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Fire Protection in Manufacturing: Why Is It So Difficult?

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Why, why does this seem so hard? First the local fire inspector is here demanding that we make a new exit, and then the insurance inspector is here asking about something called continuity planning. This is on top of the inspector from the sprinkler contractor, the fire alarm company, and the fire extinguisher company. And these folks do not even include inspectors and engineers from the federal government, such as OSHA and EPA.

Geez, this is all confusing. What is it that I "really" need to do vs. what they, the contractors are attempting to sell me to increase their revenue.

First, it is important to understand the roles all these inspectors, contractors fulfill; and the fire and safety codes, standards and ordinances that they reference and use as a basis for their work.

Public sector inspectors, whether from the local or county fire department, building department, state fire marshal or some other public entity; purpose is to ensure that the "public safety" needs of their jurisdiction is met.

The tools that they use are codes and standards, enacted by the political/governmental entity, where your business is located. Although typically viewed as enforcement officers, these professionals can (and also will) assist you and educate you relative to what you can do to become more fire safe, although these inspectors are typically limited to the codes which the local, county or state political entity has adopted.

Your insurance representative (inspector, loss prevention, loss control, consultant, specialist, and so on), is also a very good source of assistance for you, however, their extent of assistance is (could be) limited to only the lines of insurance coverage that you have with that particular company.

The various codes and standards utilized by all these folks are typically (today), the National Fire Codes (NFC) published by the National Fire Protection Association www.nfpa.org and the codes published by the International Code Council www.iccsafe.org such as the International Fire Code and the International Building Code. Additionally, there are state statutes and local ordinances unique to the jurisdiction in which your facility maybe located within.

Additionally, you must also be aware of the fire safety requirements found in the federal and state OSHA plans.

Since it is your responsibility as the property owner or occupant or a leased or rented property to comply with all regulatory codes and standards, it is strongly urged that you investigate what laws apply in your jurisdiction, and what the codes are that are applicable to your operation.

In many locales across the country; state statutes, county and local ordinances can be found online, free. What are not online are free copies of the ICC and NFPA codes, adopted by these statutes and ordinances.

The paper's intent is to briefly discuss many of the codes and standards that generally apply to the majority of operations throughout the US, as well as other non-code activities that you can implement to improve your facilities firesafety.

First, empower every employee to be a fire and safety inspector. Make as part of their job, the fire and safety of their work area and encourage teamwork by including the adjacent spaces as well. Include the safety performance of each supervisor's as a critical component of their performance appraisal.

Create a checklist specific for each work area. Require this checklist to be completed daily (or weekly). Why checklists? Because checklists help people to remember what to do, and sequence necessary. In checklists, as Dr. Atul Gawande, MD describes it in his new book, *The Checklist Manifesto*[1, 2, 3] "an idea so simple that it seemed downright loopy". As Dr Gawande writes in this book; back in 2001 Dr. Peter Pronovost, a critical care specialist at Johns Hopkins Hospital borrowed a concept from the aviation industry: a checklist, the kind that pilots use to clear their planes for takeoff.

As an experiment, Dr. Pronovost used the checklists to address a highly pervasive, but common problem in the ICU; infections in patients with central intravenous lines (catheters that deliver medications or fluids directly into a major vein). Central lines can be breeding grounds for pathogens; in the Johns Hopkins Hospital ICU, at the time, about one (1) central line in nine (9) became infected, increasing the substantially a prolonged illness, further surgery or death.

Dr. Pronovost wrote down five (5) things that all physicians must do when inserting central lines to avoid subsequent infection:

- wash hands with soap,
- clean the patient's skin with chlorhexidine antiseptic,
- cover the patient's entire body with sterile drapes,
- wear a mask, hat, sterile gown and gloves; and
- put a sterile dressing over the insertion site after the line was in.

"These steps are no-brainers; they have been known and taught for years," writes Dr. Gawande, a surgeon at Brigham and Women's Hospital in Boston Massachusetts and a staff writer at *The New Yorker,* where a version of "The Checklist Manifesto" first appeared in late 2007.

Checklists are vitally important in any industry. Safety checklists are of extreme importance, because they can significantly decrease the possibility of fire starting as well as anyone getting injured while on the job. This not only creates a level of protection for your facility, but also allows your employees to work in a much safer environment, and also assists to build a better reputation for your company as well. The safer the company is known to be; the more likely the chances will be that a higher number of qualified individuals will want to work for your company. Being aware of this, you need someone to work with your company to provide all the training needed to reduce develop these checklists. Below you'll find a few reasons why a safety checklist is of the utmost importance:

- A safety checklist works to minimize accidents. If you own a construction company, you realize this can be very dangerous work. Due to the equipment used, such as cranes, saws and numerous other heavy equipment components, it is easily understood why accidents happen so frequently. The use of a safety checklist will eliminate a lot of potential accidents.

- The costs of the project will be much less when you have a safety checklist and implement it on a daily basis. The fewer the number of accidents that any construction company may have, will substantially lower the costs of the job and this will increase the profit.

- Reduce insurance costs. The better the safety track record of any company, the less you will have to pay for insurance liability premiums. This can really work to save your company a lot of money over time, which again will allow your company to be a more profitable one.

Fire Safety Checklist

Fire also causes serious commercial economic damage, particularly to property and equipment. Also there is the issue with the effects of uninsured damage and the indirect consequences of lost profits, business disruption and the loss of customer confidence. In severe case's job losses could result from a combination of these effects.

A Checklist for Workplace Fire Safety
This checklist will assist you and your employees to conduct a basic fire safety review. If the answer to any question is 'No', action should be taken as soon as practicable to rectify the situation.

The relative importance of some of the items on this checklist will naturally vary according to the work place environment a safety rep' is operating in. Remember that fires start when a source of ignition comes into contact with combustible material. Control **all** sources of ignition and combustible material and you will greatly reduce the potential for fire.

Good Housekeeping: If It's Clean, It Is Safer
Waste and rubbish are the friends of fire. Workshops can have substantial amounts of inflammatory material such as oily rags or loose packing materials. All these items if ignited will encourage fire to spread rapidly.

Offices can have piles of paper. Documents and papers stored under desks could help a fire, for example caused, by an electrical fault, propagate much faster:

- Are staff encouraged to keep their personal workplaces tidy?
- Are the premises kept clear of all kinds of process waste and refuse?
- Are metal receptacles with fitting lids available for waste materials such as floor sweepings, with separate receptacles for saleable waste and for especially dangerous materials such as flammable liquids and oily rags?
- Is all waste removed from the building at the end of every working day or more frequently if necessary?
- Are cupboards, lift shafts, and spaces under benches, gratings, conveyor belts and behind radiators kept free from rubbish and dust?
- Are areas in and around the building kept free from accumulated packing materials, such as cartons, wood shavings and paper?
- When not in use, are workmen's clothes and overalls kept in purpose designed storage places separated from combustible material and sources of heat?

Are You Storing up Trouble for Yourself?

More major fires start in storage areas than production areas. Poorly stored goods may help to spread fire and hinder fire fighters gaining access to the source of the fire or reduce the effectiveness of sprinkler systems:

- Are storage areas separate from other parts of the premises?
- Are storage places accessible to firefighters?
- Are there clear spaces around stacks of stored materials and adequate gangways between them?
- If a sprinkler system is installed, are stocks of materials arranged so they do not impede the sprinkler heads?
- Are storage areas visited regularly and especially at the end of the working day?

Where There's Smoke, There's Fire

Smoking is a notorious fire risk. It should be prohibited in all areas within a workplace:

- Are the non-smoking regulations strictly enforced in all areas?
- Where smoking is permitted, outside of the building, is there an adequate supply of non-combustible receptacles for cigarette butts?
- Are these receptacles emptied at least once a day?

The Equipment Won't Run Forever

Inadequately maintained machines are more likely to be the cause of a fire. The overheating of bearings, due to insufficient lubrication or the presence of dust, and heat caused by friction are common causes of fire. Frequent inspection and regular maintenance are imperative. Good layout of machinery will reduce risk and make the general tidiness of premises easier to achieve:

- Is all machinery and equipment regularly and frequently inspected and maintained?
- Is the machinery kept clean?
- Are the bearings properly lubricated?
- Are the driving belts correctly adjusted?
- Is machinery so configured as to prevent congestion among machines and materials?
- Are drip trays provided and have other steps been taken to prevent floors and walls becoming soaked with oil?

Flammable and Combustible Liquids

Hazardous materials present specific problems but supplies of paint, lacquer, flammable or combustible solvents and thinners, a common feature of all industrial premises (including offices) are a less recognized hazard. Negligence in handling small quantities of flammable/combustible and water-based solvents, inks, paints and other liquids and pastes are a frequent cause of fires and injuries:

- Are stocks of paint, lacquer, solvents solvents, thinners and other flammable or combustible liquids properly stored away at the end of each work day?
- Are flammable liquids carried about in safety containers?
- Are non-sparking tools provided for use in places where flammable vapors may be present?
- Is there adequate ventilation in all areas where flammable and combustible liquids are handled and stored?

Liquid Petroleum Gas (LPG) Cylinders

The following are issues to check with LPG cylinders:

- Are liquefied petroleum gas (LPG) cylinders stored safely?
- Are permanent warning notices prominently displayed prohibiting smoking and lights/flames in areas storing LPG cylinders?

Heating and Lighting Hazards

Heating and lighting systems that are inadequately maintained or safeguarded present risks. Many fires occur from electrical faults or misuse:

- Are heating appliances at a safe distance from woodwork and combustible structural components?
- Is care taken that nothing is placed or left on heaters?
- Are heating appliances fixed, not portable?
- If portable heaters have to be deployed are they securely guarded and fixed so they cannot be knocked over?
- Are glue kettles, crucibles, pressing and soldering irons, and all similar appliances provided with stands and guards keeping them clear of benches, tables and surrounding materials?
- Are defects in electrical equipment reported and remedied immediately?
- Are the indicator warning lamps on appliances functioning?
- Is temporary extension wiring kept to a minimum and care taken not to overload existing circuits?
- Is the use of portable lighting kept to a minimum and are those used provided with strong wire guards?
- Are stored goods kept well clear of light bulbs?
- Are the main switches of all electrical circuits in the ’off’ position when equipment is not in use?

Maintenance and Security

An effective building maintenance policy is an essential feature of fire prevention. Walls and fences requiring repairs and gates and windows that are accessible encourage unauthorized entry from children and other intruders:

- Is every point of entry really secure against intruders?
- At the end of each day are all doors, windows and gates checked and secure?
- Is the building regularly inspected for damage to windows, roof and walls?
- Are the grounds surrounding the premises kept free of combustible vegetation by regular grass cutting and shrub clearance?
- When building repairs or alterations are performed are proper fire / hot work precautions undertaken for operations involving blowlamps, soldering irons, cutting and welding equipment and the heating of bitumen?
- Whenever workmen are carrying out repairs or alterations, is there adequate supervision to ensure that any temporary arrangements they make for heating and lighting are completely safe?

Last Thing at Night

Though most major fires start at night when staff are not present, they often occur during working hours:

- Does the company have a system of checks last thing at night to ensure that equipment is safely switched off, fire doors are closed, and so on?
- Are the fire doors always kept closed - particularly after working hours?
- Are goods stored clear of the floor?
- Are floors impervious to water and are ramps or sills provided at all openings to prevent water flowing to other parts of the building?
- Are drains and scuppers provided and are they kept unobstructed?
- Are fire and smoke doors kept closed whenever possible and always after working hours?

Means of Escape

All employers must become familiar with all means of escape from the building in which they work. It is particularly important that they made aware of escape routes that are different from the normal entrances and exits.

Location and Use of Portable Fire Extinguishers

All employees must know the location of the nearest fire appliances to their normal working location and the general layout of appliances in the building. Delay in tackling a fire because of ignorance regarding the fire appliances could result in a containable fire becoming out of control.

Employees must understand the types of fire extinguishers that are suitable for particular devices.

It should also be stressed that when tackling a fire with an extinguisher an employee must not endanger his or her life in attempting to extinguish the fire.

With regard to knowing which fire codes are applicable to your facility, a good place to start is NFPA 1, *Fire Code*. This fire code includes data related (but not limited) to the following:

- Inspection of permanent and temporary buildings, processes, equipment, systems, and other fire and related life safety situations
- Existing occupancies and conditions, the design and construction of new buildings, remodeling of existing buildings, and additions to existing buildings
- Design, alteration, modification, construction, maintenance, and testing of fire protection systems and equipment
- Hazards from outside fires in vegetation, trash, building debris, and other materials
- Interior finish, decorations, furnishings, and other combustibles that contribute to fire spread, fire load, and smoke production
- Storage, use, processing, handling, and on-site transportation of flammable and combustible gases, liquids, and solids
- Storage, use, processing, handling, and on-site transportation of hazardous materials
- Arrangement, design, construction, and alteration of new and existing means of egress

In addition, NFPA 1 will reference other relevant NFPA codes and standards, which are applicable to your facility.

Below you will find a brief list of NFPA Codes and Standards that have relevancy with a wide number of facilities. However, this list is not all inclusive:

- NFPA 10, *Standard for Portable Fire Extinguishers*.
- NFPA13, *Standard for the Installation of Sprinkler System*.
- NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*.
- NFPA 30, *Flammable and Combustible Liquids Code*.
- NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*.
- NFPA 34, *Standard for Dipping and Coating Processes Using Flammable or Combustible Liquids*.
- NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*.
- *NFPA* 70®, *National Electrical Code®*.
- *NFPA* 72®, *National Fire Alarm Code®*.
- NFPA 85, *Boiler and Combustion Systems Hazards Code*.
- NFPA 86, *Standard for Ovens and Furnaces*.
- NFPA 96, *Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations*.
- NFPA 101®, *Life Safety Code®*.
- NFPA 1600, *Standard on Disaster/Emergency Management and Business Continuity Programs*.

Endnotes

[1] http://www.newyorker.com/reporting/2007/12/10/071210fa_fact_gawande
[2] http://www.nytimes.com/2010/01/24/books/review/Jauhar-t.html
[3] http://www.nytimes.com/2009/12/24/books/excerpt-checklist-manifesto.html?_r=1&ref=books

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Gawande, Atul, MD. 2009. *The Checklist Manifesto.* New York: Metropolitan Books.