SAUDI BINLADIN GROUP
OPERATION & MAINTENANCE

WAREHOUSE SAFETY

A safe, orderly, efficient warehouse is a key to a successful operation. The warehouse plays an essential role in the way goods are sent, received, stored, and circulated throughout the facility.

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TABLE OF CONTENTS

WAREHOUSE SAFETY

Objectives

To explain common potential warehouse & storage hazards and the safety precautions and procedures that are important to warehouse safety. The result should be closer attention to equipment and tasks that could cause accidents, more effort to follow safety rules, and fewer accidents and near misses in the warehouse.

Suggested Materials to Have on Hand:

- Material handling equipment's
- Personal protective clothing and equipment (work boots, hard hats, eye protection, and gloves)
- Packing and strapping materials
- Ladders.

Introduction/Overview

A safe, orderly, efficient warehouse & storage is a key to a successful operation. The warehouse plays an essential role in the way goods are sent, received, stored, and circulated throughout the facility.

With so much going on and so much to keep track of, a warehouse may also have more potential for accidents than areas with more limited functions. So it's especially important to pay close attention to safety in the warehouse.

Here, we're going to review some of the potential warehouse & storage hazards and ways we reduce risks. The purpose of this document is to get you to look at the warehouse with safety in mind—so that you'll always be alert to the hazards and always do what's necessary to prevent accidents.

General Hazards

Let's consider some of the general types of hazards we may come up against in a warehouse. One of the most common hazard groups is slips, trips, and falls. When you carry and move materials on different levels, and on different types of floor surfaces, it's all too easy to lose your balance or stumble over an out-of-place item. You also have to worry about getting hit by falling objects in a warehouse. Items that aren't carefully stacked on floors, shelves, and other surfaces can fall on a head, a body, or a foot. There's an added risk when you place items in storage—or remove them. A slip or fumble can send those items flying—and you could go right along with them. Warehouse equipment can also pose hazards. Conveyors, forklift trucks, and hand trucks can all cause accidents or injuries if you're not careful. Your own body can be a hazard if you lift and carry materials improperly, risking back injuries. You also have to be cautious with the equipment we use to load, pack, and unpack—skids, pallets, strapping, and cutting tools, for instance. Materials stored in a warehouse can also pose dangers. As you know, we have to protect ourselves from both physical and health hazards when we work in a warehouse that contains hazardous substances and flammable or combustible materials.

OSHA Regulations:

Almost everything we do and use in a warehouse is covered by at least one OSHA regulation. It would take all day to review the details of every OSHA rule that could apply to warehouse work. I do want to give a brief overview, however, to help you recognize that the warehouse safety practices we're discussing today are more than good sense; they're the law. OSHA requires us to practice good housekeeping in two different regulations (29 CFR 1910.22(a) and 1910.141(a)). They focus on the importance of keeping the area clean and neat and the aisles clear. In addition, OSHA's material handling and storage regulations require us to store materials so they "don't create a hazard." The material handling and storage regulations (1910.176-181) also regulate forklift trucks and other equipment we use. Other regulations that can apply to a warehouse include those that cover ladders and other walking and working surfaces (1910.21-30); fire protection (1910.155-165); personal protective clothing and equipment (1910.132-140); and all the regulations that apply to hazardous, flammable, combustible or explosive substances that may be stored in a warehouse.

Identifying Hazards

With so many potential hazards to choose from, where do you start identifying actual warehouse hazards? That's not easy, because the hazards can change from day to day depending on the equipment you use, the tasks you perform, and the substances or materials you handle. So you have to start every day fresh. Think of yourself as a hazard detective who has never been in this warehouse before. Look around and think about what you're going to do. Then start identifying potential hazards so you can start taking steps to prevent accidents.

Housekeeping Hazards

Let's begin with a simple aspect of safety—so simple it's often ignored. That's housekeeping. Good housekeeping is an absolute must in a warehouse—not just for safety, but to be sure that everything is in its place.

If you were looking for warehouse housekeeping hazards, you might notice:

- Objects or materials in aisles or on the floor, which become tripping hazards
- Materials stacked or stored loosely or insecurely that might fall on someone
- Protruding nails, fasteners, and other sharp objects that can puncture or cut
- Large items left where people can bump against them
- Trash strewn about that can cause someone to trip or slip. Flammable trash can, of course, be a fire hazard
- Water, oil, or other liquid spills on the floor that can cause slips and falls.

Material Handling Hazards

Housekeeping, then, is clearly an area that demands safety attention. You also have to be very alert to hazards when you're involved with material handling. Whether you're using equipment or lifting and carrying yourself, here are some things to watch out for:

- Forklift trucks have a high centre of gravity and can tip over if not driven slowly and carefully by trained, authorized operators. In addition, materials placed improperly on the forks, or lifted or placed incorrectly, can easily slip. That's a hazard to the operator and to others in the area.
- Forklift operators must understand their machines and follow the rules of the road.

"Pedestrians" must be on the lookout for forklifts and stay out of the way when they're in use.

• Hand trucks, dollies, and other material handling equipment can also pose hazards to the untrained. Unbalanced loads—or loads you can't see over—can be dangerous to operators and others nearby.

• Manual lifting is a major potential source of back injuries. If you don't lift properly, you can hurt your back and struggle with a load that's too high or unbalanced to move easily. Then you're at risk not just of back injuries but of tripping or bumping into things.

Forklifts and hand trucks aren't the only warehouse equipment that can prove hazardous. Contact with moving conveyor parts can cause serious injuries. That's why it's so important to keep their guards in place.

Cranes, hoists, and derricks can be operated only by trained operators who know enough to keep from swinging a load over people or to remove their hands or feet from controls while a load is suspended. In addition, anyone who works in the vicinity must pay attention to crane movements; if you work or stand under a crane, you're looking for trouble.

You may spot hazards in the way this equipment is loaded, too. Heavy or unbalanced loads could fall over and cause serious injuries—even fatal ones.

Anyone searching for hazards should also take a good look at ladders. If they're not rated for the task, not in good condition, or not used properly, someone could take a bad fall.

Even equipment as seemingly simple as skids, pallets, rope, and strapping can be dangerous. People who aren't wearing gloves can be hurt by splinters or loose nails on a skid or pallet.

Carelessly placed empty skids or pallets can be hazardous, too—especially if you're the one who bumps into or trips over them.

Rope can be hazardous if it breaks while in use. Another potential hazard is an extended rope that's pulled tight. A break or sudden release can whip anyone in the vicinity quite painfully.

You also don't want to get whacked by steel or plastic strapping, which is why everyone working with or around it has to wear PPE and be very careful.

Even a loading dock can become hazardous, especially if it gets wet or icy. Other potential hazards include falling off an unguarded dock edge or jumping off a loading dock.

Other dock hazards occur during loading or unloading. People, goods, or vehicles can get into trouble if movable dock plates aren't secured or if trucks aren't blocked to keep them from moving. There's also the possibility of injury if overhead doors start to open or close when people aren't expecting it.

Of course, we have to be conscious of potential hazards in the materials we handle, move, store, etc. There's always a risk of chemical releases, fires, explosions, and other hazards if you don't know what materials you have and take the proper precautions.

We've established that a lot of warehouse materials and equipment can be hazardous. But you may have noticed as I went through this list that these things become hazardous if people don't operate or handle them properly or aren't aware of the risks. Equipment can actually improve safety if we use it correctly and take the attitude that identifying hazards—and protecting ourselves and others from them—is a central part of our jobs.

Protection against Hazards

Now that we've talked about hazards, we'll discuss some of the ways we protect ourselves from harm around them. Protection comes both from equipment safety features and the ways we use the equipment and perform our jobs.

Material Handling Protections

Let's begin by talking about material handling. Whether you use equipment or your own body to move materials, you prevent hazards by making preparation the first step in each job. That way, you make sure you can get where you want to—and unload there—without trouble.

Check the load first to decide how best to move it—forklift, hand truck, by hand, etc. Then check the route. If there are obstacles, remove them. If they can't be moved, figure out a different route. Make sure there's space for the load at its destination. If you plan to use material handling equipment, be sure there's room to get the equipment in and turn it around. You can't use material handling equipment casually. You need skill and practice to drive a forklift, for example; that's why OSHA only permits trained, authorized operators to use them. There are a few key points that both operators and people in the area should remember:

- No one but the operator should ever ride on a forklift.
- Never stand or walk under the raised part of a forklift, even if it's empty.
- Place forklift loads carefully so they're stable and won't fall off or tip the truck over.
- Drive a forklift slowly, obeying traffic rules.
- Keep forks—and loads—low and tilted back while moving.
- Park a forklift with forks lowered and tilted flat, brake set, and key removed.

Dollies and hand trucks are much simpler. But they, too, can be hazardous if they're not loaded and used properly. Here are some reminders:

- Load heavy objects on the bottom and secure any bulky or awkward items.
- Don't pile items so high that you can't see over them.
- Push, rather than pull, when possible.
- Lean in the direction you're going and keep the load ahead of you when walking downhill.

Let's not forget conveyors. They're great for getting things—but not people—from place to place.

Never ride on a conveyor or crawl across or under it. You also have to be very careful to avoid injury from contact with a conveyor belts gears, shafts, and other moving parts. Conveyors have guards to protect you from their moving parts and pinch points. Be sure to leave those guards in place. It's also wise not to wear loose clothes or jewellery when you work around a conveyor. If you're working under or next to a moving conveyor, stay alert. There's always a chance of materials coming off the belt, and you don't want them to hit you. Sometimes materials are moved with cranes, hoists, or derricks. These are serious pieces of machinery, and OSHA requires operators to be trained and authorized. Like forklifts, these machines are subject to a great many OSHA rules, including careful inspection and maintenance to assure that the equipment is in top—and safe—condition.

Here are a few other precautions for cranes, hoists, and derricks:

- Use the equipment only for its intended purpose.
- Check the maximum load capacity and stay within it.
- Clear the work area of items that could be hit or knocked over during operation.
- Stay out of the way of a functioning crane, hoist, or derrick unless you're directly involved with the job at hand.

Safe Lifting

Sometimes we handle materials with our own bodies. The best way to prevent injury is to lift and carry properly.

First, know your own limitations. Don't test your strength by seeing how big a load you can lift. If it's too heavy or awkward, get help.

As you know, back injuries are the biggest hazard in lifting and carrying. To save your back, let your legs do the work. When you lift:

• Stand close to the load and squat down to it; don't bend over.
• Grip the load firmly with your hands and bring it close to your body, with your weight cantered.
• Lift your head and shoulders first, and then let your legs push your body up.
• Be sure you can see over the load.
• As you move, take small steps and don't twist. Move your feet to change direction.
• To unload, face the spot and lower the load slowly, bending your knees.
• Place the load on the edge of the surface, with your fingers away from the bottom. Then slide the load back.

Ladder Safety

Material handling is not, of course, the only potential source of hazards in the warehouse. To make effective use of warehouse space, materials are often stacked. That means we may have to climb ladders to get to the top shelves or racks in these high places. To prevent falls, we use our knowledge of ladder design and ladder safety.

You know that ladders come in different types and lengths, designed for different uses and rated to hold different weights. When you select a ladder for a job, be sure it's taller than the point you want to reach and rated to hold you and anything you might carry. Inspect a ladder carefully before use; don't use one that has any missing or broken parts. In addition, keep these ladder safety rules in mind:

• Never use a metal ladder around live electricity.
• Set a ladder on a firm level surface, with its feet parallel to the firm surface it leans against.
• Angle the ladder so its feet are a distance from the wall that equals one-fourth its length. In other words, set the bottom of a 12-foot ladder 3 feet from the wall.
• Don't place a ladder against a window, window sash, unlocked door, or anything unstable like loose boxes.
• Secure the bottom of the ladder—or have someone hold it.
• Never allow more than one person on a ladder.
• Face the ladder and hold the side rails as you climb up or down.
• Carry tools and materials with a rope or belt—not your hand.
• Stand cantered on the ladder; don't stretch or lean to the side.
• Stand no higher than four steps or rungs from the ladder top—two for a stepladder.

Loading Dock Safety

Yet another area where you use a combination of built-in protections and good sense is the loading dock. Check dock plate load capacity before piling up materials or starting to unload. Slide the dock plate into place, rather than dropping it. Pay attention to weather conditions on the loading dock. To prevent slips and falls, keep the area dry and don't let ice form on it.

Another way to prevent loading dock falls is a simple one: don't jump off the loading dock. You can also protect yourself and others by making sure that trucks or trailers can't move once they've come up to the dock. Check that the wheels are blocked or chocked.

Loading docks aren't the only surfaces that demand your attention. Any floor or wall openings are potential hazards. To keep us from falling in, OSHA requires such openings to have guardrails, toe boards, floor covers, barricades etc. But we have to pay attention to these protections and keep them in place.

Safety Procedures

Many procedures we follow on the job are designed for safety as well as efficiency.

Housekeeping falls into that category. Good housekeeping allows us to function much more effectively and productively in a warehouse. It also helps us to identify and remove hazards that can lead to slips, trips, falls, fires, and a variety of other accidents. Let's not forget that good housekeeping is also required by OSHA (29 CFR 1910.22(a)), which says that we must keep the area "clean and orderly and in a sanitary condition." OSHA says that the floor has to be clean and, "so far as possible," dry and "free from protruding nails, splinters, holes, loose boards," etc. OSHA even states that we have to provide clear aisles and safe clearances in areas that use mechanical handling equipment like forklifts.

Good warehouse housekeeping begins with a simple rule: Keep it neat and make sure everything is in its place. For example:

- Don't leave items in aisles, on the floor, or perched insecurely on a surface.
- Clean up all spills immediately.
- Don't block sprinklers, fire exits, or fire extinguishers.
- Put items in their assigned places immediately, rather than moving them from one stopping point to another.
- Don't leave cutters or other sharp tools or materials sticking out.
- Keep cords and wires off the floor.
- Report loose flooring or other tripping hazards.
- Dispose of all trash immediately in proper containers.

Closely tied to both good housekeeping and safe material handling is the way you stack and place materials. OSHA says (29 CFR 1910.176(b)-(c)) that "Storage of material shall not create a hazard." The agency requires us to stack containers and materials so they're "stable and secure against sliding or collapse." We have to have signs to warn of clearance limits. In addition, we have to keep the storage areas "free from accumulation of materials that constitute hazards from tripping, fire, explosion, or pest harbourage."

Safety and the law also demand awareness of rules that apply to materials we store. High on the list of concerns are hazardous chemicals and materials that have the potential to burn or explode. Such materials are covered by their own OSHA regulations. In all cases, check labels and material safety data sheets very carefully before handling or storing these substances. That's the only way to know about handling precautions as well as whether the storage area has to be fireproof, ventilated, etc. In addition, we have to be sure we know what to keep the substances away from—ignition sources, other chemicals, even water or air—to prevent accidents.

Safe Storage Practices

So safe storage is more than keeping everything in its proper place. It includes checking what you're storing to determine if it needs certain conditions—dry, dark, ventilated, etc. It also means placing items safely and sensibly so people won't bump into them and so they won't come tumbling down to cause injuries. We also, of course, have to be able to remove stored items easily when we need them.

Here are some general guidelines to keep in mind when you're placing any materials in storage.

- Check that shelves and racks are sturdy and in good condition.
- Stack all materials on a flat base.
- Place heavier objects close to the floor, lighter/smaller objects higher.
- Don't stack items so high that they could block sprinklers or come in contact with overhead lights or pipes.
- Use material handling equipment or stand on a ladder to place or remove items above your head. Never stand on a shelf or rack or on boxes or a chair.

Certain items need special storage precautions. If, for instance, you have to stack empty skids or pallets, use equipment or get a helper. Don't drop or walk on empty skids or pallets; it could weaken them. In addition:

- Stack empties flat, not on end.
- Don't let them jut out into aisles.
- Stack them no more than four feet high.
- Watch out for splinters or nails.

Packing and Unpacking

You also have to be aware of hazards and safety procedures when you pack and unpack containers. Any cutting tool demands caution. Hold and use it in a manner that won't cut you or someone else. Don't leave an open blade on the floor or any surface where it creates a hazard. Take care with metal and plastic strapping, too. If it whacks you in the face or eyes—or anywhere else, for that matter—you'll regret it. Always wear heavy gloves and goggles when you attach or remove strapping. Use cutting tools that don't leave sharp edges. If you're doing packing, be sure to put the straps on with just the right tension—not too loose or too tight. Don't lift by the strap unless it's designed for that purpose. When you remove the straps, use one hand to hold down the strapping and one to cut. Make sure that the sharp strapping end will go away from you when you cut. Once the straps are cut, place them immediately in a trash container so they don't hurt someone while lying on the floor.

Preventing Falling Objects

One of the biggest hazards in a high-ceilinged warehouse is getting hit by falling objects. An object doesn't have to fall far to pack a powerful punch. To avoid such accidents, keep these safety procedures in mind:

- When working on a height, use signs and barricades to alert people on the ground level.
- When working on the ground, pay attention to warning signs and don't stand under people or materials.
- Don't keep tools and materials on the edge of a platform, ladder, railing, etc.
- Don't let tools stick out of your pocket when you're above ground; they could fall out when you bend or lean over.
- Don't stand or walk under a crane, forklift, etc.

Personal Protective Clothing

One of the best ways to protect you from injury in the warehouse is to wear the proper clothing and equipment. OSHA requires employers to provide—and employees to use—PPE wherever we identify hazards that could cause "injury or impairment" (29 CFR 1910.132(a)).

As we've noted, a lot can go on over your head in a warehouse. So hard hats are an important form of protection, which OSHA requires "where there is a potential for injury to the head from falling objects" (29 CFR 1910.135(a)). Protecting your feet is important, too. OSHA requires protective footwear "where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole...." Your shoes should also have non-skid soles to prevent slips when you work on loading docks, ladders, etc.

Some warehouse situations may require other forms of PPE. For instance, you need gloves to protect your hands when you're handling materials that are rough or sharp or have splinters. Some such tasks may also require safety glasses. You'll also need gloves and safety glasses— and perhaps protective clothing—if you handle chemicals. In high-noise areas, you also may need hearing protection.

Safety Attitude

We've talked about many different safety procedures that can prevent injury and accidents in a warehouse. There's one more, which is all-important. That's your attitude. No matter how good the protective equipment and how strict the rules, you can't be safe unless you make safety a priority. You have to take it seriously and use the equipment and procedures we've discussed. You also have to use your common sense. For example:

- Pay attention to warning signs and signals—and obey them.
- Watch where you're going; work is no place for daydreaming.
- Walk, don't run. You'll get there almost as quickly—and more importantly, you'll get there.
- Hand tools and materials to other people; don't throw them.
- Don't fool around; there are too many potential hazards here to allow horseplay.

Wrap-Up

Our warehouse is not a dangerous place, but it does contain many potential hazards. We don't want to get so caught up in getting materials moved in and out that we forget to do it safely. Fortunately, the safe way to run a warehouse is also the most efficient way. So following safety rules and guidelines isn't just a legal requirement—it's good sense. Good housekeeping is one of the best ways to assure warehouse safety. We have to keep the entire warehouse clean and neat, with everything in its place. Don't block aisles or leave materials around for someone to trip or fall over. Don't place items on shelves or racks or ladders so unsteadily that they might fall on someone below. Wear necessary protective gear and pay attention to warning signs and to the work that's going on around you. Give the right of way to forklift trucks and even hand trucks. Operate material handling equipment carefully; watch where you're going and keep your loads stable and secure.

When you lift and carry, do it properly so your legs do the work—not your back.

Preview every job before you start to make sure your equipment is in good condition and that you are properly protected. Don't forget to alert others around you to tasks that could put them in danger. In other words, every day, all day, pay attention to what's going on around you and take precautions that will keep you—and others—safe.

CHEMICAL HAZARDS

Chemical Hazards:

Chemicals may exert either acute or chronic effects on workers. The effects depend on (1) extent (concentration and duration) of exposure, (2) the route of exposure, and (3) the physical and chemical properties of the substance. The effects exerted by a substance may also be influenced by the presence of other chemicals and physical agents or by an individual's use of tobacco, alcohol, or drugs.

Highly Toxic Chemicals Standard Operating Procedures

Standard operating procedures (SOP) are intended to provide you with general guidance on how to safely work with a specific class of chemical or hazard. This SOP is generic in nature. It addresses the use and handling of substances by hazard class only. In some instances multiple SOPs may be applicable for a specific chemical (i.e., both the SOPs for flammable liquids and carcinogens would apply to benzene). If you have questions concerning the applicability of any items listed in this procedure, contact Vanderbilt Environmental Health and Safety (322-2057) or the Principal Investigator of your laboratory. Specific written procedures are the responsibility of the principal investigator. If compliance with all the requirements of this standard operating procedure is not possible, the principal investigator must develop a written procedure that will be used in its place. This alternate procedure must provide the same level of protection as the SOP it replaces. Vanderbilt Environmental Health and Safety is available to provide guidance during the development of alternate procedures.

Training:

All employees who work with hazardous chemicals must be apprised of the hazards of chemicals present in their work area. This training must be provided before initial assignment and before new exposure situations. Before a lab worker may begin work with Highly Toxic Chemicals they must be trained on the lab specific Standard Operating Procedure for these materials. The primary factors that lab workers need to be trained on in regard to highly toxic chemicals are the identity and location of highly toxic chemicals in the lab, the procedures for handling these materials, the toxic effects associated with both acute and chronic exposures, antidote and other first aid measure that should be taken upon exposure to a highly toxic chemical and any other protective measures.

Decontamination procedures:

Personnel: Wash hands and arms with soap and water immediately after handling highly toxic chemicals.

Area: Decontamination procedures vary depending on the material being handled. The toxicity of some materials can be neutralized with other reagents. All surfaces should be wiped with the appropriate cleaning agent following dispensing or handling. Waste materials generated should be treated as a hazardous waste.

Equipment: Decontaminate vacuum pumps or other contaminated equipment (glassware) before removing them from the designated area.

Designated area:
All locations within the laboratory where highly toxic, carcinogenic or reproductive hazards are handled should be demarcated with designated area caution tape. Areas that should be designated include all fume hoods, sinks and bench tops where the highly toxic, carcinogenic or reproductive hazards are handled. An entire laboratory may be considered a designated area if the PI determines the need for such chemicals to be handled in the entire laboratory. A lab worker may Highly Toxic Chemicals CHP Standard Operating Procedures Rev.04/23/03 Page 2 of 4 designate an area only during the time the chemical is used and then remove the designated area sign/tape. Only lab workers trained on the particular hazards found in a designated area should work in that area Where feasible highly toxic chemicals should be manipulated over plastic -backed disposable paper covered work surfaces. These disposable work surfaces minimize work area contamination and simplify clean up.

Emergency procedure:
Emergency procedures, which address response actions to fires, explosions, spills, injury to staff, or the development of sign and symptom of overexposure, must be developed. The procedures should address as a minimum the following:

- Who to contact: University police, Vanderbilt Environmental Health and Safety, and the Principal investigator of the laboratory including evening phone number.
- The location of all safety equipment (showers, eye wash, fire extinguishers, etc.)
- The method used to alert personnel in nearby areas of potential hazards.
- Specific first aid treatment required by the type of highly toxic material(s) handled in the laboratory. (Student Health Clinic or Occupational Health Clinic should be consulted for first aid procedures.)

Eye protection:
Eye protection in the form of safety glasses must be worn at all times when handling highly toxic chemicals. Ordinary (street) prescription glasses do not provide adequate protection and cannot pass the rigorous test for industrial safety glasses. Adequate safety glasses must meet the requirements of the Practice for Occupational and Educational Eye and Face Protection (ANSI Z.87. 1 1989) and must be equipped with side shields. Safety glasses with side shields do not provide adequate protection from splashes, therefore, when the potential for splash hazard exists other eye protection and/or face protection must be worn.

Eyewash:
Where the eyes or body of any person may be exposed to highly toxic chemicals, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use. Bottle type eyewash stations are not acceptable.

Glove (dry) box:
Certain highly toxic chemicals must be handled in a glove box rather than a fume hood. Vanderbilt Environmental Health and Safety (322-2057) or the Principal Investigator will determine if this is required.

Gloves:
Gloves should be worn when handling highly toxic chemicals. Nitrile gloves provide adequate protection against accidental hand contact with small quantities of most laboratory chemicals. However, when larger quantities are handled or regular contact is involved more protective gloves should be used. Lab workers should contact VEHS for advice on chemical resistant glove selection when direct or prolonged contact with hazardous chemicals is anticipated. A glove assessment chart can be found in Appendix H.
Highly Toxic Chemicals CHP Standard Operating Procedures

Hazard assessment:
Hazard assessment should focus on proper use and handling procedures, the education of employees concerning the health risk posed by highly toxic materials, and on the demarcation of designated areas.

Lab hood:
Manipulation of highly toxic chemicals should be carried out in a fume hood. If the use of a fume hood proves impractical refer to the section on special ventilation.
All areas where highly toxic chemicals are stored or manipulated must be labeled as a designated area.

Labels:
Containers: All highly toxic chemicals must be clearly labeled with the correct chemical name. Handwritten labels are acceptable; chemic al formulas and structural formulas or abbreviations are not acceptable.

Notification:
You should notify Vanderbilt Environmental Health and Safety prior to the initial use of highly toxic substances. Notification is also required following significant changes in procedures or the quantity of materials used.

Protective apparel:
Appropriate lab attire (lab coats, closed- toe shoes and long- sleeved clothing) should be worn when handling highly toxic chemicals. Additional protective clothing should be worn if the possibility of skin contact is likely.

Safety shielding:
Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction. All manipulations of highly toxic chemicals, which pose this risk, should occur in a fume hood with the sash in the lowest feasible position. Portable shields, which provide protection to all laboratory occupants, are acceptable.

Safety shower:
A safety shower should be available in a nearby location where the highly toxic chemicals are used.

Signs and labels:
Doorways: The hazard identification sign must demarcate where carcinogens, reproductive hazards, and/or highly toxic chemicals are stored or used.

Special storage:
Highly toxic chemicals must be stored in a designated area.
Highly Toxic Chemicals CHP Standard Operating Procedures

Special ventilation:
Manipulation of highly toxic chemicals outside of a fume hood may require special ventilation controls in order to minimize exposure to the material. Fume hoods provide the best protection against exposure to highly toxic chemicals in the laboratory and are the preferred ventilation control device. Handle highly toxic chemicals in a fume hood where possible. If the use of a fume hood proves impractical attempt to work in a glove box or in an isolated area on the laboratory bench top.
If your research does not permit the handing of highly toxic chemicals in a fume hood, or glove box, you must contact VEHS for further instruction.
All areas where highly toxic chemicals are stored or manipulated must be labelled as a designated area.

Spill response:
Anticipate spills by having the appropriate clean up equipment on hand. The appropriate clean up supplies can be determined by consulting the material safety data sheet. This should occur prior to the use of any highly toxic chemical. In the event of a spill alert personnel in the area that a spill has occurred. Do not attempt to handle a large spill of highly toxic chemicals. Vacate the laboratory immediately and call for assistance.
Vanderbilt University Police Department 1-1911 or 322-2745. Remain on the scene, but at a safe distance, to receive and direct safety personnel when they arrive.

Vacuum protection:
Evacuated glassware can implode and eject flying glass, and splattered chemicals. Vacuum work involving highly toxic chemic als must be conducted in a fume hood, glove box or isolated in an acceptable manner.
Mechanical vacuum pumps must be protected using cold traps and, where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood.

Waste disposal:
All materials contaminated with highly toxic chemicals should be disposed of as a hazardous waste. Wherever possible, attempt to design research in a manner that reduces the quantity of waste generated. Questions regarding waste pick up should be directed to Vanderbilt Environmental Health and Safety. This office can also assist you in minimizing waste generation.
Fact sheets for chemical waste management can be found in Appendix N.

Extent of Exposure

The exposure concentration of a substance is the mass per unit volume of air to which a worker is exposed. In the workplace, airborne concentrations are usually expressed in terms of milligrams of substance per cubic meter of air (mg/m3) or parts of substance per million parts of air (ppm). In the case of asbestos, concentration is expressed as fibres per cubic centimetre (f/cc) or fibres per cubic meter (f/m3) of air. The exposure dose is the amount of a substance that actually enters the body during the period of exposure. The substance continues to be present in the body until it is metabolized or eliminated. Although some chemicals are rapidly metabolized, others are not and may be excreted unchanged or stored in the fatty tissues (solvents), lungs (dusts and fibres), bone (lead and radium), or blood (soluble gases).

Route of Entry into the Body

Toxic substances can enter the body through several routes, including the intact skin, the respiratory system (inhalation), the mouth (inhalation and ingestion), the eyes, and by accidental needle punctures. Some substances can also damage the skin or eyes directly without being absorbed. Not all substances can enter the body through all routes. Inorganic lead, for example, can be inhaled or swallowed, but it does not penetrate the skin. (It should be noted that tetraethyl lead, a component of automotive gazolines, can be absorbed through the skin and therefore can contribute to the total absorbed dose.) Sometimes a chemical substance can enter through more than one route. Asbestos, for example, can be swallowed or inhaled, but the latter route appears to be more hazardous.

Physical and Chemical Properties

The physical properties of a chemical or physical agent include such characteristics as vapor pressure, solubility in water and organic solvents, boiling point, melting point, molecular weight, specific gravity, and morphology. Chemical properties describe the reactivity of a substance with other chemicals.

Warning Properties

Some chemicals have characteristics that can be perceived by workers and can serve as a warning of the chemical's presence. The most commonly discussed warning property is odour. Depending on a person's ability to detect the odor of a substance, a chemical is considered to provide either good or poor warning of its presence. The lowest concentration at which the odor of a chemical can be detected is called the odor threshold. Some substances, such as asbestos, have no odor and therefore provide no warning of their presence. In many cases, the concentration of a chemical that can be detected by odor and the concentration that is capable of causing adverse effects are similar. For example, the odor threshold of ethylene oxide is about 700 ppm, a concentration that has been demonstrated to cause a variety of severe effects among exposed workers. In other cases, exposure to a chemical can cause olfactory fatigue that prevents a worker from continuing to smell the chemical. People cannot detect odours equally well. Thus some may be able to

detect the odour of chlorine at a concentration of 0.02 ppm, and others cannot detect its presence until the concentration reaches 0.2 ppm. For these reasons, workers should not rely on their sense of smell to warn them of the presence of hazardous substances. Nevertheless, available information on odor thresholds has been included for the substances discussed here. al. 1969).

Asbestos

Because asbestos is an extremely hazardous material and compliance with all relevant aspects of the OSHA asbestos regulations must be assured, Companies should develop a policy for working with asbestos. All workers who may have reason to work with this substance should receive training.

A company asbestos policy must outline specific OSHA requirements (29 CFR* 1910.1001) for the following:

- Reports of each asbestos use or exposure (a log of all jobs in which personnel are exposed)
- Work practices for handling asbestos, such as wet handling, development of clean-up protocols, use of plastic sheeting to seal off work areas, and bagging of removed insulation during routine operations, maintenance, and repair
- Asbestos waste collection, labelling, and disposal
- Respiratory protective equipment (types of respirators, maintenance, training programs, use, and record keeping.)
- Dressing rooms and special clothing
- Air monitoring
- Record keeping. and maintenance of records (30 years)
- Medical surveillance (requirements are set by OSHA according to the level of asbestos exposure)
- Training

Asbestos removal must only be conducted by fully trained personnel as specified by OSHA (29 CFR 1910.1001).

Hazard Location

Companies use asbestos for many purposes, including the non-combustible, no conducting, or chemically resistant materials required for fireproof clothing, curtains, and roofing. Before the early 1970's, asbestos was used as insulation throughout most buildings (including hospitals). Significant asbestos exposures can occur when insulation in old buildings is removed during renovation. Maintenance personnel in most hospitals do not know and often are not trained in the proper methods of performing repairs on systems that contain asbestos. They frequently perform spot repairs without protecting themselves, patients, or staff from exposure. Asbestos is also used to make heat-resistant protective gloves for central supply and laboratories. With time, these gloves may become worn and disintegrate, releasing fibres into the air.

Potential Health Effects

Asbestos causes asbestosis (a fibrosis or scarring of the lung tissue) and cancer. These diseases may develop 15 to 30 years after the first exposure.

Asbestosis belongs to the group of pulmonary diseases called pneumoconiosis; these include coal workers' pneumoconiosis (often called black lung disease) among coal workers and silicosis among workers with prolonged exposure to sand blasting or other operations in which silica-containing rock is crushed, drilled, or used. Pneumoconiosis is characterized by restriction of lung function, which eventually increases the load on the circulatory system so that the fully developed disease usually involves heart failure as well. The only hospital workers most likely to encounter enough asbestos to produce asbestosis are engineers who work in furnace rooms where boilers are lined with asbestos, and maintenance workers who frequently repair old piping or do minor renovation. These workers must take special care to protect them and to ensure that asbestos is not spread throughout the facility when they perform tasks involving this substance.

All asbestos-exposed workers have a higher risk of lung cancer than no exposed workers, but exposed workers who smoke cigarettes have a markedly greater risk of lung cancer than non-smoking exposed workers

Standards and Recommendations

The current OSHA PEL for asbestos is an 8-hour TWA concentration of 0.2 f/cc (200,000 f/m^3) for fibres that are 5 micrometres or longer and that have a length-to-diameter ratio of 3:1 (29 CFR 1910.1001). The asbestos standard is very detailed and has specific requirements for training, labelling, protective equipment, medical surveillance, and environmental monitoring. Questions regarding the implementation of the standard should be referred to the State or Federal OSHA program, which has a consultation service. The NIOSH REL for asbestos (fibres longer than 5 micrometres with a length-to-diameter ratio of 3:1 or greater) is an 8-hr TWA concentration of 100000 f/m^3 (0.1 f/cc) (NIOSH 1984b).

Environmental Monitoring

Sampling should be conducted in a manner and on a schedule that will provide an accurate depiction of job-specific asbestos exposures. All analyses should be done by laboratories accredited by the American Industrial Hygiene Association (AIHA). The minimum schedule for monitoring is established by OSHA regulation ((29 CFR 1910.1001).

Exposure Control Methods

Removal and encapsulation

Whenever asbestos fibres are exposed, they present a hazard that can be eliminated by removing or encapsulating (covering) them so that they will not be released. Asbestos must only be removed by fully trained personnel using methods and protective equipment mandated by OSHA (29 CFR 1910.1001).

Protective equipment

Complete physical covering and a NIOSH/MSHA-certified, positive-pressure, air-supplied respirator are required for any worker exposed to asbestos. The OSHA asbestos standard should be consulted along with the NIOSH/EPA document entitled A Guide to Respiratory Protection for the Asbestos Abatement Industry (NIOSH/EPA 1986).

Work practices

Only workers fully trained in asbestos handling should be allowed in areas where asbestos is exposed. The work practices appropriate for handling asbestos are set out in detail in the OSHA regulation (29 CFR 1910.1001).

Chemical Disinfectants

Because of the variety of needs for disinfectants, a number of different substances are used. The most important are:

- Isopropyl alcohol
- Sodium hypochlorite (chlorine)
- Iodine
- Phenolic
- Quaternary ammonium compounds
- Glutaraldehydes
- Formaldehyde

Many of the following descriptions of disinfectants refer to the lowest concentration at which the odor of these substances can be detected; however, workers should not rely on odor as a warning of exposure because many persons are unable to detect odors.

Sodium Hypochlorite (Chlorine)

Chlorine can be generated from solutions of sodium hypochlorite. Chlorine is effective against bacteria and viruses, and it can destroy some spores, depending on the concentration.

Hazard location

Chlorine is used for disinfecting water tanks, bathtubs, toilets, and bathrooms; it is also used as bleach for laundries, a sanitizer for dishwashing, and a disinfectant for floors. Chlorine-containing cleaning materials should never be mixed with ammonia or ammonia-containing materials because the reaction may produce a toxic gas.

Potential health effects

Chlorine is released slowly from cleaning and bleaching solutions as they are used. Repeated exposure to chlorine may cause a runny nose, coughing, wheezing, and other respiratory

problems (NIOSH 1976b). Mild irritation of the mucous membranes can occur at exposure concentrations of 0.5 ppm (ACGIH 1986).

Standards and recommendations

The OSHA PEL for chlorine is a ceiling of 1 ppm (3 mg/m^3) (29 CFR 1910.1000, Table Z-1). The NIOSH REL is a ceiling of 0.5 ppm for 15 min (NIOSH 1976b). Chlorine has an odor threshold between 0.02 and 0.2 ppm, but since the sense of smell is dulled by continued chlorine exposure, odor does not provide adequate warning (NIOSH 1976b).

The ACGIH recommends a TLV of 1 ppm (3.0 mg/m^3) as an 8-hr TWA and a short-term exposure limit (STEL) of 3 ppm (9 mg/m^3) but has published a notice of intended change to a TLV of 0.5 ppm (1.5 mg/m^3) as an 8-hr TWA and a STEL of 1 ppm (3 mg/m^3) (ACGIH 1987).

Exposure control methods

Workers should be provided with and required to use splash-proof safety goggles where there is any possibility that chlorine-containing solutions may contact the eyes. To prevent any possibility of skin contact with chlorine-containing liquids, workers should be provided with and required to use appropriate personal protective equipment (see Section 2.3.5) such as gloves, face shields, and respirators (see Section 2.3.5.6) as necessary. No impervious clothing that becomes contaminated with chlorine-containing solutions should be removed immediately and rework only after the chlorine-containing solution is removed from the clothing. Skin that becomes contaminated with chlorine should be immediately washed to remove any chlorine. Additional control measures for chlorine include process enclosure and good exhaust ventilation.

Iodine

Iodine is a general disinfectant; it can be mixed with alcohol for use as a skin antiseptic or with other substances for general disinfecting purposes.

Potential health effects

Symptoms of iodine exposure include irritation of the eyes and mucous membranes, headaches, and breathing difficulties (ACGIH 1986). Crystalline iodine or strong solutions of iodine may cause severe skin irritation: it is not easily removed from the skin and may cause burns.

Standards and recommendations

The OSHA PEL for iodine is a ceiling of 0.1 ppm (1.0 mg/m^3) (29 CFR 1910.1001, Table Z-1). The ACGIH recommends a TLV of 0.1 ppm (1.0 mg/m^3) as a ceiling (ACGIH 1987). NIOSH has no REL for iodine.

Exposure control methods

To prevent skin contact with solids or liquids containing iodine, workers should be provided with and required to use personal protective equipment such as gloves, face shields, and any other appropriate protective clothing deemed necessary (see Section 2.3.5).

If there is any possibility that clothing has been contaminated with solid iodine or liquids containing iodine, a worker should change into uncontaminated clothing before leaving the work area. Clothing contaminated with iodine should be stored in closed containers until provision is made to remove the iodine. The person laundering or cleaning such clothes should be informed of iodine's hazardous properties.

Skin that becomes contaminated with solids or liquids containing iodine should be immediately washed with soap or mild detergent and rinsed with water. Workers who handle solid iodine or liquids containing iodine should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

Phenolic

Phenolic were among the first disinfectants used general cleaning.

Hazard location

Phenolic are widely used on floors, walls, furnishings, glassware, and instruments.

Potential health effects

Phenol may be detected by odour at a concentration of about 0.05 ppm. Serious health effects may follow exposure to phenol through skin adsorption, inhalation, or ingestion. These effects may include local tissue irritation and necrosis, severe burns of the eyes and skin, irregular pulse, stertorous breathing (harsh snoring or gasping sound), darkened urine, convulsions, coma, collapse, and death (NIOSH 1976d). Both ptBP and ptAP have caused hospital worker to experience loss of skin pigment that was not reversed one year after use of the compounds was discontinued (Kahn 1970).

Standards and recommendations

The OSHA PEL for phenol is 5 ppm (19 mg/m^3) as an 8-hr TWA (Skin) (29 CFR 1910.1000, Table Z-1). The NIOSH REL for phenol is 20 mg/m^3 (5.2 ppm) for up to a 10-hr TWA with a 15-min ceiling of 60 mg/m^3 (15.6 ppm) (NIOSH 1976d). Neither OSHA nor NIOSH has established exposure limits for ptBP or ptAP.

Exposure control methods

When working with phenol, workers should be provided with and required to use protective clothing (see Section 2.3.5), gloves, face shields, splash-proof safety goggles, and other appropriate protective clothing necessary to prevent any possibility of skin or eye contact with solid or liquid phenol or liquids containing phenol.

If there is any possibility that the clothing has been contaminated with phenol, a worker should change into uncontaminated clothing before leaving the work area and the suspect clothing should be stored in closed containers until it can be discarded or until provision is made for removal of the phenol. The worker laundering or cleaning such clothes should be informed of phenol's hazardous properties.

Skin that becomes contaminated with phenol should be immediately washed with soap or mild detergent and rinsed with water. Eating and smoking should not be permitted in areas where solid or liquid phenol or liquids containing phenol are handled, processed, or stored. Workers who handle solid or liquid phenol or liquids containing phenol should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.

Additional measures to control phenol exposure include process enclosure, local exhaust ventilation, and personal protective equipment.

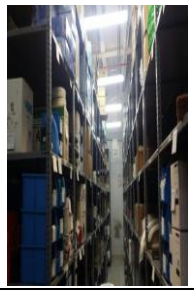
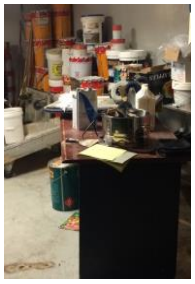
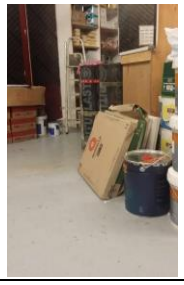
STORES SUMMARY

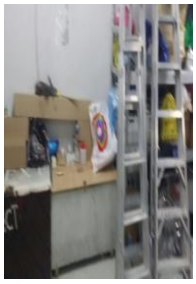
(Sample Actual Report)

PODIUM & COMMERCIAL

DOKAAE PROJECT

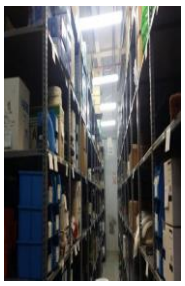
LOCATIONS	Store Responsible	Store Type	Safety Condition				Fire Protection Systems				PICTURES	RECOMMENDATION	RISK LEVEL
			Material Storage	Electric Hazard	Ventilation	Housekeeping	Water Sprinkler	Smoke Detector	Emergency Light	Fire Extinguisher expire Date			
B3, Tower C, ZONE 03, (B3-03-043)	**SSCL**	CIVIL	pallets, paint boxes, trolleys, ladders, cartons, boxes, wooden material	YES	OK	OK	OK	OK	NO	22.10.17		There must be proper racks and spacing and the labelling for the material identification must be utilised properly Emergency Light must be installed. The ventilation must not be covered with any material. All the obstructions in the entrance door must be cleared properly	**Medium**
B3, Tower C, ZONE 03, (B-03-050)	**SSCL**	CIVIL	pallets, paint boxes, trolleys, plastic bottles, ladders, cartons, boxes, tables, wooden sticks	NO	OK	OK	OK	OK	NO	30.01.18		There must be proper labelling and adequate racks. The height of material storage for a specific rack must be maintained and the spacing must be adequate. Thus no material must be stored above the water pipelines and duct lines. Emergency Light must be installed.	**Low**
B2, Tower A, ZONE 06, (TA-06 NEAR FHC #68)	**SSCL**	HOUSEKEEPING	cleaning agents, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	YES	NO	OK	NOTOK	NOTOK	NO	30.01.18		Electrical cable must be properly fixed. And there must be no wire trailing in the store. Emergency Light must be installed. Sprinkler and Smoke Detector should be fixed and corrected	**HIGH**
B2, Tower A, ZONE 06, BESIDE OF FM200 ROOM FDR	**SSCL**	HOUSEKEEPING	cleaning agents, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	YES	NO	OK	NO	NO	NO	30.1.18		Electrical cable must be properly fixed. The height of the material must be 45cm from the ceiling height. Emergency Light must be installed. Sprinkler and Smoke Detector should be installed	**HIGH**
B2, Tower A, ZONE 06, (BESIDE EXIT STAIR 3D)	**SSCL**	HOUSEKEEPING	cleaning agents, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	NOTOK	NOTOK	NO	18.10.17		Emergency Light must be installed. Sprinkler and Smoke Detector should be fixed and corrected so that fire detecting and extinguishing equipment's are in-line and efficient. There must be no overloaded racks and there must be proper labelling for all the various chemicals	**HIGH**

B2,(INFRONT OF EXIT STAIR 2C)	**SSCL**	WARE HOUSE STORE	wooden material, flammable material, combustible material, trolleys, ladders, equipment's	NO	No	OK	OK	Not OK	NO	18.10.2017 1.11.2017		HVAC System must be checked for proper working condition. Emergency Light must be installed.	**HIGH**
B1, Tower C, ZONE 03, (B1-23-TC-19)	**SSCL**	CIVIL	pallets, paint boxes, trolleys, plastic bottles, ladders, cartons, boxes, tables, wooden sticks	NO	NO	OK	OK	OK	NO	1.11.17		adeuate temperature must be maintained. Emergency Light must be installed.	**Medium**
B1, Tower C, ZONE 03, (B1-3C-042)	**SSCL**	CIVIL	pallets, paint boxes, trolleys, plastic bottles, ladders, cartons, boxes, tables, wooden sticks	NO	ok	OK	OK	OK	NO	18.10.2017 16.9.17		.HVAC System must be checked for proper working condition. Emergency Light must be installed. The height of rack must be appropriate and the spacing between racks must be sufficient and below 45cm height from the ceiling	**Low**
B1, Tower C, ZONE 03 (B1-3-053)	**SSCL**	Electrical	pallets, paint boxes, trolleys, plastic bottles, ladders, cartons, boxes, tables, wooden sticks	NO	OK	OK	OK	OK	NO	30.1.18		HVAC System must be checked for proper working condition. Emergency Light must be installed. All the racks must be properly labelled	**Low**
GF, Tower B, ZONE 04, (GF-02-033)	**SSCL**	HOUSEKEEPING	cleaning agents, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	OK	**OK**	NO	18.10.17		Emergency Light must be installed. The cooling system of location must be appropriate and there must be adequate ventilation for the particular store.	**Medium**
GF, Tower C, ZONE 03, (GF-03-091)	**SSCL**	HOUSEKEEPING	cleaning agents, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	OK	OK	OK	**OK**	NO	30.1.18		Emergency Light must be installed. The labelling of materials must be clear and spacing between racks must be of minimum standards.	**Low**

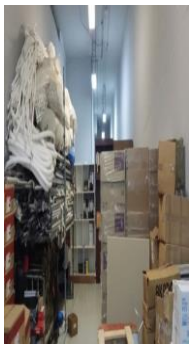
GF, Tower H, ZONE 02, NEAR SAFETY OFFICE (GF-TH-96)	**SSCL**	HOUSEKEEPING	cleaning agents, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	OK	Not Ok	OK	**OK**	NO	30.1.18		Emergency Light must be installed. Water Sprinkler should be corrected to avoid consequences of the fire hazards and all the supply lines for the water sprinkler must also be checked properly	**HIGH**
P1, Tower A, ZONE 06, (P1-1-068)	**SSCL**	HOUSEKEEPING	cleaning agents, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	OK	**OK**	NO	30.1.18		HVAC System must be checked for proper working condition and suitable temperature must be maintained. Emergency Light must be installed. There must be use of pallets and adequate racking send the racks must not be overloaded	**HIGH**
P3, Tower D, Inside ZamZam Service Lift	**SSCL**	EQUIPMENT Workshop	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	OK	**OK**	NO	30.1.18		Electrical cable must be properly fixed. There must be no electrical equipment (heater) inside the store and it must be immediately removed. Emergency Light must be installed. There must be no use of heaters and such devices and there must be adequate ventilation for the store as it's a deviation from standards	**HIGH**
M4, CENTER PODIUM, ZONE 05, BESIDE OSAMA ENGG. OFFICE.	**SSCL**	(MECH) Workshop and Scrap	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	YES	OK	OK	NO	**OK**	OK	30.1.18		Electrical cable must be properly fixed and must not be trailing to avoid the consequences generated from the electrical hazards. Emergency Light must be installed. Water Sprinkler should be installed	**HIGH**
P5, Tower C, ZONE 03, (BESIDE STATIONARY STORE UNDER RAMP)	**SSCL**	CIVIL (WAREHOUSE)	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	OK	**OK**	NO	30.1.18		HVAC System must be checked for proper working condition. Emergency Light must be installed.	**HIGH**
P5, Tower D, ZONE 01, (L-5-4-069)	**SSCL**	ELECTRICAL	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	YES	OK	OK	**OK**	**OK**	OK	16.9.17, 30.1.18		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed.	**Medium**

P5, Tower D, Zone 1, Infront of ZamZam Service lift	**SSCL**	CARPENTER WORK SHOP (CIVIL)	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	OK	OK	OK	NOT OK	NO	30.1.18		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed. The ventilation must be proper	**HIGH**
P5, Tower C, ZONE 03, (BESIDE EXIT STAIR 2C)	**SSCL**	STATIONARY (W.H)	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	OK	OK	OK	**OK**	NO	30.01.18 1.11.17		Emergency Light must be installed.	**LOW**
P6, Tower H, ZONE 02, (NEAR EXIT STAIR 1H)	**SSCL**	CIVIL	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	NOT OK	OK	NOT OK	NO	30.01.18		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed. There must be no use of heaters and such devices	**HIGH**
P6, Tower H, ZONE 02, (NEAR FHC 21)	**SSCL**	CIVIL	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	OK	**OK**	NO	30.1.18		The combustible and flammable materials must be stored separately to avoid the consequences generated from the hazards associated. HVAC System must be checked for proper working condition. Emergency Light must be installed.	**Medium**
P6, Tower A, ZONE 06, BESIDE ESCALATOR #43-44	**SSCL**	HOUSEKEEPING	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	OK	**OK**	NO	30.1.18		Emergency Light must be installed.	**High**
P6, Tower A, ZONE 06, NEAR FHC - 66	**SSCL**	MECHANICAL	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NOT OK	OK	OK	**OK**	NO	31.1.18		Electrical cable must be properly fixed and the wires must have proper insulation and sheath must be covere . HVAC System must be checked for proper working condition. Emergency Light must be installed. There must be no use of heaters as it has main potential of enhancing fire hazards	**HIGH**

P6, Tower H, ZONE 02, (NEAR FHC 22)	**SSCL**	MECHANICAL STORE	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	OK	OK	OK	**OK**	NO	30.1.18		Electrical cable must be properly fixed and there must be no trailing of cables. HVAC System must be checked for proper working condition. Emergency Light must be installed.	**HIGH**
P6, Tower H, ZONE 02, (NEAR EXIT STAIR 1H, FHC 21)	**SSCL**	ELECTRICAL	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	OK	**OK**	NO	30.1.18		Emergency Light must be installed.	**Medium**
P6, Tower C, Zone 03 NEAR FHC-33	**SSCL**	TRANSIT STORE (W.H)	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	YES	NO	OK	NOTOK	**OK**	NO	30.01.18		Electrical cable must be properly fixed. Emergency Light must be installed. The height for the material suitable must have distance of n45cm from the ceiling and spacing should be adequate. Water Sprinkler should be installed in the location so that fire extinguishing system is in-line	**HIGH**
P7, Tower A, ZONE 06, (BEFORE SERVICE LIFT)	**SSCI**	CIVIL	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	OK	OK	OK	**OK**	NO	30.01.18 30.01.18		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed.	**MEDIUM**
P7, Tower B, ZONE 04, (TB-SSCL-CIVIL)	**SSCI**	CIVIL	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	OK	**OK**	NO	30.1.18		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed.	**HIGH**
P7, Tower C, ZONE 03, (P7-03-TC-017 NEAR FHC 32)	**SSCI**	ROYAL STORE	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	YES	OK	OK	OK	**OK**	NO	30.01.18		Emergency Light must be installed. The spacing must be adequate between the racks and the appropriate rack height must be maintained	**LOW**

P7, Tower H, ZONE 02, (NEAR FHC 24)	**SSCI**	MECHANICAL	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	OK	OK	OK	**OK**	NO	1.11.17		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed.	**Medium**
P7, Tower C, ZONE 03, (P7-03-TC-18 NEAR FHC 32)	**SSCI**	ELECTRICAL	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	YES	OK	OK	OK	**OK**	NO	2.10.17		Electrical cable must be properly fixed and the insulations of wires must be suitable. Emergency Light must be installed. The material must be stored properly and the space between racks must be sufficient and ladders, scaffolds must be stored separately	**HIGH**
P7, Tower C, ZONE 03, (MAIN ROYAL STORE)	**SSCI**	ROYAL (R.F)	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	OK	**OK**	NO	2.10.17 2.10.17 16.9.17		Emergency Light must be installed.	**LOW**
P7, Tower C, ZONE 03, (P7-TC-3-19)	**SSCL**	SCRAP (MECH)	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	OK	**OK**	NO	1.11.17	**NOT AVAILABLE**	Emergency Light must be installed. The sharp edge material must be stored separately	**Medium**
P7, Tower C, ZONE 03, (23-5-15)	**SSCL**	TOOLS STORE	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	OK	OK	OK	**OK**	NO	30.01.18		HVAC System must be checked for proper working condition. Emergency Light must be installed. There must be proper rocking of materials and height of rack must be according to NFPA standards	**HIGH**
P7, Tower H, ZONE 02, (P7-02-TH-17 NEAR FHC 24) ROOM 77	**SSCL**	MULTI MATERIAL (MECH)	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NOT OK	OK	NOT OK	**OK**	NO	30.01.18		Emergency Light must be installed. Water sprinkler must be installed properly	**High**

P9, Tower C, ZONE 03, (BEHIND LIFT LOBBY-TC)	**SSCL**	CIVIL	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	OK	OK	OK	**OK**	NO	3.01.18		HVAC System must be checked for proper working condition. Emergency Light must be installed.	**LOW**
P10, Tower A, ZONE 06, (HIJRA SIDE)	**SSCL**	HOUSEKEEPING	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	NO	OK	OK	**OK**	NO	30.01.18		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed. Adequate saving of racks and its height	**HIGH**
P10, Tower C, ZONE 03 (BESIDE FHC 36)	**SSCL**	PLUMBING (MECH)	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	OK	OK	OK	**OK**	NO	18.10.17		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed.	**MEDIUM**
P06, T H, Z2 (Near FHC 24 and fire control room)	**SSCL**	ELECTRONIC SSCL	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys	NO	OK	OK	OK	**OK**	NO	18.10.17		Emergency Light must be installed.	**LOW**
P07, T C, Z3 Near Exit stair 3C	**SSCL**	CIVIL STORE	mechanical tools, machines, chemicals, toxic materials, tissues, cartons, flammable material, trolleys, Electrical wires, cables	NO	NO	OK	OK	**OK**	NO	30.01.18		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed.	**MEDIUM**

P2, Tower D, ZONE 01, near ZAMZAM lift	**SSCL**	CIVIL	pallets, paint boxes, trolleys, plastic bottles, ladders, cartons, boxes, tables, wooden sticks, bricks, tile material	NO	OK	OK	OK	OK	NO	N/A		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed. Sprinkler and Smoke Detector should be fixed and corrected. The material must be properly stirred in the racks	**HIGH**
B3, Tower D, ZONE 01, Beside Assembly point	**SSCL**	CIVIL	pallets, paint boxes, trolleys, plastic bottles, ladders, cartons, boxes, tables, wooden sticks	NO	OK	OK	NOTOK	OK	NO	N/A		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed. Only PAT certified electrical equipment's be utilized for the cutting, grinding purpose	**HIGH**
P6, Tower C, ZONE 03, (TC-Z3-101)	**SSCL**	CIVIL	, chemicals, toxic materials, tissues, cartons, flammable material, trolleys, cement, tile	NO	NO	NO	NOTOK	OK	NO	N/A		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed. Sprinkler and Smoke Detector should be fixed and corrected	**HIGH**
P3 Tower A, ZONE 06, (TA-Z6-L3-01-33)	**SSCL**	CIVIL	cartons, flammable material, trolleys, cement, tile material, brick material and ladders	NO	OK	NO	OK	OK	NO	N/A	N/A 	Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed. Sprinkler and Smoke Detector should be fixed and corrected and the detector must not be covered with any material. The space for the store must be sufficient	**HIGH**

B3, Tower C, ZONE 03, (TC-Z3-47)	**SSCL**	CIVIL	Chemicals, toxic materials, tissues, cartons, flammable material, trolleys, cement, tile	NO	NO TO K	O K	O K	O K	N O	N/A		Electrical cable must be properly fixed. HVAC System must be checked for proper working condition. Emergency Light must be installed. Sprinkler and Smoke Detector should be fixed and corrected	**Medium**

STORES BELONGS TO	QTY.
SSCL CIVIL	17
HOUSEKEEPING	10
MECHANICAL	9
WAREHOUSE	3
ELECTRONIC	1
ELECTRICAL	3
ROYAL STORE	2
	45

OTHER STORES SUMMARY

LOCATIONS	Store Responsible	Store Type	Safety Condition					Fire Protection Systems				RECOMMENDATION	RISK LEVEL
			Material Storage	Electrical equipment	Electric Hazard	Ventilation	Housekeeping	Water Sprinkler	Smoke Detector	Emergency Light	Fire Extinguisher expire Date		
B3, Tower C, ZONE 03, (B3-03-046)	**ABPD**	Fire & BMS store	pallet, trolleys, ladders, cartons, boxes, wooden material	NO	NO	OK	OK	OK	OK	NO	22.10.17	There must be proper racks and spacing and the labelling for the material identification must be utilised properly Emergency Light must be installed. The ventilation must not be covered with any material.	**Medium**
B1, Tower D, ZONE 01, (TD-B1-4-95)	**ENTOTOX**	Pest control	pallets, , trolleys, plastic bottles, ladders, cartons, boxes, tables, wooden sticks, Chemicals , sprays, pest equipment	NO	NO	NOT OK	OK	OK	OK	NO	30.01.18	There must be proper labelling and adequate racks. Emergency Light must be installed. There must be proper ventilation	**Medium**
P3M, Tower D, ZONE 01, (NEAR FHC #11)	**KONE**	Escalator & Elevator	Ladders, electrical equipment's, cartons, belt, machinery parts and tools of escalator	NO	NO	NOT OK	OK	OK	OK	NO	30.01.18	Electrical cable must be properly fixed. And there must be no wire trailing in the store. Emergency Light must be installed. Sprinkler and Smoke Detector should be fixed and corrected	**Medium**
M4, Tower D, ZONE 01, BESIDE Exit stair 2D	**ABPD**	Aluminium workshop	Tools, Machinery Parts, trolleys , Ladders	NO	NO	OK	OK	OK	OK	NO	30.1.18	Electrical cable must be properly fixed. The height of the material must be 45cm from the ceiling height. Emergency Light must be installed. Sprinkler and Smoke Detector should be installed	**HIGH**

M4, TOWER H, ZONE 2, Beside Exit Stair 1H	**BT**	MECHANICAL	Pipes, Tools, Equipment's	NO	NO	OK	OK	OK	OK	NO	OK	There must be no overloaded racks and there must be proper labelling for all the various chemicals	**Medium**
P5, TC, ZONE 3 BESIDE SECTION 5	**KONE**	Escalator & Elevator	, trolleys, ladders, equipment's, Tools nad equipment's	NO	NO	OK	OK	OK	OK	ok	1.11.2017	All the system is in-line with respect to standards and tube light must have covers and cable management must be proper	**LOW**
P6, Tower A, ZONE 06, in front of Escalator 43&44	**ABPD**	Electrical	wires, bulbs, electrical equipment, fan motors	NO	NO	NO	OK	NO	OK	NO	N/A	Adequate temperature must be maintained. Emergency Light must be installed. Water sprinkler must be installed properly as it is necessary with reference to standards of fire extinguishing system to be in-line	**HIGH**
P9, TOWER B, ZONE 4, Beside 43	**Al-hassan**	Pest Control	pallets, , trolleys, plastic bottles, ladders, cartons, boxes, tables, wooden sticks, Chemicals, sprays, pest equipment	NO	NO	NO	OK	NO	OK	NO	1.11.2017	Adequate temperature must be maintained. Emergency Light must be installed. Water sprinkler must be installed properly as it is necessary with reference to standards of fire extinguishing system to be in-line. There must be appropriate ventilation in the store premises	**HIGH**

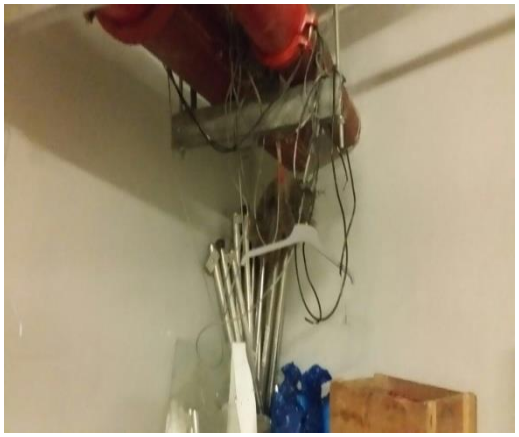
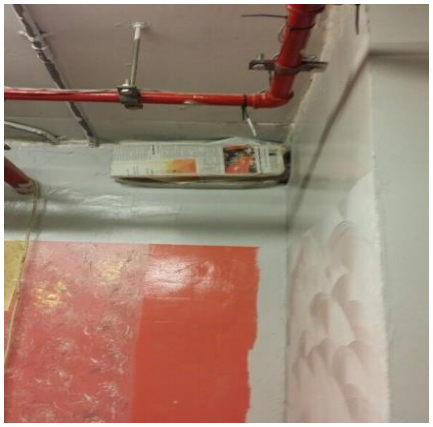
SAMPLE REPORT STORES HAZARD ANALYSIS

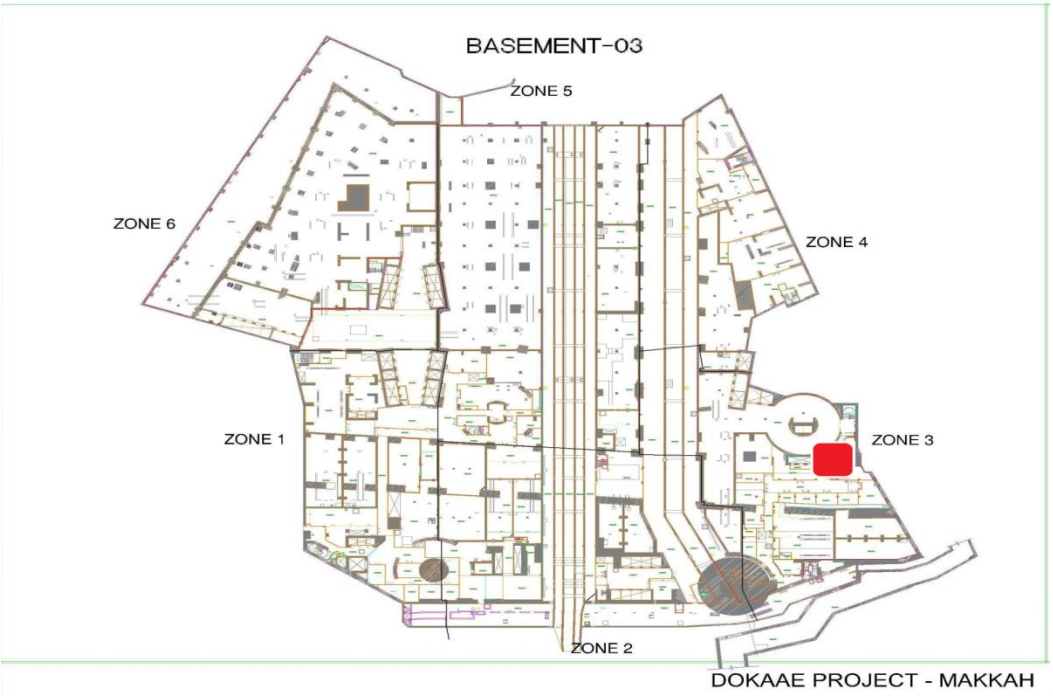
STORE NAME	**SSCL CIVIL STORE (BASEMENT 03)**	**STORE CONTACT DETAILS**
LOCATION	**1. B03, Tower C, ZONE 03, (B3-03-043)**	Name : Mob # :
MATERIALS STORAGED	• Civil Related Materials, Flammable materials, non-flammable materials etc.	**FIRE PROTECTION /AC/VENTILATION SYSTEM STATUS**
OBSERVATION AND HAZARDS	• Contamination of flammable and non-flammable materials found. • Improper arrangement of the materials. • No separate cabinets to store the materials. • The ventilation hole was covered with a sheet which is a safety violation. • Poor cable management and trailing of cables electric cables. • No Emergency Light in the store was found • **HAZARDS:** • **Fire hazard, Chemical hazard, Electrical hazard** • **Slip & trip hazard, Mechanical hazard, Dust, Ergonomics, non-mechanical**	• Ok
LIKELIHOOD & CONSEQUENCES	• Fire Incident & chemical spillage due to contamination of the materials. • Falling of the Materials due to improper arrangement of the materials stored. • Obstruction during an evacuation in case of emergencies. • Slip & trip due to insufficient lighting in the store in case of power shutdown • Property loss, Injuries, Moral loss, Loss of duty of care. • Due to the inadequate covering of ventilation	

ACTION FOR RECOMMENDATION	• Isolation/segregation of flammable and non-flammable materials with proper ventilation and the hole must not be covered moreover, LEV (local exhaust ventilation) must be installed
	• Separate cabinets/racks should be placed for flammable & nonflammable materials.
	• All the paint boxes must be placed in separate racks and all the material must be stored 45cm below from the ceiling.
	• No material must be placed above the ducts and pipelines.
	• All the chemicals, flammable material and toxic material must be occupied according to **NFPA** standards and **OEL** limits.
	• **NFPA 230: standard for the fire protection of storage**
	  • Racks shall not be loaded beyond their concerned capacity sec 5.3(2)
	  • Storage clearance in all direction from roof structure shall not be less than 18 inch sec 6-4.2.1
	  • **NFPA 70E**: Standards for Electrical Safety in Workplace regarding the proper insulation of the electrical wires and all the pre-checks including visual inspection of the electrical equipment's
	• Waste Combustible materials must be removed immediately.
	• Store must be well maintained to avoid incidents.
	• Good cable management for electric cables and trolleys to carry wires of portable equipment.
	• Emergency light should be installed to avoid slips & trips in case of Power Shutdown.
	• Room temperature should be maintained as per NFPA guidelines. If get increased results in ignition source.

PICTURES FOR THE REFERENCE:



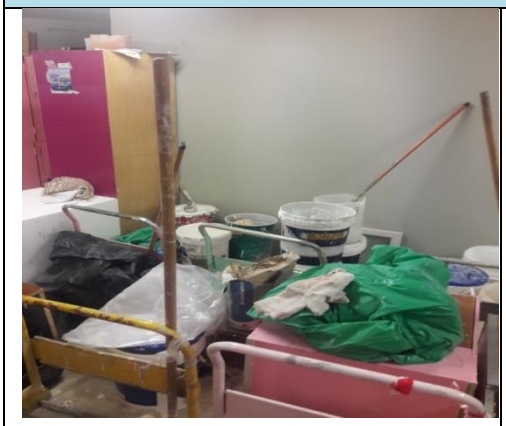
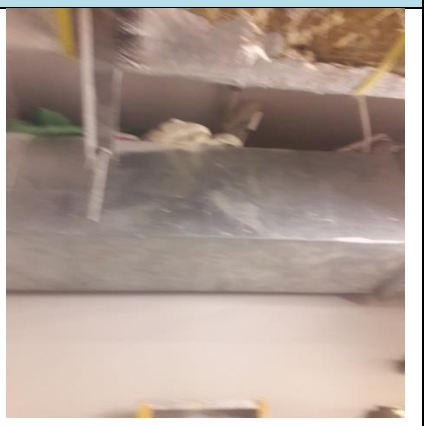



LOCATION ON SKETCH: B03, Tower C, ZONE 03, (B3-03-043), B01, Tower C, ZONE 03, (B1-23-TC-19)

STORE NAME	**SSCL CIVIL STORE (BASEMENT 01)**	**STORE CONTACT DETAILS**
LOCATION	**2. (B01, Tower C, ZONE 03), B1-23-TC-19**	Name: Mob # :
MATERIALS STORAGE	• Flammable Materials and nonflammable materials, civil related materials.	**FIRE PROTECTION /AC/VENTILATION SYSTEM STATUS**
VIOLATIONS AND HAZARDS	• Contamination of Flammable & nonflammable materials. • Waste combustible materials stored. • Improper arrangement of the flammable materials. • Flammable Materials stored directly on the floor. • Incompatible and compatible materials mixed with flammable materials. • Cabinets/racks not present. •	• Ventilation not available

	• **HAZARDS:** • **Fire hazard, Chemical hazard, Slip & trip hazard**	
LIKELIHOOD & CONSEQUENCES	• Falling of the Materials due to improper storage. • Obstruction during an evacuation in case of Fire or an emergency. • Slips & trips due to insufficient lighting in the store in case of power shutdown. • Property loss, Injuries, Moral loss	

RECOMMENDATIONS	• Training for health & safety policy
	• Isolation/segration of flammable and nonflammable materials with proper ventilation.
	NFPA 30: flammable and combustible liquid code.
	  • Storage of any liquid shall not physically obstruct means of egress 6-4.3.2.1
	  • Wood at least 25mm normal thickness shall be permitted to be used for shelving racks, dunnage, scaff board and similar installations sec 6-4.3.2
	  • Minimum 1.2m wide aisle shall be provided between adjacent rack section and any adjacent storage of liquids and main aisle must be 2.4 m wide sec 6-4.3.3
	• Separate cabinets/racks should be placed for flammable & nonflammable materials.
	• Waste Combustible materials must be removed immediately.
	• Store must be well maintained to avoid incidents.
	• The materials must be occupied with respect to exposure limits and NFPA	

PICTURES FOR THE REFERENCE		
		

STORE NAME	**SSCL CIVIL STORE (BASEMENT 01)**	**STORE CONTACT DETAILS**
LOCATION	**3. B01, Tower C, ZONE 03, (B1-3C-042), B3, Tower C, ZONE 03, (B-03-050)**	Name : Mob # :
MATERIALS STORAGE	• Flammable Materials and nonflammable materials, Marbles Tiles, Cement, Ladder, Trolleys, Tool Kits, Staff Cabin, Rolls, gypsum board.	**FIRE PROTECTION SYSTEM/AC/VENTILATION SYSTEM STATUS**
VIOLATIONS AND HAZARDS	• Contamination of Flammable & nonflammable materials. • Waste combustible materials stored (cartons, blankets, shopping bags and paints. • The insulation of air duct was damaged which can lead to severe problems regarding utilities. • Flammable Materials stored directly on the floor. • Incompatible and compatible materials mixed with flammable materials. • Inadequate ventilation in the store. • Poor placement of racks and there was no labeling for the identification of flammable and toxic materials. • Drill machines and portable equipment were placed in an undesignated areas and wires trailing all over. • Exposed electrical wires without switches and covers were observed in the panels. • Cabinets/racks not present and there was insufficient	• Ventilation not available

	spacing between the stored materials. **HAZARDS:** • **Chemical hazard, Slip & trip hazard**	
LIKELIHOOD & CONSEQUENCES	• Fire Incident due to contamination of materials. • Falling of the Materials due to improper storage. • Spillage of chemicals and paints as the boxes are opened and exposure limits are violated. • Obstruction during an evacuation in case of Fire or an emergency. • Slips & trips due to insufficient lighting in the store in case of power shutdown. • Property loss, Injuries, Moral loss.	
RECOMMENDATIONS	• Training for health & safety policy of the staff members of the project • Isolation/segration of flammable and nonflammable materials with proper ventilation • Separate cabinets/racks should be placed for flammable & nonflammable materials. • For the sufficient lighting in all the locations, the light must be of minimum standard in (LUX) as per **Occupational safety and health convention 1981 (Art-16 C155)** • Waste Combustible materials must be removed immediately. • Store must be well maintained to avoid incidents. • Emergency light should be installed to avoid slips & trips in case of Power Shutdown. •	

PICTURES FOR THE REFERENCE: