds the rating mechanism** and gives the **FMCSA** the authority to **disqualify drivers from driving because of poor ratings**.

Hazmat carriers.....(see related article below)

In the Aug. 3 **Safety Measurement System** release, **FMCSA** refined the criteria that **determines which motor carriers are subject** to the more **stringent hazardous materials intervention threshold**.

The **thresholds are ratings** in various **BASICs** that **determine when the agency will begin enforcement interventions** – anything from **warning letters to full on-site compliance reviews**.

Hazmat motor carriers are **traditionally held to a higher standard**, which in turn means they **face a lower BASIC threshold to trigger the interventions**.

Previously, the **hazmat threshold was applied to motor carriers** based solely on their **registration information** indicating they **transported any quantity of hazmat**. That meant some motor carriers that **weren't even carrying enough hazmat** for a placard were **facing the lower threshold**. Conversely, it **resulted in some carriers not being subjected to the lower threshold that should have been**.

The **hazmat threshold now applies to motor carriers that transport placardable quantities** of hazmat based on **operational evidence**. These are motor carriers that **meet one of the following criteria**:

- ▶ Inspection in the past 24 months where the motor carrier was identified as carrying placardable quantity of hazmat;
- ▶ Review or safety audit in the last 24 months where the motor carrier was identified as carrying placardable quantity of hazmat; or
- ▶ Motor carrier has a hazmat permit.

FMCSA Redefines Hazmat Interventions

"The intent of the revised definition is to apply lower thresholds to carriers transporting placarded quantities of HM (generally 1,001 pounds or more of most HM)," wrote Rob Abbot, vice president of Safety Policy at the American Trucking Associations.

Abbot said that, previously, even carriers hauling small quantities of more benign materials, such as household paint, were subject to the threshold.

The new intervention threshold now applies to motor carriers that transport placardable quantities of HM based on operational evidence. However Abbott says the new definition still falls short.

"We understand the logic behind excluding carriers that haul very small quantities of less egregious HM from the HM carrier definition, But the new definition needs improvement. For instance, a carrier that hauled a single placarded load in the past 24 months is now considered an HM carrier and subject to the lower intervention thresholds."

"Intuitively, these are not the carriers FMCSA had intended to label as HM carriers, since they do not regularly haul commodities that could contribute to crash severity. Instead, the agency should consider taking frequency into account."

Court Throws Out EOBR Rule

The **Federal Motor Carrier Safety Administration's** electronic onboard recorder 2010 final rule for motor carriers with significant hours-of-service violations does not protect truck drivers from potential harassment by their employers, a federal appeals court has ruled.

Siding with three truck drivers and the Owner Operator Independent Drivers Association, a panel of the 7th U.S. Circuit Court of Appeals on Aug. 26 vacated and remanded the rule back to the agency for further proceedings.

The appeals court said the agency's EOBR mandate for carriers with past HOS problems, set to go into effect in June 2012, does not adequately address or ensure that carriers could not use the devices to force drivers to stay on the road even when they are tired.

"The agency needs to consider what types of harassment already exist, how frequently and to what extent harassment happens, and how an electronic device capable of contemporaneous transmission of information to a motor carrier will guard against (or fail to guard against) harassment," the court said.

Although the court decision specifically addresses the 2010 final rule, FMCSA also will also likely have to bring into compliance its Jan. 31 proposed rule mandating that nearly all motor carriers equip their trucks with EOBRs, said Robert Digges, vice president and chief counsel for American Trucking Associations.

The agency has said it expects to issue the final rule for nearly all carriers by June of 2012, but will give truckers three years to comply after it becomes final.

"I think that the general direction by Congress to consider the issue of driver harassment is applicable to that rulemaking as well as the earlier one," Digges said.

Todd Spencer, executive vice president of OOIDA, said an analysis conducted by FMCSA had said that "companies use EOBRs to enforce company policies and monitor drivers' behavior in other ways."

"They can contact the driver and put on pressure to get back on the road to get the most of his or her on-duty time, regardless of how fatigued a driver may be," Spencer said in a statement. "Such a mandate would be a step backward in the effort toward highway safety and is an overly burdensome regulation that simply runs up costs for the majority of trucking, which is small-business."

After the ruling, FMCSA Communications Director Candice Tolliver Burns said that the FMCSA "is committed to raising the bar for commercial truck and bus safety." She said the court's decision is under agency review.

American Trucking Associations CEO Bill Graves said in a statement that ATA is still reviewing the court's decision, but supports FMCSA's efforts to mandate the adoption and use of electronic logging devices for hours-of-service compliance. "We hope FMCSA will work quickly to address the Court's decision and the important device design and performance specifications being evaluated by the Administrator's Motor Carrier Safety Advisory Committee," Graves said.



ATA Says FMCSA's Strategic Plan Doesn't Go Far Enough in Addressing Crashes

In comments filed July 29, American Trucking Associations said that the **Federal Motor Carrier Safety Administration's** draft **Five-Year Strategic Plan** "represents a genuine effort on the part of the agency to listen to, and incorporate, the recommendations of stakeholders," however, ATA went on to tell the agency that, while a good start, the plan does not do enough to address the root causes of crashes.

"ATA commends FMCSA for acknowledging the need to address all entities that affect truck and driver safety in the transportation life cycle, especially the operators of passenger vehicles with which trucks share the road," ATA wrote in its comments. "However, while the draft plan addresses these issues, it falls far short in that it does not identify the primary causes of crashes and prioritize countermeasures and solutions accordingly."

"ATA recognizes that FMCSA's primary role is to regulate the trucking industry. However, the agency's mission is to reduce truck crashes," ATA said. "While the goals identified in the draft plan are certainly laudable, it is appropriate to align these goals with the agency's overarching object: to reduce truck crashes."

By minimizing the emphasis on addressing passenger vehicle driver behavior, "FMCSA will, at best, only impact the minority of truck crashes – perhaps less than 30% - caused by truck drivers."

Read ATA's full comments [here](#)

Fatality Prevention - Rules to Live By

"Rules to Live By" is an initiative to improve the prevention of fatalities in mining. Through a first phase of industry outreach and education followed by enhanced enforcement, the focus will be on **24 frequently cited standards** (11 in coal mining and 13 in metal/nonmetal mining) that cause or contribute to fatal accidents in the mining industry in **9 accident categories**.



In 2009, mining fatalities fell to an all-time low for the second straight year. While the mining community achieved a record-setting low of **34 mining deaths** in the United States and has seen a significant decline in fatal mining accidents during the past 10 years, too many miners still lose their lives in preventable accidents.

The loss of even one miner causes devastation and pain to the victim's family and friends. From CY 2000 - 2008, **589 miners lost their lives**, mostly in single and double fatality accidents.

MSHA analyzed these fatal accidents to identify conditions and practices that contributed to the **589 deaths**, safety standards violated, root causes, and abatement practices. MSHA's analysis identified **24 standards** - 13 in metal and nonmetal mining and 11 in coal mining - frequently cited in fatal accident investigations. These violations fell into 9 different categories.

The nine accident categories are:

- Falls from Elevation
- Falls of Roof and Rib
- Operating Mobile Equipment (Surface)
- Operating Mobile Equipment (Underground)
- Maintenance
- Lock and Tag Out
- Struck by Mobile Equipment (Surface)
- Struck by Mobile Equipment (Underground)
- Blocking Against Motion

Many miners over the years have lost their lives in these types of accidents. All of us - MSHA, mine operators, contractors, miners' representatives and miners - must focus on why these accidents happen and how to stop them.

MSHA will provide operators program and resource information, such as engineering suggestions, and reach out to miners and miners' representatives during inspections to ensure that mine operators and miners have information to address and eliminate workplace hazards.

Compliance with safety and health standards is the responsibility of mine operators. While MSHA supports education and outreach efforts to assist the mining industry in improving mine safety and health, MSHA is charged with ensuring consistent and strict compliance with safety and health standards, and expects operators to foster a culture of zero tolerance for violations in their operations, including violations by contractors. Please share this information with all of your members and constituents.

MSHA has compiled reference material on this page to help operators, contractors, supervisors, miners' representatives, miners, and other members of the mining community to focus on these **24 standards and 9 categories** and improve safety and health in America's mines.

We believe it is possible to eliminate fatalities in our nation's mining industry, and working together we can accomplish that. We look forward to working with you to make that happen.

Rules to Live By I: Fatality Prevention – focuses on 24 frequently cited standards (11 in coal mining and 13 in metal/nonmetal mining) that cause or contribute to fatal accidents in the mining industry in 9 accident categories.

Rules to Live By II: Preventing Catastrophic Accidents – focuses on 9 standards which were cited during major disasters over the last 10 years, and which contributed to 5 or more fatalities.

RLB-II was developed from data gathered by reviewing accidents that resulted in five or more fatalities, as well as incidents caused by fires or explosions that potentially may have resulted in more fatalities.

The accident categories for RLB-II are:

- | | |
|---------------------|------------|
| Mining Methods | Explosions |
| Aftermath of a Fire | Exams |

OSHA'S MATERIALS HANDLING STANDARD

Handling and storing materials involves diverse operations such as hoisting tons of steel with a crane, driving a truck loaded with concrete blocks, manually carrying bags and material, and stacking drums, barrels, kegs, lumber, or loose bricks.

The efficient handling and storing of materials is vital to industry. These operations provide a continuous flow of raw materials, parts, and assemblies through the workplace, and ensure that materials are available when needed. Yet, the improper handling and storing of materials can cause **costly injuries**.

Workers frequently cite the weight and bulkiness of objects being lifted as major contributing factors to their injuries. In 1990, back injuries resulted in 400,000 workplace accidents. The second factor frequently cited by workers as contributing to their injuries was body movement. Bending, followed by twisting and turning, were the more commonly cited movements that caused back injuries. Back injuries accounted for more than 20 percent of all occupational illnesses, according to data from the National Safety Council.

In addition, **workers can be injured by falling objects, improperly stacked materials, or by various types of equipment.** When manually moving materials, however, workers should be aware of potential injuries, including the following:

- *Strains and sprains from improperly lifting loads, or from carrying loads that are either too large or too heavy.*
- *Fractures and bruises caused by being struck by materials, or by being caught in pinch points; and*
- *Cuts and bruises caused by falling materials that have been improperly stored, or by incorrectly cutting ties or other securing devices.*

Since numerous injuries can result from improperly handling and storing materials, it is important to be aware of accidents that may occur from **unsafe or improperly handled equipment and improper work practices,** and to recognize the methods for eliminating, or at least minimizing, the occurrence of those accidents. Consequently, employers and employees can and should **examine their workplaces to detect any unsafe or unhealthful conditions, practices, or equipment** and take the necessary steps to correct them.

METHODS OF PREVENTION

General safety principles can help reduce workplace accidents – These include work practices, ergonomic principles, and training and education. Whether moving materials manually or mechanically, employees should be aware of the potential hazards associated with the task at hand and know how to exercise control over their workplaces to minimize the danger.

MOVING, HANDLING, AND STORING MATERIALS

When manually moving materials, **employees should seek help when a load is so bulky it cannot be properly grasped or lifted,** when they cannot see around or over it, or when a load cannot be safely handled.

When an employee is placing blocks under raised loads, the employee should **ensure that the load is not released until his or her hands are clearly removed from the load.** Blocking materials and timbers should be large and strong enough to support the load safely. **Materials with evidence of cracks, rounded corners, splintered pieces, or dry rot should not be used for blocking.**

Handles and holders should be attached to loads to reduce the chances of getting fingers pinched or smashed. Workers also should use appropriate protective equipment. For loads with sharp or rough edges, wear gloves or other hand and forearm protection. **To avoid injuries to the hands and eyes, use gloves and eye protection.** When the loads are heavy or bulky, **the mover should also wear steel-toed safety shoes or boots to prevent foot injuries if the worker slips or accidentally drops a load.**

When mechanically moving materials, avoid overloading the equipment by letting the weight, size, and shape of the material being moved dictate the type of equipment used for transporting it. **All materials handling equipment has rated capacities that determine the maximum weight the equipment can safely handle and the conditions under which it can handle those weights.** The equipment-rated capacities must be displayed on each piece of equipment and must not be exceeded except for load testing. When picking up items with a powered industrial truck, the **load must be centered on the forks and as close to the mast as possible** to minimize the potential for the **truck tipping or the load falling.**

A lift truck must never be overloaded because it would be hard to control and could **easily tip over.** Extra weight must not be placed on the **rear of a counterbalanced forklift to offset an overload.** The load must be at the lowest position for traveling, and the **truck manufacturer's operational requirements must be followed.** All stacked loads must be correctly piled and cross-tiered, where possible.

Precautions also should be taken when stacking and storing material – Stored materials must not create a hazard. Storage areas must be kept free from accumulated materials that may cause tripping, fires, or explosions, or that **may contribute to the harboring of rats and other pests.** When stacking and piling materials, it is important to be aware of such factors as the materials' height and weight, how accessible the stored materials are to the user, and the **condition of the containers where the materials are being stored.**

All bound material should be stacked, placed on racks, blocked, interlocked, or otherwise secured to prevent it from sliding, falling, or collapsing – A load greater than that approved by a building official may not be placed on any floor of a building or other structure. Where applicable, **load limits approved by the building inspector should be conspicuously posted in all storage areas.**

When stacking materials, height limitations should be observed – For example, lumber must be stacked no more than 16 feet high if it is handled manually; 20 feet is the maximum stacking height if a forklift is used. **For quick reference, walls or posts may be painted** with stripes to indicate maximum stacking heights.

Used lumber must have all nails removed before stacking – Lumber must be stacked and leveled on solidly supported bracing. **The stacks must be stable and self-supporting.** Stacks of loose bricks should not be more than 7 feet in height. When these stacks reach a height of 4 feet, they should be **tapered back 2 inches for every foot of height above the 4-foot level.** When masonry blocks are stacked higher than 6 feet, the stacks should be **tapered back one-half block for each tier above the 6-foot level.**

Bags and bundles must be stacked in interlocking rows to remain secure – Bagged material must be stacked by **stepping back the layers and cross-keying the bags at least every ten layers.** To remove bags from the stack, start from the top row first. Baled paper and rags stored inside a building **must not be closer than 18 inches to the walls, partitions, or sprinkler heads.** Boxed materials must be banded or held in place using cross-ties or shrink plastic fiber.

Drums, barrels, and kegs must be stacked symmetrically – If stored on their sides, the bottom tiers must be blocked to keep them from rolling. When stacked on end, put **planks, sheets of plywood dunnage, or pallets** between each tier to make a firm, flat, stacking surface. When stacking materials two or more tiers high, the bottom tier must be **chocked on each side to prevent shifting in either direction.**

When stacking, consider the need for availability of the material – Material that cannot be stacked due to size, shape, or fragility **can be safely stored on shelves or in bins.** Structural steel, bar stock, poles, and other cylindrical materials, unless in racks, must be stacked and blocked to prevent spreading or tilting. **Pipes and bars should not be stored in racks that face main aisles; this could create a hazard to passers-by when supplies are being removed.**