First Responder Inspector

CHAPTER TWELVE
SAFE HOUSEKEEPING PRACTICES

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Welcome to Chapter 12 Safe Housekeeping Practices.
In this Chapter we will discuss:

- An overview of housekeeping
- That good housekeeping is an effective fire prevention strategy
- Housekeeping issues on the exterior of the building
- Blocked or obstructed access
- Obstructions to fire protection equipment
- Protection of flammable liquid and gas equipment
- Fire exposure threats
- Wildland interface.

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Then we will move on to interior housekeeping and discuss:

- Spontaneous ignition and Oil waste, towels and rags
- Dust and lint accumulations
- Mechanical equipment
- Combustible material storage
- High piled combustible storage
- Trash and recycling issues
- Packing and shipping materials
- Flammable and combustible liquids
- Painting, coating , finishing and lubricants
- Obstructions to fire protection equipment
- Kitchen cooking hoods, exhaust ducts, and equipment
- Compressed gas cylinders
- Correction of housekeeping issues

And we will conclude this Chapter with the need for Fire Safety Plans and control of smoking.

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One of the most effective tools a First Responder Inspector has is a straightforward approach to good housekeeping. You will discover that it is not necessary to have years of experience to recognize and correct poor housekeeping issues. By simply using common-sense and following safe housekeeping practices, you can educate the building owner or occupant to the benefits of safe housekeeping. These benefits include reduced fire risk, safer working conditions, and increased productivity which can all be motivating factors for the building owner.

Over the course of your career, by educating building owners and occupants, you will see a reduction of housekeeping problems, reduced fire risk, and safer buildings not only for the occupants, but also to any responding fire suppression crews.

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When you encounter occupancies that have poor housekeeping practices, be mindful of other fire and life safety deficiencies. Poor housekeeping practices can be a telltale sign that other fire safety deficiencies are likely.

Effective housekeeping can help control or eliminate potential hazards. If the sight of garbage, debris, clutter, and spills is accepted as normal, then other more serious hazards may be taken for granted.

Housekeeping is not just cleanliness. It includes keeping areas neat and orderly, maintaining exit routes and floors free from obstructions and trip hazards, and regularly removing waste materials so they do not accumulate.

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As a fire inspector, you will want to keep the four major fire and life safety objectives in mind when conducting inspections.

Objective 1 is to identify and eliminate any unnecessary fuels, to reduce fire growth potential and assist in extinguishment. In this case, all of the cardboard boxes are empty and just adding unnecessary fuel load. In addition, the tires are piled too close to the ceiling. Because this storage area is not sprinklered, the fire code requires a clearance of not less than 1 m between the top of the storage pile and the underside of the floor or roof deck to allow access for hose lines.

Objective 2 is to identify and communicate to the building owner any obstructions or impediments to egress, such as storage of materials. In this case, the swing of the marked exit door is impeded by a cooler and will not open. If this is a required exit door, it should swing out in the direction of exit travel not into the kitchen. Reversing the swing of the door is one long term solution but the immediate reduction of hazard is to move the cooler. If the door is not a required exit, then the exit sign should be removed. In either case, the door should be free to swing.

References
NFC 3.2.2.3

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Objective 3 is to control and/or eliminate sources of ignition.
This can be accomplished by:

- Removing unnecessary sources of heat or replacing them with safer alternatives.
- Ensuring that the use of heat-producing equipment follows the manufacturers operation and maintenance instructions
- Install machinery and equipment which has been designed to minimize the risk of fire and explosions.
- Replace naked flame and radiant heaters with a central heating system.
- Keep ducts and flues clean
- Ensure that all electrical fuses and circuit breakers are of the correct rating and suitable for the purpose.
- Ensure that sources of heat do not arise from faulty or overloaded electrical or mechanical equipment such as overheating bearings.
- Where appropriate, require hot works permits for processes like welding or flame cutting.
- Institute smoking policies.

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Objective 4 is to improve the safety for firefighters. If you look after the safety issues for the building occupants by minimizing the spread of fire, by reducing the fuel load, providing unobstructed access to exits, and minimizing ignition sources you are providing safer conditions for the firefighters as well.

In these photos firefighters are fighting a fire in a sawdust collection system at a wood processing plant. The dust created a minor explosion that engulfed the firefighter with the hose line. Fortunately, he was not injured.
By improving the safety for firefighters, the other objectives of safe housekeeping are looked after.

By having these four major fire and life safety objectives in mind during your fire inspection, you will have more success with getting the building owner to practice good housekeeping.

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The three basic requirements of good housekeeping can be identified as equipment arrangement and layout, material management, and operational neatness, cleanliness, and orderliness.

As you conduct your fire inspection, take note of how the material is arranged and handled. Is the material placed in the proper containers for disposal and are these containers suitable for the material? For example, are oily rags stored in a metal container with a metal lid? You should ask the building owner how often the material is removed from the container and where the material is disposed of.

Operational neatness, cleanliness, and orderliness promotes fire safety. You should find out how often waste and trash is collected and disposed of. This will be dependent on what the process is, what kind, and how much waste is produced. Most occupancies that practice safe housekeeping have a maintenance schedule to ensure a clean and safe environment.

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As you conduct your fire inspection, pay special attention outside of the building as fires often start on the outside and spread to the building. This was covered in detail in Chapter 5 “Performing an Inspection” so we will only provide a brief review here.

Many building owners fail to recognize or understand the importance of applying safe housekeeping practices on the exterior of the building which include:

Unobstructed fire department access which can delay or hinder access to the building and/or building services.

Clearly posting the building address so it is visible on approach. If there are multiple buildings in a complex each building must be readily identifiable. Most local governments have addressing bylaws stipulating address requirements.

Be mindful of outbuildings like storage sheds and shipping containers. These may contain flammables that could spread a fire to the building you are trying to protect.

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Consider any obstructions that will hinder the ability for fire fighters to access fire protection equipment which could include fences, gates, or vegetation. Signs indicating the location of the fire protection equipment should be posted. These signs not only aid firefighters in locating the equipment, but they also provide a reminder to others to not block access.

Make sure that there are no fences or gates that interfere with exiting the building or accessing services.

In winter, snow and ice must be managed so access and egress to the building and fire protection equipment is maintained.

Ensure utilities connections are readily accessible, not overgrown by vegetation and have tamper seals installed.

When you encounter utility connections that are vulnerable to collision damage, ask the building owner to install barriers that will prevent damage.

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As you conduct your fire inspection identify any waste material or business by-products that accumulate near the building. A fire that occurs on the exterior of a building can be easily spread into the building if the combustible material is stored to close. You should ensure during your fire inspection that combustible materials, like wooden pallets and/or tires, have a reasonable separation away from the building. If the material is no longer required ask the owner to get rid of it.

Section 2.4 of the fire code is entitled Fire Hazards, and it says in part “Combustible waste materials in and around buildings shall not be permitted to accumulate in quantities or locations that will constitute an undue fire hazard.” The material in this photo is domestic waste and should be removed right away as it presents a fire hazard and potential target for vandalism.

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Some of the most common exterior fires are dumpsters, garbage and recycling bins. They are often a target for vandals as they present an opportunity. Another cause of these types of fires is discarded ash from solid fuel appliances or smokers' materials.

The fire code says that “outdoor storage receptacles, such as dumpsters, used for combustible materials shall be located so that they do not create an undue fire hazard to surrounding buildings. Measures such as those described in NFPA 80A, “Protection of Buildings from Exterior Fire Exposures,” must be taken to ensure that buildings are protected from fires in outdoor receptacles containing combustible materials.

During your fire inspection you can help prevent or minimize the damage to buildings by ensuring they are kept at least ten feet away from the building, that they are not stored under building roof eaves or overhangs or near windows where the fire can penetrate the glass and spread to the building interior. They should be kept in a secured area that is not accessible to the general public. In this photo garbage and recycling containers are under the roof overhang but also located in an area that provides visual protection for a would-be fire setter.

You should recommend that the building owner provide a secure area away from the building, thus

allowing for good housekeeping and preventing the spread of fire to the building.

References:
NFC 2.4.1.1 and A-2.4.1.1.(6)

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Protection should be provided for flammable liquid and gas equipment and utilities. This should include protection from wildfire, tampering, and vehicle collision. In the case of potential collision damage, posts or bollards may be used to secure the area.

To protect the building and oil tank from an exposure fire, the vegetation around the oil tank in this photo should be removed.

In this photo, the oil tank is sitting directly on the ground and leaning against the building. It should be secured on a non-combustible stand. When full, a fuel tank of this size can weigh around 2,000 pounds. To stop unwanted movement, it should be properly anchored to a solid footing. Ideally, the foundation for a tank is a large concrete pad with a metal tank stand firmly bolted down. Wooden tank stands are no longer accepted.

Check the tank for rusting, corrosion, dents or other signs of physical damage on the outside of the tank. This could be an indication of weak spots that are more susceptible to rupture and leakage.

More information and a guide to Oil Tanks is provided in the additional materials section.

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A growing concern for fire prevention officials is the increasing use of land near the wildland/urban interface. As towns and cities grow, the need for land development near the wildland urban interface becomes more common. As a fire inspector, one of your roles may be to educate property owners about the importance of fire-safe landscaping and the use of fire resistive building materials.

FireSmart Canada and many Provincial FireSmart organizations have programs, updates, and resources to help you establish or maintain a wildland urban interface community education program. These programs extend to the outdoor storage of materials which can provide ladder fuels. Fuels that can carry a fire burning in low-growing vegetation to taller vegetation is called ladder fuel. Examples of ladder fuels include combustible materials stored outdoors, grasses, low-lying tree branches, and shrubs under the canopy of larger trees. In areas prone to wildfire, creating a separation in vegetation by removing ladder fuels is an important task.

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Through good housekeeping practices, building owners can prevent the buildup of ladder fuels between the building and/or storage area and the urban interface. As you inspect the exterior of the building and surrounding area, look for potential fuels like the wood pile in this photo. Embers from a wildland fire could easily land on this pile of dry firewood which would likely result in a total loss of this commercial building.

Also look for space between the urban interface and the area that requires protecting. This is referred to as a defensible space. The distance of the defensible space will depend on the slope, aspect,

environmental factors, and type of combustibles present. Slope refers to the upward or downward topography of the land, fire normally burns faster up a slope. Aspect refers to the compass direction facing the fire and environmental refers to factors like wind and weather.

The recommended defensible space will vary depending on the location and vegetation type, so the First Responder Inspector should work closely with the local forestry management agency professionals who are better trained to deal with these issues.

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In this case a house survived a wildland fire while many around it did not. The house had a sprinkler placed on the roof that saved the structure. Because of the overhang of the eves the water did not reach the vinyl siding which melted due to radiant heat. It is lucky that the wood piled against the side of the home did not ignite as it would have resulted in a total loss fire.

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As you move from the exterior of the building into the interior you should be thinking of three main life safety concerns – early fire detection, adequate exiting, and confining the fire. This in part, involves identifying any potential sources of ignition and fuel loads that could contribute to the rapid growth and spread of a fire. The cleanliness and general standard of housekeeping is indicative of the level of fire safety in the building. A business that keeps its operations neat and tidy will enjoy a reduced risk of fire. However, you should also recognize the overall cleanliness of the building is often based on the process and operations conducted. For example, dust can be expected to accumulate in a sawmill operation, but if it is managed appropriately, it does not present an undue hazard. If, however, it is not dealt with regularly, devasting results can occur. The ignitability of any dust-air mixture is based on the size of the particles, moisture content, and energy required for ignition.

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There are numerous industries that produce dust including, food production, metal processing, wood products, chemical manufacturing, rubber and plastics, and coal fired plants.
When inspecting operations that produce dust, you should identify the process and provide strategies to limit the potential hazard. The potential hazard comes in the form of combustible dust. Combustible dust is a finely divided solid material that presents a fire or explosion hazard when dispersed and ignited in air.

It is very important to communicate to the building owner that they are responsible to minimize the accumulation of combustible dust on equipment and building surfaces. They should do this using suction rather than blowing with compressed air. Compressed air will make the dust airborne and easy to ignite and or explode. When you inspect buildings that house special processes, ensure dust collecting equipment is properly working and all safeguards are in place.

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Fire inspectors should be familiar with Section 5.3 of the Fire Code which is entitled “Dust-Producing Processes” This section applies “to buildings or parts of buildings where combustible dusts are produced in quantities or concentrations that create an explosion or fire hazard.”

It deals with:

- Dust Removal
- Cleaning Equipment

- Dust-Collecting Systems
- Dust Collectors
- Electrical Bonding and Grounding
- Explosion Venting
- Explosion Prevention Systems

And

- Ignition Sources.

It also provides specific references to Grain Handling and Storage Facilities and Woodworking Operations. For example, a portable extinguisher must be provided within 7.5 m of any machine producing wood dust, particles or shavings.

The following video was produce3d by WorkSafe BC in response to several fatal explosions in wood processing plants.

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Video

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When conducting your inspection consider the potential of spontaneous combustion . Spontaneous combustion is the occurrence of fire without the application of an external heat source. Due to chemical, biological, or physical processes, combustible materials can self-heat to a temperature high enough for ignition to occur. According to the NFPA, an estimated 14,070 fires occur annually in the US from spontaneous combustion.

The potential for spontaneous combustion can be reduced through good housekeeping. Products that are susceptible to spontaneous combustion should be stored in non-combustible containers with tight fitting lids and removed from the building daily. The building owner or occupant should have a policy to deal with oily waste, towels or rags,.

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Generally, businesses such as restaurants, woodworking shops, and automotive shops tend to deal with oily waste items, but laundries and dry cleaners can **also** experience spontaneous combustion. When cotton cloth, vegetable oil, and bleach have been combined, washed and dried in laundry equipment, the cotton may spontaneously ignite. This photo shows rags that were washed and dried and then ignited. Luckily, the ignition happened during the day when workers were around and noticed the fire in the incipient stage and were able to extinguish it before it spread to other combustibles.

The NFPA “Fires Caused by Spontaneous Combustion or Chemical Reaction Fact Sheet” , found in the additional materials section of this Chapter, says that one-quarter **of** the spontaneous ignited fires in mercantile or business properties occurred in laundry or dry-cleaning facilities and one-quarter of the spontaneous fires in manufacturing properties began with oily rags.

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When doing an inspection in buildings with laundry facilities make sure to check for lint both inside and outside the building. As you walk around the exterior check dryer vents for signs of lint accumulation like

that shown in this photo. Lint is visible at the outlet and on the ground below, so the vent requires immediate cleaning or use of the dryer should be discontinued.

Dryer vents should be cleaned any time there is an indication of a buildup of lint, but they should be cleaned at least annually. Lint traps are required by the fire code to be cleaned after each use. If lint is a problem, additional inline lint traps, like the one shown in these photos, can be installed that are easily accessible for cleaning.

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Vent outlet caps or screens should also be in place to avoid unwanted entry by water, snow, ice, or small animals that may build nests that could eventually block the air flow as shown in this photo. Make sure the outdoor vent covering opens freely when the dryer is on. If the vent covers are broken or do not operate properly, they should be replaced.

Inspect the venting system behind the dryer to ensure it is not damaged or restricted and that the area is clean. Often this is an area where lint and dirt will accumulate.

Reference:
BC 9.32.1.(2) and A-9.32.1.3.(2) Venting of Laundry-Drying Equipment

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Make sure that the dryer vent is securely connected to the dryer. In this case the vent is not connected so the dryer is venting directly into the laundry room.

The building code requires laundry-drying vents to be constructed of a smooth corrosion-resistant material, however this applies to the piping and ducting located within the wall assembly and not to the often-flexible duct used to connect the appliance to the rigid exhaust vent duct.

Accordion type plastic flexible dryer vents should be strongly discouraged as they get brittle from heat over time and lint tends to buildup inside as can be seen in this photo.

Accordion type aluminium ducts are much better than plastic but whenever possible smooth, sheet metal exhaust ducts that terminate on the outside of the building should be used.

Reference:
NBC 9.32.1.(2) and A-9.32.1.3.(2) Venting of Laundry-Drying Equipment

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One of the most common issues in every building is the lack of storage space, which often leads to unsafe storage of materials. As you conduct your fire inspection, ensure you inspect areas hidden from plain sight as these are often used for storage. For example, building occupants may use vacant rooms, service rooms, and even the space underneath stairs that are not designed for storage.

In this photo the space under the stairs has been used. This may be permissible, but the space would have to be properly fire separated, normally by applying gypsum board. If the building has a fire alarm system, detection will have to be installed, and if the building is sprinkler protected, a sprinkler head would have to provide adequate coverage.

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If stored materials are blocking an exit, or impeding access to an exit, the building owner or occupant should immediately clear the path to the exit. In this case furniture on display is blocking the exit door, the exit light is burned out and there is no portable fire extinguisher where one is indicated by the sign. These deficiencies should be corrected right away.

In this case storage is blocking access to the exit door, and the storage is piled in such a way that it is unstable and could fall over and further block the exit.

As you conduct your fire inspection, identify if stored materials are too close to potential ignition sources like, hot water heaters, boilers, space heaters, and even light bulbs.

If storage impedes access to building services, it should be moved. In this case access to the main electrical panels and sub-panels is obstructed.

As these deficiencies are easily corrected, they should be done immediately or as soon as reasonably possible.

References
NFC - 2.6.3 1) Electrical equipment vaults shall not be used for storage purposes

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The fire code says that combustible materials, other than those for which the location, room, or space is designed, are not permitted to accumulate in any part of an elevator shaft, ventilation shaft, means of egress, service room, or service space. The fire code goes on to say that:

- horizontal concealed spaces, such as crawl spaces and ceiling spaces, shall not be used for the storage of combustible materials. In this case, the space between the roof trusses is used for storage which should be removed.

The code also says that “combustible materials shall not be stored on a roof or adjacent to any building which would create a fire hazard to the building or its occupants”. This photo shows wooden pallets piled against the outside of the building. Should this catch fire, significant damage to the building can be expected so the combustibles should be removed.

References
NFC - 2.4.1
NFC - 2.6.3 1) Electrical equipment vaults shall not be used for storage purposes

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Service rooms are defined by the fire code as –”a room provided in a building to contain equipment associated with building services”. Typical examples of service rooms include boiler rooms, furnace rooms, incinerator rooms, garbage handling rooms and rooms to accommodate air-conditioning or heating appliances, pumps, compressors, and electrical equipment. Rooms such as elevator machine rooms and common laundry rooms are not considered to be service rooms.

The fire code specifically says that “Electrical equipment vaults shall not be used for storage purposes”

Electrical vaults are not defined in the fire code. Some First Responder Inspectors use this clause to say that storage is not permitted in an electrical room, which is also not a defined term. Electrical rooms are covered by the typical examples of service rooms provided in the notes section of part 2 of the fire code. Some inspectors allow storage in electrical rooms if sufficient access is provided to the electrical panels while others prohibit storage in electrical rooms all together.

Either is correct depending on the hazard and local policy. Many jurisdictions allow storage in electrical rooms if the material stored is non-combustible, securely piled, and does not impede access to the electrical equipment.

References
NFC - 2.4.1

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When conducting fire inspections at buildings such as large storage facilities or large retail stores, ensure you inspect areas of high-piled storage. . High-piled storage is defined by NFPA 13 as “solid-piled, palletized, rack storage, bin box, and shelf storage in excess of 3.7m (12 Feet) in height.
When looking at the storage, determine how the material is stored. Are the heavy items near the bottom,how would water affect the storage, and could the material pose a risk to firefighters?

To ensure materials are being stored properly you should consult the fire and building code to determine the classification of the product, maximum permitted height of storage according to its base area and shape, and the stability of the stored products.

The fire code refers to NFPA 13 which gives an extensive description with numerous examples of commodities for classification purposes and should be consulted.

References:
NFC
- *3.2. Indoor Storage*
- *A-3.2.1.1.(1) Note*
- *3.2.3 General storage*
- *NFPA 13 2019 edition Chapters 3 and 7*

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The fire code requires adequate access for firefighting purposes be provided and maintained to all portions of the storage area. Access aisles not less than 1.0 m wide must be provided to fire protection equipment and aisles must be maintained free of obstruction.

In storage rooms the aisle widths may have to be increased. A storage room or area that is greater than 100 m2 must have at least one main aisle with a minimum width of 2.4 m for storage heights of not more than 6m, and 3.6 m for storage heights of more than 6m. The width of main access aisles need not exceed 2.4 m where the products are stored in racks and the building is sprinklered.

Main access aisles must be accessible from at least 2 directions in the event one becomes unusable.

References:

NFC: 3.2.2.2 Aisles

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Wall clearances of not less than 600 mm must be provided where stored products may swell or expand with the absorption of water.

In unsprinklered buildings, a clearance of not less than 1 m between the top of storage and the underside of the floor or roof deck must be maintained to permit hose streams to reach the area.

In sprinklered buildings, the clearance between the top of storage and ceiling sprinkler deflectors must meet the design specifications of the sprinkler system.

All stored combustible materials should be kept away from hot elements of heating equipment.

Combustible pallets should normally be stored outdoors but some limited quantities are permitted to be stored indoors even in unsprinklered buildings. Check the fire code for specific details.

References:
NFC
- *3.2.2.3 Clearances*
- *3.2.2.4.*
- *3.2.2.6*

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When inspecting rack storage you should confirm:
- Storage rack capacity documentation is visible
- Loads on the storage rack are within rated capacity
- Loads are stable and secure
- Clearances are within allowable distances
- That the rack is plumb with no signs of deflection - any deflection of more than ½ “, either vertical or horizontal, should be noted and repaired by a qualified person
- Base plates are secure and anchored to the floor
- Columns and frames show no signs of physical damage
- Horizontal and diagonal struts are in place with no signs of broken welds, missing braces, or braces with rips, tears, or deflection

References:
WorkSafe BC Pallet Rack Inspection Checklist
Apex Warehouse rack safety video at this link https://www.youtube.com/watch?v=inn9JQaG6og&t=111s
REB Storage Systems International https://rebstorage.com/reb-services/rack-safety-inspections/

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- Column guards and row end protectors are in good condition
- Check for missing or damaged safety pin connectors
- Pallets are in good condition and not falling apart

- Pallets are the correct size for the rack and are not overloaded
- Work areas around the storage racks, such as aisles and hallways, are clear of debris and unobstructed
- The aisle width seems appropriate for the size and type of storage.

If you have any immediate safety concerns, the rack should be unloaded until it is professionally inspected, and repairs are made as required.

The following short video talks about 4 American National Standards Institute standards pertaining to identifying, repairing, and replacing damaged racks. One thing to note about the video is that the portable fire extinguisher should be properly mounted and not sitting on the floor.

There is also a good video by Apex Companies on inspecting rack storage in the additional materials section of this Chapter.

Resources :
Insert Apex video link https://www.youtube.com/watch?v=inn9JQaG6og&t=111s in the Additional Resources Section

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Video

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Many businesses you inspect will have forklifts for moving material around. The fire code refers to these as Industrial Trucks and provides specific requirements for their operation. Some of the specific requirements are:

- The use, maintenance, and operation of industrial trucks must conform to NFPA 505
- Fuel-fired industrial trucks must conform to ULC/ORD-C558,
- Battery-powered industrial trucks must conform to ULC/ORD-C583
- Fuel-fired industrial trucks shall be stored in detached buildings, or in areas separated from the remainder of the storage area by a fire separation having a fire-resistance rating of not less that 1 h, or in areas where the vehicles will not create a fire hazard to the storage area.

Resources:
NFC 3.1.3 Industrial Trucks

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- Fuel-fired industrial trucks must be refuelled at designated locations outside buildings.
- Fuel-fired industrial trucks that are fuelled by replaceable propane cylinders are permitted to have their cylinders replaced indoors provided cylinder replacement is done at a safe location that is at least 7.5 m from ignition sources, open pits, and underground entrances.
- The cylinders' valves must be closed, or the engine is operated until the fuel in the system is consumed

- Spare propane cylinders must be stored outdoors and must be supported on raised concrete or other non-combustible platform and be located in a fenced enclosure.
- Each fuel-fired industrial truck must be equipped with at least one portable extinguisher having a minimum rating of 2-A:30-B:C.

Resources
NFC 3.1.3 Industrial Trucks

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Battery-Powered Industrial Trucks

- Battery-charging installations for battery-powered industrial trucks must be located at least 1.5 m from combustible materials, in well ventilated areas, where precautions are taken to prevent ignition sources.
- Battery-charging stations must be equipped with at least one portable extinguisher having a minimum rating of 2-A:30-B:C.
- Only trained and authorized personnel are permitted to operate industrial trucks, replace propane cylinders, refuel fuel-fired industrial trucks, or charge batteries for battery-powered industrial trucks.

Like cars and trucks, forklifts are fuel-powered vehicles. But unlike other vehicle types, forklifts frequently operate indoors. So even the smallest forklift-related fire can quickly become a big problem.

Resources
NFC 3.1.3 Industrial Trucks

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Industrial truck fires can be minimized through:

- Regular routine maintenance - that will spot the conditions that could lead to a forklift fire. These include things like leaky propane connectors, build up of grease or pooling oil on the vehicle, or unsafe electrical connections.
- Increase Fire Safety Awareness - Forklift operators are the first line of defence against forklift-related fires. Operators should be trained to avoid the conditions that could lead to a fire and what to do in the event one happens.
- Clean Forklifts Regularly - Cleaning forklift regularly ensures that the risk of flammable materials ignition is minimized, even eliminated.
- Pay Special Attention to Battery Cables - Batteries are a primary potential ignition source for forklift fires. Protect battery cables from damage and inspect them regularly to make sure they aren't damaged. Batteries typically come with an insulated, fire-resistant covering to prevent sparking or arcing. Ensure it is intact and in place during every pre- and post-shift forklift inspection.

Resources
NFC 3.1.3 Industrial Trucks

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As you conduct your fire inspection, ensure that trash and other waste materials are collected and

removed at frequent intervals. Find out where the waste is stored and how often it is picked up. If the building has a waste collection system or room, inspect the area and equipment to ensure that safe housekeeping practices are followed.

As discussed in Chapter 2, if refuse chutes are incorporated as part of the waste management system, they must be properly fire separated from the remainder of the building, or they could create a chimney that can aid in the rapid spread of fire, smoke and hot gases vertically throughout the building.

Chute access doors should be equipped with a fusible link and be self-closing. The building code also requires automatic sprinklers to be installed in each linen or refuse chute and in the room or bin into which the chute discharges.

Like other fire safety installations regular inspection and maintenance will ensure the system works as designed.

References:
NFC 2.4.1.2 Storage Rooms for Combustible Waste Materials
NBC 3.6.3.3 Refuse Chutes

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You will come across spray coating operations during you fire inspections. They are usually found in buildings that are occupied by auto shops, cabinet shop and industrial businesses. The fire code says, “The design, operation and maintenance requirements relating to spray coating processes shall conform to NFPA 33, “Spray Application Using Flammable or Combustible Materials.” NFPA 33 says that spray applications and processes must be confined to spray booths, spray rooms, spray areas, or in a temporary membrane enclosure meeting NFPA specification.

The construction and design requirements for spray areas, spray rooms, and spray booths are covered in Chapter 5 of NFPA 33.

References
NFC 5.4.5.2
NFPA 33

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A spray booth is defined as “a power-ventilated enclosure for a spray application, operation, or process that confines and limits the escape of the material being sprayed, including vapours, mist, dusts, and residues that are produced by the spraying operation”. There are a few sub-categories of spray booths including Dry Particulate, Electrostatic Precipitator, High-Capacity Dry Paint Arrestor, and Water-Wash Spray Booths.

A spray room is defined as “A power-ventilated fully enclosed room with a specified fire resistive rating used for flammable or combustible materials.

References
NFPA 33 Chapter 3 Definitions

NFC 5.4.5.2

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Spray operations can only be conducted in Group F Industrial occupancies unless the operation is in a room that has a minimum of a 2-hour fire separation and is sprinklered in accordance with NFPA 13.

Spray operations must not be in basements unless there is adequate means of egress and access is provided for emergency responders.

The main hazards associated with spray coating operations are toxicity and flammability. Solvents contained in paints often have acute effects on the central nervous system, initially causing giddiness and then, with further exposure, unconsciousness. These solvents may also be extremely flammable especially when atomized in a spray.

References
Fire and Risk Analysis of Paint Shops of an Automobile Industry -
https://ijesc.org/upload/2700b56ed3903cf4ffcb5055c85be5ee.Fire%20and%20Risk%20Analysis%20of%20Paint%20Shops%20of%20an%20Automobile%20Industry%20(5).pdf

NFPA 33 Chapter 3 Definitions
NFC 5.4.5.2

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Operation and maintenance procedures for all spray applications should comply with the manufacturers specifications and should include but not be limited to:

- Spray operations must only be performed in approved facilities
- Combustible residues must not accumulate
- Thin paper or plastic coverings are permitted to facilitate cleaning
- If excessive residue accumulates, spray operations must be discontinued until conditions have been corrected
- Overspray collectors must be inspected daily, and clogged filters discarded
- All discarded filters must be placed in a non-combustible container with a tight-fitting lid or be placed in a water-filled container.

References
Fire and Risk Analysis of Paint Shops of an Automobile Industry -
https://ijesc.org/upload/2700b56ed3903cf4ffcb5055c85be5ee.Fire%20and%20Risk%20Analysis%20of%20Paint%20Shops%20of%20an%20Automobile%20Industry%20(5).pdf

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- Rags or waste materials impregnated with sprayed material must be put into an approved waste container immediately after use.
- Waste containers must be in a well-ventilated area.
- Employees contaminated clothing must be removed form the premises overnight or stored in metal lockers
- Flammable liquids must be kept in covered containers when not actually in use
- Leaked or spilled products must be cleaned up and disposed of promptly and safely

In the automotive industry, many of the paints are now water-based products which provide considerable advantages when it comes to limiting fire and explosion events. In tests conducted most commercially available water-based paints proved to be non-flammable when sprayed, but some paints and other products are still flammable and may present a fire and or explosion hazard.

References
Fire and Risk Analysis of Paint Shops of an Automobile Industry - https://ijesc.org/upload/2700b56ed3903cf4ffcb5055c85be5ee.Fire%20and%20Risk%20Analysis%20of%20Paint%20Shops%20of%20an%20Automobile%20Industry%20(5).pdf

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When conducting your fire inspection, identify any obstructions that block the access or intended use of fire protection equipment. You should ensure storage material is not blocking access to fire extinguishers, pull stations and other fire protection equipment. In this photo the extinguisher is mounted higher than permissible and would be difficult to access.

You should inspect sprinkler rooms to ensure the control valves are accessible and do not have any hanging items on them. In this photo the sprinkler system is obstructed by items stored in the room. A clear unobstructed path to the sprinkler system must be maintained.

You should check that all sprinkler heads have at least eighteen inches of clearance below them, as per NFPA 13. This allows for the proper discharge from the sprinkler head, thus providing an effective spray pattern to control a fire. In this case, pillows are piled on the top rack of a shelving unit obstructing the operation of the sprinkler head. Storage should not be allowed on the top shelf.

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The US Fire Administration through the National Fire Academy regularly publish short Coffee Break Training sessions. They have one on the topic of Clearance Beneath Sprinklers. We have added this document to the Additional Materials section of this chapter.

Reference:
https://chiefcdn.chiefpoint.com/content/External/ofc424/Document/Document_24_cb-2006-27_0272.pdf/

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When inspecting kitchen systems for safe housekeeping issues, you should visually check for the accumulation of grease on the hood, exhaust ducting, walls, and cooking appliance surfaces. In this photo grease can be seen around an exhaust fan and running down the wall.
In this photo grease is running down the hood above the appliances.
In this case, grease can be seen all over the underside of the hood and dripping off the piping for the fire extinguishing system. **You may also note that there is an un-approved light installation which would not conform with the requirements of NFPA 96.**
In each case, use of the kitchen should be discontinued until a thorough cleaning is performed by a qualified technician.

If upon inspection, the exhaust system is found to be contaminated with deposits from grease laden vapours, the system must be cleaned by properly trained, qualified, and certified contractors.

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You should also visually inspect the filters and ensure they are clean and that the grease tray and grease catchers are not overflowing.

As you inspect the kitchen area, make sure the manual pull station and K class fire extinguisher are clear of any obstructions and workers have a clear egress to the exit.

Emergency lighting is also required in the kitchen.

NFPA 96 is the Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations and is an excellent resource for you when conducting a commercial kitchen inspection. It establishes the frequency for grease inspections based on the type of cooking performed as can be seen in this table.

NFPA 17A is the Standard for Wet Chemical Extinguishing Systems like those found in commercial kitchens. Chapter 7 deals with inspection, maintenance, and recharging.

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The benefits of good housekeeping practices are not just about cleanliness; they lay the foundation for accident and fire prevention. It requires attention to details, such as the layout of the worksite or facility, identification and marking of physical hazards, ensuring adequate storage areas are provided, and routine maintenance.
The strategies for good housekeeping should focus on:

- Reducing or eliminating sources of ignition
- Controlling the fuel load
- Providing access to the site for emergency responders
- Providing access to fire protection equipment like sprinkler systems
- Providing and maintaining adequate egress

Good housekeeping practices result in savings to the building owner so most will buy in once you point this out. There are a few that will not respond positively but usually those are in cases where the business is marginal at best. If you are unable to resolve the deficiencies, you may have to resort to further enforcement action.

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Smoking materials are still a major cause of fires even though smoking is not permitted in many occupancies and public places. Regulations that limit smoking have for the most part been effective but have also led to an increase in occurrences where people smoke where they should not or think they are concealed from detection. During inspection you should look for signs of smoking such as discarded cigarette butts and ash cans both inside and outside the building.

In situations where smoking should definitely be prohibited, no smoking signs in conformance with the fire code, should be prominently displayed. Smoking should always be prohibited around flammable and combustible liquids, flammable gases, dusts, and in areas where the are large quantities of combustibles.

Where smoking is permitted, an adequate number of ash trays must be provided, and designated smoking area signs should be displayed.

Reference:
NFC 2.4.2 Smoking

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Most jurisdictions have some form of recycling facilities be it a landfill or transfer station. The definition of a waste and recycling facility varies, but the goal is to avoid throwing material into a landfill if it can be reused somewhere else. Such materials include plastics, metals and organics. Traditional hazards in these facilities include aerosol cans, gas tanks, and propane tanks. One growing hazard in recycling facilities is lithium-ion batteries, which have caused smoldering fires and explosions.

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The consequences of poor fire safety practices and lack of emergency planning are especially serious in properties where processes or quantities of stored materials would pose a serious threat to the community and environment. In most recycling facilities, the main fire hazards are associated with bulk storage of combustible material and hazardous products. The potential for large fires with negative environmental impacts is significant.

In an effort to prevent fires, and minimize the damage from fires when they occur, owners and operators of recycling operations and waste handling facilities are encouraged to develop and implement Fire Safety Plans for their property.
There are lots of papers available on fire safety planning for recycling facilities and waste processing operation. One such guideline, published by the Ontario Fire Marshals office, is included in the Additional Materials section of this Chapter.

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Most waste, including hazardous waste in Canada, is disposed of by compaction and burial or by incineration. The biggest concern with incineration is the residual hazardous waste which must be disposed of in compliance with appropriate regulations.

If incineration is part of the waste processing in your jurisdiction you should be familiar with the type of equipment in use, and the safe operating practices that the facility employs.

The fire code states that the installation and alteration of indoor incinerators shall conform to the Building Code. In the case of outdoor incinerators, the design, construction, installation, alteration and maintenance of outdoor incinerators must conform to NFPA 82 except that the flue venting an incinerator can't serve as the chute conveying waste material to the incinerator.

The fire code also addresses spark arrester's which must be inspected and cleaned at intervals not greater than 12 months or more frequently where accumulations of debris will adversely affect operation. Burned-out spark arresters must be repaired or replaced.

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The fire code requires Fire Safety Plans for indoor and outdoor storage in conformance with the fire code. For storage areas the plans must include :

- the product classifications for each different product stored

- the method of storage, including aisle widths for rack storage,
- the maximum permitted height of storage
- the maximum permitted size of individual storage areas,

and

- Signs must be posted indicating the storage method and maximum height of the goods stored

When the products stored include Group A plastics, rubber products, Level 2 or 3 aerosols, or *dangerous goods*, the fire safety plan must identify the location and maximum quantity of product that is being stored.

Reference:
NFC 3.2.2.5 Indoor Storage
3.2.2.5 Fire Safety Plan

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In this Chapter we discussed:

- An overview of housekeeping
- The use of a common-sense approach
- Educating the building owners and occupants about good housekeeping practices
- Poor housekeeping can be indicative of other fire safety deficiencies
- Four major fire and life safety objectives of good housekeeping are to
- Eliminate unnecessary fuel
- Remove obstructions to egress
- Control ignition sources
- Improve safety for firefighters

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We also discussed:

- Housekeeping on the outside of the building including
- Obstructed fire dept. access
- Clearly posting the building address
- Outbuildings, storage sheds, and shipping containers
- Obstructed fire protection equipment
- Utility connections
- Accumulation of garbage
- Placement of dumpsters and recycling containers
- Flammable and combustible liquid storage
- Wildland fire potential and FireSmart Communities

We then moved on to housekeeping issues on the interior of buildings and talked about

- Dust as a potential fire and explosion hazard and section 5.3 of the fire code which is entitled Dust Producing Processes

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- Spontaneous ignition of certain materials and that the potential for spontaneous ignition can be reduced through good housekeeping
- Inspecting laundry facilities for lint and the cleaning of dryer vents
- The use of accordion type plastic flexible dryer vents should be strongly discouraged – wherever possible smooth sheet metal exhaust ducts should be used.
- We talked about the lack of storage space in many buildings
- Stored materials obstructing access to exit
- Materials stored close to ignition sources
- That the fire code does not permit storage in service rooms, crawl spaces, or ceiling spaces

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We then looked at

- rack storage and discussed clearances, aisle width, and the inspection process
- Industrial trucks and forklifts where the use, maintenance, and operation must conform to the fire code and NFPA 505
- Indoor trash and recycling collection and removal
- Spray coating operations including spray areas, spray booths and spray rooms
- Obstructions to fire protection equipment
- Housekeeping in kitchens in conformance with the fire code and NFPA 96
- Correction of housekeeping issues

And

We concluded this Chapter with a discussion on controlling smoking and the need for Fire Safety Plans specific to indoor and outdoor storage.

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That's the end of this chapter.

You are now ready to move on to the next Chapter but please complete the Chapter Quiz first.