

Attached is the second draft of the CCTC Safety Reference Manual. The manual is being put together for distribution to all new employees, as well as current CCTC personnel. The manual is intended to give a general overview of the safe practices that CCTC personnel are expected to abide by.

Although the attached document is not in final form, it will give you an idea of the areas that will be addressed by the manual.

The following persons are on the committee working to update the manual.

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~~JPL~~
LWH COMMENTS
All 5-12-99

→ Billy -

Thanks for the comments.
I have added statements
in the appropriate sections.

Paul H.

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SAFETY REFERENCE MANUAL

FOREWORD

None of us would knowingly do anything which would endanger ourselves or our co-workers. The key to safety might then be knowing what is safe without having to stop and think about it. The first consideration of Hoechst Celanese is for the safety of the individual. Each person must be equipped with the necessary knowledge, skills, and physical resources to safely perform the job.

Much of our work is in new areas, with new or unfamiliar equipment, reactions, chemical compounds, or reaction conditions. It makes good common sense to ask ourselves: "What is the hazard and what can I do to avoid dangerous situations from arising?"

This booklet gives us some of the necessary guidelines to minimize any risk in doing our work. It cannot cover everything; your thoughts on how we can improve it and our safety practices will be very valuable. Read this entire booklet, and you will gain some of the knowledge needed to be a safer worker.

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Statement of Environmental, Safety, and Health Accountability

It is essential that all groups at the Corpus Christi Technical Center conduct their activities in accordance with Corporate and local Environmental, Safety, and Health (ESHA) policies. All managers and supervisors will be held accountable for the performance of their groups in regard to ESHA issues. Appraisals of all employees will include an evaluation of their performance in compliance with established policies and specific objectives as appropriate.

We all have an obligation to the general public, our neighbors, our co-workers, and ourselves to excel in these areas. In particular, personnel safety must be placed equal in importance to employee productivity, cost, morale, and quality.

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HAZARD COMMUNICATION

The Hazard Communication section of the Occupational Safety and Health Act (OSHA) requires that each employee be familiar with the hazards and safe handling procedures for all chemicals that he or she may be exposed to in the workplace. This facility has an established hazard communication program designed to provide each employee with the information necessary to safely handle the chemicals used or produced on site.

Details of the program are outlined in the Corpus Christi Technical Center (CCTC) Hazard Communication Manual. The manual provides details on the location and availability of material safety data sheets (MSDS), the procedure for writing an MSDS for a new chemical, the definition of MSDS terms, site labeling requirements, and other items providing information on the safe handling of chemicals at CCTC.

A public copy of the hazard communication policy can be found in the CCTC library, and each supervisor has a copy. Each employee must be familiar with the policy.

CHEMICAL LABELING SYSTEM (CELMIS)

"CELMIS" is the labeling system used at this site for easy identification of hazards and disposal methods for chemicals that pose a potential health or safety problem. Each chemical container greater than 100 grams must have a celmis label attached. The person who purchases or makes a chemical is responsible for affixing a label to the container.

This is an example of a blank celmis label:

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XXXXXXXXXXXXX
X      X      X   (Add Label Here)
X      X      X
XXXXXXXXXXXXX
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The hazards and disposal methods for each chemical are identified by either a number or a letter. The celmis ratings are assigned by the environmental, safety, and health affairs (ESHA) department. After being assigned, each celmis code is recorded on the Vax computer system. (Your supervisor can assist you with how this system operates).

Following is an explanation of the codes used in celmis.

-Health: Ratings are 1 to 4, with 4 being the most hazardous.

Letters that follow the numerical rating for health indicate the following suspected or proven effects:

M = Mutagen
C = Carcinogen
R = Reproductive Effects

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T = Teratogen
N = Neurotoxin
I = Irritant
Ch = Chronic Effects
Ac = Acute Effects

-Flammability: Ratings are 0 to 4, with 4 being the most hazardous. Ratings are determined using the criteria of the National Fire Protection Association.

-Reactivity: Ratings are 0 to 4, with 4 being the most hazardous.

-Disposal Methods: Si = Can be poured in lab sink.
Su = Should be disposed of in a sump outside building 130.
Po = Material must be taken to the waste water treatment facility.
Treatment = Material must be neutralized before disposal.
Vent = Vent to atmosphere.
BA = Dispose of in hazardous waste barrel.

-Other Codes: A: Material can be purchased and used in all areas of CCTC.
L: Material can be purchased only with designated signatures and can be used only in designated areas.
E: Material can be purchased but evaluation procedure has not been completed.
N: Material does not require evaluation.
B: Material has not been approved for use anywhere.

TOXIC SUBSTANCES CONTROL ACT (TSCA) SECTIONS 8(C) AND 8(E)

TSCA is a law enacted to allow the Environmental Protection Agency (EPA) to monitor chemical substances and mixtures in the U. S. and to regulate those which "present an unreasonable risk of injury to health or the environment".

Under section 8(c) of TSCA, each employee is obligated to notify the CCTC TSCA contact (or the EPA) of all adverse reactions resulting from an exposure to any chemical made or used at this site. Such an adverse reaction may be either to a person or to the environment. Once you have reported the adverse reaction to the CCTC TSCA contact or the EPA, your obligation under the law is complete. (The Safety Supervisor is the CCTC TSCA contact).

Under section 8(e), the Company is responsible for reporting to the EPA any adverse reactions that may represent a significant risk to personnel or the environment.

Details of section 8(c) and 8(e) are given in the Product Safety section of the Environmental Safety and

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Health Affairs (ESHA), policies and procedures manual.
A public copy of the manual is located in the CCTC
library. Each supervisor also has a copy.

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CCTC EMERGENCY RESPONSE PROCEDURES

-Reporting an Emergency

Quick response to any emergency is the key to minimizing the damage that may result. Each individual at the Tech Center has a responsibility to promptly report any emergency observed. When sounding the emergency alarm, it is best to err on the conservative side and turn in the alarm. There is no penalty for turning in an alarm if, in your opinion, an emergency exists.

A fire alarm at the Tech Center can be reported by three different mechanisms:

-Smoke/Heat detectors

Smoke and heat detectors are located in most of the buildings on site. If a fire is sensed by one of the detectors, a steady alarm will sound in the area of the fire and at the main alarm panel. When a fire is large enough to be sensed by two detectors, the alarm will sound site-wide and will code-in the location of the fire.

-Pull stations

Fire alarm pull stations are located at each exit door in the administration building and in several locations in the pilot plant area. You should become familiar with the location of the fire alarm pull stations in your area. If you observe a fire, you can activate the alarm by pulling down on the pull station lever. This will sound the alarm site-wide and code in the location of the fire.

-Telephone

Fire alarms can also be turned in by dialing a predetermined number on the telephone. Each phone in the facility has a sticker on it that indicates what number must be dialed if a fire is observed in the zone where the phone is located. The first three digits of the number are always 666. The last digit is used to indicate the location.

-FACILITY FIRE ZONES

-Eight zone locations

The Tech Center is divided into 8 zones for emergency response purposes. A map showing the zones follows this section. A zone location map is also posted on each bulletin board. Note that Clarkwood road is located on the right side of the map and the front parking lot is located at the upper right. Zone one is located at the upper left of the map and includes building 149 in the pilot plant. Immediately below zone one is zone 2, which includes the open structure of the pilot plant. Below zone 2 is zone 3. Zone 3 is the maintenance shops. Zone 4 is located to the right of zone 3. The high pressure lab is located in zone 4. This is the lab area where experiments using relatively high pressures are performed.

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Zones 5, 6, 7, and 8 are in Building 130 (the administration building). Zones 5 and 8 are laboratory areas and zones 6 and 7 are office areas.

The fire zone locations are also shown on the back of the CCTC telephone listing.

PLACE FIRE ZONE MAP HERE!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

-Alarm Codes (fire alarm)

The fire alarm at the Tech Center is coded to identify the location of the emergency. As an example, for an emergency in zone 2, the alarm would first sound eight blasts to signal that an emergency has occurred. The eight blasts would then be followed by two blasts (indicating the zone location), a short pause, and an additional two blasts. This alarm sequence of 8-2-2 is repeated three times and then ceases. For an emergency in zone 3 the alarm sequence will be 8-3-3, for zone 4, 8-4-4, and so on.

-RESPONDING TO AN EMERGENCY

-Reporting areas

When the emergency alarm sounds, each person at the facility must take some action as a response. This response may range from actually reporting to the emergency area, to only reporting to your supervisor for headcount purposes. Duties of the members of the Tech Center emergency response team are defined in the Tech Center emergency plan manual. Persons who are not members of the emergency response team should report to their supervision for headcount purposes and stay away from the emergency zone.

The Tech Center fire alarm does not identify if the emergency is actually a fire or involves some other type of emergency such as a vapor release or a chemical spill. For this reason, alarms in zones 1, 2, 4, 5, and 8 should initially be treated as vapor releases. This is considered the worst case from the standpoint of personnel safety.

For alarms in zones 1 and 2 (pilot plant area), you should travel upwind of the zone to reach your designated reporting area. If you are in building 130 (administration building) when either a zone 5 or 8 (labs) alarm sounds, you should exit the building upwind of the zone and gather with your work group in either the north or south parking lot. Windsocks are located throughout the facility for easy identification of wind direction. Do not exit from basement doors of building 130, as vapors may be heavier than air and may gather in areas outside basement doors.

For alarms in zones 6 or 7, persons in building 130

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should exit from the nearest safe exit door, as the emergency is most likely a fire.

If an emergency is out of control and progresses to the point where personnel are in imminent danger, the emergency director will authorize the facility evacuation alarm. This is a series of three blasts, repeated three times. At the sound of this alarm, all non-emergency response personnel should leave the facility and gather at a point a safe distance away.

-Headcount

When the emergency alarm sounds, all personnel should report to their supervision. This process aids in identifying persons that may be missing in the emergency area. Headcount may be reported in person or may be called in by telephone. Telephone calls other than those related to the emergency (such as headcount calls) should be terminated when the alarm sounds.

-Personnel responsibilities (ie operations, maintenance, fire wardens, other personnel)

Persons on the emergency response team have specific duties when the alarm sounds. All operations personnel report to either the shift supervisors' office or the boiler house to await instructions from the fire captain. The shift supervisor is the fire captain. Personnel in maintenance report to the lunch room, warehouse, or north gate to await instructions to aid in repair efforts. And predesignated personnel in building 130 serve as fire wardens to insure that all personnel are properly evacuated when the emergency warrants.

-Audible Alarms (other than fire alarms) and Response

Other alarms that may be heard at the Tech Center include the "All Clear" signal, which signifies that an emergency is under control and personnel can return to their regular duties. The all clear signal is two horn blasts, repeated three times (2-2-2).

The signal to warn of an approaching tornado is a series of two blasts repeated for 30 seconds. At the sound of this alarm, all personnel should proceed to one of the basement areas in building 130.

When a safety shower or emergency pull cord is activated at the Tech Center an audible alarm sounds in the area of the shower, at the main alarm panel, and in the shift supervisors' office. This alarm is either a bell or chime in the lab areas or a pulsing, high pitched horn in the pilot plant and maintenance areas.

Several of the areas are also equipped with local alarms that indicate a problem. If you hear an alarm that you do not recognize, consult your coworkers, supervisor, or a member of the Safety Department.

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1. Reporting Hazards - It is the responsibility of every person to report any recognized hazard to supervision or to the Safety Supervisor. Hazards have the potential to cause accidents and should be repaired or removed immediately.

2. Reporting Accidents - All accidents must be reported immediately. Injury cases will be recorded on a form provided at the dispensary. Details of the CCTC Accident and Injury Reporting Procedure can be found in the Environmental Safety and Health Affairs (ESHA) Policy and Procedures manual. A public copy of the manual is located in the CCTC library. All supervisors also have a copy of the manual.

3. Housekeeping - Keep your work area clean and in order. Clean up all spills immediately. Pick up tools not being used and return them to their proper place. A dirty work area breeds accidents - keep your area in order.

4. Equipment - Operate all equipment in a safe and prudent manner. Do not use or operate equipment with which you are not familiar. Report faulty equipment.

5. Horseplay - Horseplay can be grounds for disciplinary action. Many good safety records have been spoiled because of horseplay or practical jokes.

6. Safety Showers and Eyewash Stations - The area beneath all safety showers and eyewash stations shall not be obstructed. Safety showers and eyewash stations must not be used for other than designated purposes. The CCTC safety showers are tied into a central alarm system that will notify the appropriate personnel when a shower is activated. The eyewash stations are not tied into the alarm system.

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*Need more positive statement here.
i.e. responsibility, pride, etc*

7. Equipment Guards - If a guard is needed or required, machinery, tools, and equipment must be operated with the appropriate guard device in place. If a guard is required on other equipment, it will be designed by the Engineering Research Department and approved by the Safety Supervisor.

8. Lifting - Improper methods of lifting are frequent causes of injury. The legs should be used primarily. The back should be kept vertically straight. If the load appears too heavy, get help or use authorized mechanical assistance.

9. Tools - All defective tools should be removed from service and repaired or replaced.

10. Static Ground - Loading or unloading operations must be preceded by proper grounding techniques. Static charges built up by improper grounding or no ground often produce an electrical spark which can cause fire or explosion if flammable vapors or combustible dusts are present.

11. Compressed Air - Do not use compressed air to clean clothes. This is a very dangerous practice since it can drive small particles of rust or scale into the skin. Air used to clean a work area may not exceed 30 psi.

12. Electrical - Only trained and authorized personnel will be allowed to install, repair or maintain electrical equipment.

13. Fire Fighting Equipment - All approaches to fire fighting equipment, hose houses, extinguishers, must be kept clear. The fire water system will be used only to fight fire, unless otherwise authorized by the Fire Captain.

Fire equipment is for your protection; extinguishers, nozzles, hydrants must not be tampered with, or seals broken unless the equipment is to be used for fire fighting. Only authorized personnel will make adjustments or work on fire protection equipment. Only trained personnel may use fire fighting equipment.

14. Oxygen and Acetylene - Never use oil or grease on oxygen gauges, fittings or containers. Oxygen on contact with grease can cause spontaneous combustion or explosion. Do not use copper or brass lines or fittings with acetylene.

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Care of GFI's

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15. Intoxicating Beverages/Illegal Drugs - Introduction, possession, or use of intoxicating beverages or illegal drugs on company property is forbidden. Persons under the influence of alcohol or drugs pose a serious safety hazard. Persons in violation of this policy will be removed from CCTC.

16. Barricades - Rope off or barricade all areas where hazards exist, such as where the possibility of falling objects, open holes, trenches, or otherwise dangerous conditions exist.

17. Warning Tags - Observe all warning tags on switches, valves, etc. Never remove a tag unless authorized to do so. Be sure all concerned are aware that the tag is being removed and the equipment is being placed in service again.

18. Smoking - Smoking regulations are for the protection of personnel and plant property. Anyone found smoking in "no smoking" areas will be subject to immediate dismissal. The CCTC smoking policy can be found in the Environmental, Safety, and Health Affairs (ESHA) Manual.

19. Protective Equipment - Safety glasses or goggles must be worn in all designated areas and as required by work being performed. (See safety glasses policy in the ESHA manual). Areas where glasses are required include the lab areas, (including hallways), and inside the fenced area of the facility. Contact lenses are not allowed in areas where safety glasses are required, unless approved by the Safety Supervisor.

Safety glasses will be furnished to all employees at no cost (one pair every 12 months). Personnel requiring prescription safety glasses must furnish a prescription less than two years old. The glasses will be purchased by the Technical Center.

Safety headgear (hardhats) will be worn where designated and as required by the work being performed. Hard hats must meet the requirements of the American National Standards Institute's standard for class A or B hardhats.

Other protective equipment, including gloves, face shields, goggles, splash protection suits and hoods, safety shoes, respirators, and hearing protection may also be required.

Check procedures with your supervisor or the unit standard operating procedures prior to starting any job to insure that you are wearing the proper personal protective equipment (PPE).

20. Disposal of Used PPE - Personal protective equipment should be discarded when no longer useful. PPE must be decontaminated prior to disposal.

21. Visiting - If you visit other work areas, be sure to

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observe the safety rules for that particular area. If someone visits your work area, point out in a courteous manner the safety rules. This will also apply to non-employees authorized to visit the plant.

Family members under the age of 10 may not enter the laboratory or pilot plant areas without prior approval from the personnel manager or alternate.

All personnel must wear an I.D. badge. Personnel must register in and out of the facility, either with their I.D. badge, on the receptionist's visitor's log in the lobby, or on the visitor's log at the warehouse.

22. Engines - Do not operate any internal combustion engine in an enclosed area or pilot plant unit without a permit.

23. Radioactive Uses - Radioactive uses in pilot plant and laboratory research projects are varied in nature. In each instance, safety procedures will be written as required. The CCTC radiation safety officer must be consulted prior to bringing any radioactive material on site.

24. Vehicles

-Only authorized personnel will operate vehicles.

-As a driver you are responsible for the safety of passengers or pedestrians. Do not exceed the speed limit. The speed limit at CCTC is 15 mph.

-Do not drive a vehicle backward or forward when you are unable to see where you are going. Have someone clear the way and direct you.

-Do not get on or off a vehicle until it comes to a complete stop.

-Do not hang legs from the side of a truck or tail gate.

-Do not hang legs or arms from open doors of a moving vehicle.

-Do not stand up while riding.

-Do not operate vehicles with defective steering or defective brakes. Do not operate vehicles at night with defective lights.

-A hot work permit is required for unapproved vehicles to enter a restricted area.

-Seat belts should be worn when provided.

25. Work Clothing

Although CCTC does not have a specific dress code, everyone

personnel working in the lab, maintenance, and development areas) is encouraged to dress sensibly for safety.

Loose, long sleeves, neckties, chains, pendants, and long hair may drop into hazardous chemicals, or catch in moving equipment. Rings and rigid watchbands may retain corrosive materials underneath, even after thorough washing of hands and wrists. These items may also get caught in machinery. The wearing of such articles is discouraged.

Open toed shoes or sandals and high heels are discouraged in the lab areas and not allowed in the developmental area. Canvas type shoes are also discouraged when working around chemicals.

26. Chemical Spills: All chemical spills must be reported to your supervisor. Large spills must be reported to the CCTC Environmental Coordinator. Spills should be cleaned up as soon as possible.

OFFICES AND STORAGE AREAS

Offices

1. When placing materials in filing cabinet drawers, load bottom drawer first. If top drawers are loaded first, the cabinet may fall forward when top drawers are pulled out.
2. Defective chairs, desk or other office equipment should be reported to your supervisor.
3. Do not leave electrical extension cords lying where they will be tripping hazards.
4. Do not throw cigarettes or matches in waste paper baskets - place them in an ashtray.
5. Do not leave knives with open blades, razor blades, etc. in desk drawers. Razor blades should not be used as a cutting tool.
6. Containers of flammable or toxic materials (ie chemicals or chemical samples) are not allowed in offices or office areas.

Warehouse

1. Good housekeeping is a must in any warehouse.
2. Aisles must be kept clear.
3. Keep the approaches to all fire extinguishers clear.
4. Do not stack material so high that it may fall over. Keep stacked material straight and orderly.
5. Place used rags in closed metal containers.
6. Get help with heavy loads.
7. Use a ladder designed for the purpose of storing or

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reaching material on high shelves.

8. Handle pipe with care; be sure it is properly chocked so it will not roll. Beware of burrs and sharp ends.

9. Use gloves when handling rough materials.

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EXPERIMENTAL AREAS

Laboratory

Because of the highly technical and varied nature of laboratory operations, it would be very difficult to write all of the necessary rules. The aim here, therefore, is to cover general rules.

1. Before using an unfamiliar chemical, a literature check should be made to determine the chemical's characteristics. Material Safety Data Sheets (MSDS) are available in the library for every chemical on site. Chemicals shipped to CCTC must be accompanied by an MSDS.
2. Check on antidote and proper first aid treatment before using a highly toxic or corrosive chemical. Inform at least one other responsible person of your proposed project.
3. DO NOT MIX CHEMICALS UNLESS YOU ARE AWARE OF THE PROBABLE REACTIONS AND HAVE TAKEN PROPER PRECAUTIONS. (Examples of incompatible chemicals include Nitric acid and Organics, Acids and Bases, etc.).
4. Use aspirator bulbs for filling pipettes. Do not use mouth for suction of chemicals.
5. Before applying heat to chemicals, or to mixtures, the chemist or technician must have knowledge of the thermal stability of the material. A secondary containment vessel is recommended when applying heat to a known flammable or sample with unknown characteristics. Secondary containment is required when a hot plate is used as the heat source for a flammable.

6. Food, cooking, and eating utensils must not be stored in areas common to chemicals.
 7. Laboratory utensils must not be used for preparation of food. Laboratory refrigerators must not be used for food storage. Laboratory ovens are not to be used for food preparation.
 8. Reactions and operations which are potentially violent are to be shielded.
 9. Toxic, odorous, and irritating chemicals are to be handled in ventilation hoods. Hood doors must be kept closed when access to the equipment inside is not needed.
 10. Goggles, face shield, gloves, and apron are to be worn any time there is the possibility that corrosive materials (eg acids or bases) may splash on you.
 11. Protect hands by using glass tube holder or folded cloth towels and gloves when pushing glass tubes through stoppers.
 12. Keep area beneath safety showers clear.
 13. Electrical connections and resistance wires must be carefully insulated.
 14. All electrical apparatus and metal racks holding electrical equipment must be grounded.
 15. Safety glasses must be worn in the laboratory areas at all times.
 16. When an experiment is left running unattended (ie overnight, on weekends, or holidays) the responsible technician and chemists' name and phone number must be posted near the experiment. Also, the operating parameters (ie temperature, contents, etc.) must be posted.
- The Shift Supervisor and Chairperson of the Lab Safety Committee must be notified in writing when potentially hazardous experiments are left running unattended.
17. "No Smoking" rules must be strictly observed at all times. Smoking is allowed in designated areas only. Consult the Smoking Policy in the ESHA policy manual for details.
 18. Place all mercury not in use in closed containers. Guard against spilling mercury. Report mercury spills to your supervisor and the CCTC environmental coordinator.
 19. See that guards are on pumps or other rotating machinery while in operation.
 20. Clean up spills immediately, on tables, counter tops, and floors.

11. Avoid releasing toxic vapors outside of hoods. Always read the label prior to opening a container and never perform work without the proper level of protection (eg respirators).

Report unusual conditions of fumes or vapors outside of hoods to your supervisor or the ESHA department. A respirator may be required when handling toxic chemicals. See the Respiratory Protection Policy in the ESHA manual for details.

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22. Know where emergency equipment (ie fire extinguishers, safety showers, fire blankets, etc.) are located.

23. Be careful to prevent excessive heat from an operation reaching the ceiling. The laboratory has been provided with an automatic alarm system which will be set off by excessive heat.

24. Store toxic materials, flammable liquids, etc. in suitable containers. Do not leave containers open. Be sure all material is properly labeled. Container labels must identify the contents and hazards of the contents, in accordance with the CCTC Celmis system.

FLAMMABLES MUST BE STORED IN FLAMMABLES STORAGE CABINETS OR SAFETY CANS WHEN NOT IN USE.

25. Do not allow dirty glassware and apparatus to pile up in the work area. When not in use, see that it is cleaned and stored.

26. Samples or other laboratory materials must be kept in laboratory areas, NOT in office areas.

27. If you have used a dangerous or highly toxic material in laboratory apparatus, either clean the apparatus or warn the person cleaning it about its contents.

28. If hazard label disposal methods are not clear or understood, check with your supervisor or the environmental coordinator prior to disposing of chemicals. Certain chemicals may be poured down the drain, some must be taken outside for disposal, and others are collected for offsite disposal.

29. Experiments operating at relatively high pressures may require special precautions. The chairperson of the Lab Safety Committee should be consulted prior to beginning such operations. High pressure operations (ie greater than 500 psig) are normally required to be performed in the high pressure lab (HPL), and the rules of the HPL must then be followed.

30. If you are disposing of broken glassware or other sharp objects, the trash container used should be identified as containing sharp objects.

31. All contaminated equipment (ie glassware, plastic, etc.) must be cleaned prior to disposal.

32. Glass containers of chemicals should be carried in protective containers (eg rubber buckets) when moving from one lab to another.

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extremely toxic,

Disposal of
more info

- Small quantities
chemicals (ie < 1 qt) of
feasible acceptable chemicals
may be disposed of in the
sinks. ^{or in chemicals such as} ~~pesticides~~ pesticides,
Heavy Metals, Odorous, and some
other chemicals

COMPRESSED GASES

GAS CYLINDER PIPING

1. Gas delivery tubing, fittings and valves downstream of the cylinder regulator should conform to pressure, temperature and material requirements (See LWH-770-83).

2. Do not use adapters between the regulator and rack connection in a way that nullifies the Compressed Gases Association (CGA) connection system.

3. Manifolds must meet the requirements of approved CCTC design. Consult with the Compressed Gases Committee Chairperson.

4. Lines used for the delivery of liquefied petroleum gas must be equipped with a safety relief device.

A small temperature change can cause a very high pressure increase in lines filled with LPG.

5. Excess flow valves must be installed downstream of the regulator for manifolds that supply flammable (3 or 4 rating), oxidizing, or toxic gas (3 or 4 rating).

6. Do not install type 67R Fisher Regulators in H₂ lines that service GC's.

The R stands for relief and a substantial amount of H₂ can be discharged into the Laboratory.

7. All lines and equipment used for O₂ service must be degreased before use. Parts of equipment that come in contact with high pressure O₂ or air should not be touched because traces of skin oil may be deposited. Oil or grease in contact with high pressure oxygen may ignite.

8. Special requirements have been established in regard to hooking up to the house hydrogen and carbon monoxide systems. Consult with the the Chairperson of the Compressed Gases Committee.

9. Pressure check gas cylinder lines before use in a new service.

GAS CYLINDER REGULATORS

1. Modification of gauges, safety devices and cylinder connectors on gas cylinder regulators by unauthorized personnel is forbidden.

The regulator connector, gauges and relief valve must be compatible with each other.

2. Regulators should be compatible with their use.

There are special regulator designs for high pressure and corrosion resistance.

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3. Never remove a connector from one regulator and install it on another.

This allows the possibility of an explosion due to regulator contamination. If an oil contaminated regulator is used on an O2 or air cylinder a serious explosion can occur.

4. If a nut will not screw on, consider whether it is a left-hand thread or whether the correct regulator has been selected.

GAS CYLINDERS

1. Never mistake the safety nut for a capped cylinder outlet.

Removal of the safety nut can result in rapid discharge of the entire cylinder content.

2. Know the contents of a cylinder.

Do not rely on color codes. Read the label. Unlabeled cylinders should not be accepted for use. Cylinders that contain different and incompatible gases can be the same color.

3. Never allow a cylinder pressure to drop to atmospheric pressure.

An open and empty cylinder can allow moisture from the air to start internal corrosion.

4. Cylinder caps should always be in place when cylinders are transported or are unchained.

Cylinder caps are to protect the cylinder valve in case it is accidentally dropped.

5. Never refill a cylinder and never allow the contents of one cylinder to back into another due to pressure imbalance.

The filling of cylinders often requires special knowledge and equipment. CCTC gas manifolds require check valves for every cylinder to prevent accidental gas transfer from cylinder to cylinder.

6. Never use a cylinder without a regulator.

Needle valves are not regulators.

7. Stop the flow from a cylinder with a valve.

Regulator seats may not cause positive shutoff.

8. When heating a cylinder use only a controlled temperature bath and be aware of the cylinder relief system. Also consider that some cylinders have no

relief system.

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Operators

1. If not familiar with the operation of equipment, consult with your supervisor.
2. Make a point to KNOW location and operational purpose of valves, instruments, contents of lines, vessels, etc. Acquire a full working knowledge of your area.
3. Know where all safety equipment is located, including fire hoses, extinguishers, fire water valves, safety showers, etc. Familiarize yourself with the operation of all emergency equipment.
4. Keep operations floors clean. Oil spills, grease, water, chemical spills, etc. must be cleaned up immediately.
5. Place used rags in approved disposal containers.

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6. Always wear the proper personal protective equipment (PPE) specified for a job. PPE requirements are detailed in the operating manual for each unit. Failure to comply with PPE requirements may result in disciplinary action.
7. Do not run up or down stairs.
8. Keep tools and maintenance supplies in proper place.
9. Before start-up, opening valves, etc., be sure a "Safety Permit" (ie Hot Work, Confined Space Entry) is not in effect.
10. Be sure all blinds are removed from lines before startup. Blinds should be tagged with a colored marker (eg ribbon) for easy identification.
11. Do not allow welding, cutting, burning, sandblasting, etc. without a "Hot Work Permit." See the Hot Work Permit policy in the ESHA manual for details.
12. Remember- an "entry permit" is required before entering any vessel, tank, sump over 5 feet deep, excavation over 5 feet deep, or any other confined space. See the Confined Space Entry policy in the ESHA manual for details.
13. Working on energized electrical or mechanical equipment can be dangerous. Equipment must be locked out in accordance with the CCTC Lock Out policy prior to work beginning. Details of the CCTC Lock Out policy and procedure can be found in the ESHA manual.
14. Log books and/or other data will be taken as instructed by Operations Supervision.

Boilers

1. Although the boilers are automatic, proper care and maintenance must be exercised.
2. Instruments must be checked to insure that levels are maintained and boilers are functioning properly.
3. Housekeeping is very important around the boilers and utility area; keep your area clean.
4. An entry permit is required to go into a boiler.
6. In some cases, steam lines have been known to become contaminated with flammable vapors. A hot work permit must be obtained prior to welding or cutting on the boilers.

Safety and Relief Valves

Eng & Maint

The Maintenance and Engineering Department will be responsible for procedures concerning the setting, inspection, maintenance, and repair of safety relief valves. Valves are

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pressure setting, and inspection number. All relief vents must be arranged so that material will not strike personnel if the set pressure is exceeded.

✓ The Maintenance and Engineering Department must be consulted concerning any change in a safety valve.

MAINTENANCE WORK

The following section has been divided up by craft. However, many of the items listed under a specific craft may also apply to personnel in other crafts and also to personnel in other departments. Read and become familiar with the requirements of this entire section, regardless of your craft or department.

TOOLS

1. Do not use tools with broken handles, mushroomed ends, frayed electrical cords, etc. Defective tools should be repaired or discarded.
2. All cutting tools should be kept properly sharpened.
3. Store grinding wheels in a dry place, do not stack wheels, and do not stack other objects on them. Be sure proper wheel is used for specified speed on R.P.M.
4. Tools must be returned to the proper storage area when not in use.

ELECTRICIANS

1. Wear only approved, non-conducting safety hats issued. Do not wear metal hats.
2. Do not use metal rulers, metal ladders, metal flashlights or conductive handle tools where there is a possibility of contacting live electrical equipment.
3. Do not work "hot" lines or equipment, unless absolutely mandatory and prior approval has been given by your supervision.
4. All electrical equipment must be properly grounded.
5. Lock out switches and tag them before working on equipment. Lock Out of equipment must be performed in accordance with the ESHA policy manual policy procedure.
6. Do not remove a lock or tag if it was placed there by someone else. The person who places a lock or tag on the switch must also remove it.
7. Always use fall protection equipment when there is a possibility of falling 10 feet or more.

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8. Signs designating "high voltage" areas, "danger", etc. must be in place.
9. Use a ground fault interrupter when using portable electric tools.
10. Do not stand in front of high voltage breaker panels when operating the breakers.

CARPENTERS

1. Remove nails from lumber which is being disassembled. Nail wounds are punctures and are apt to become infected.
2. Keep guards in place on all power tools.
3. Skill saws are dangerous unless used properly; keep fingers out of the way.
4. Keep scrap material piled neatly. Discard if not usable.
5. Be sure scaffolding and ladders are in good condition. Scaffolds must be properly constructed.
6. Face ladders when climbing up or down.
7. Always wear proper protective equipment.

PIPEFITTERS

1. Do not work on pressurized lines unless approval to do so has been given by your supervision.
2. Do not strike pressurized lines with a hammer or other heavy object.
3. Always loosen flanges so that you are not facing directly toward the side being loosened.
4. Do not open or close any valve without first checking with the operating personnel.
5. Do not attempt to work in close quarters around moving machinery.
6. Goggles must be worn when opening a flange or breaking open a line.
7. Do not use a wrench as a hammer.
8. When working above ground level, place tools so they will not fall.
9. Get help on heavy loads.
10. Clean mud, oil, etc. from shoes before climbing ladders.

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WELDERS

(Requirements for performing "Hot Work" at CCTC are defined in the ESHA policy manual).

1. Only authorized personnel will use welding equipment.
2. Do not start a machine or light a torch in restricted areas until an authorized "Hot Work Permit" is in your possession. Restricted areas include areas inside unit boundaries and warehouses where flammables are stored.
4. Always use an approved hood for electrical welding and dark goggles for burning. Use heat resistant gloves to handle hot work.
5. When welding, wear gloves with long gauntlets and a shirt with sleeves down. On overhead welding an apron will be worn.
6. Always turn off machine when job is finished.
7. Always close acetylene and oxygen valves on cylinders not in use (ie at breaktime and at end of work day).
8. Secure cylinders so they cannot fall.
9. Never use grease or oil on oxygen valves or fittings.
10. Keep caps on cylinders not in use.
11. Do not allow cylinders to become overheated.
12. Never leave a burning torch unattended.
13. Warn nearby persons before striking an arc.
14. Wear approved safety goggles when hammering scale or slag.
15. Keep a fire extinguisher within reach; know how to use it. A fire watch is required when welding or torch cutting in areas other than the maintenance shops.
16. Never use a barrel, cylinder, or any combustible material as a work support.
17. Guard against poisonous gas fumes generated by certain types of welding operations. (eg welding on galvanized metal).
18. Inspect leads frequently; replace or repair badly worn or damaged leads.
19. Use a friction lighter to light torches.

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20. Do not use torch as a hammer.
21. Remove any leaking cylinder to open air, keep it away from fire, and notify your supervisor.
22. Never attempt to extinguish a fire in an oxygen hose by doubling or pinching off the hose. Always turn off the valve at the cylinder.
23. If eyes become "burned" from electric welding arc, report for first aid.
24. Do not weld on or near conduit with live wire inside.
25. Keep all connections gas-tight between cylinders, hose connections, etc.
27. Use approved low voltage, explosion proof lights in vessels, tanks, etc.
28. Do not use acetylene at pressures in excess of fifteen pounds per square inch gauge. Do not transfer acetylene through copper tubing.
29. Use caution when operating hand held grinders. Wear a face shield and safety glasses.

INSTRUMENT MECHANICS

1. Be sure all pressure has been bled off before removing instruments from lines or dismantling at the shop.
2. Wear goggles when grinding, buffing, handling hot solder, or chemicals. Use a brush to clean away metal chips, etc.
3. Keep shop in neat order.
4. Mercury must be kept in closed containers. Wear protective gloves when handling mercury.
5. Be careful with gauge glasses; if broken, you may be sprayed by chemicals or hot liquids.
6. Do not remove instruments or turn valves until properly cleared with Area Supervision. Wear proper personal protective equipment for protection against the chemical(s) that were in the equipment being worked on.
7. All instruments connected to a process should be properly washed out prior to removal to avoid chemical exposures.

SHOP MECHANICS AND MACHINISTS

1. Do not clean, or repair machinery while in motion except those items necessary for adjustment: carburetor, valves, governors, etc.

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2. Be sure all guards are in place.
3. Do not use faulty extension cords.
4. Do not use compressed air at pressures greater than 30 psi to clean metal shavings from work area or to clean clothes since it may drive small particles of rust or scale into your skin.
5. Do not use defective tools.
6. Do not wear rings while operating machinery.
7. Files must be equipped with handles.
8. See that material being worked on is securely held in place.
9. Get help for heavy loads.
10. Wear goggles when striking metal to metal surfaces.
11. Do not remove packing gland from pump or valve under pressure unless the valve was manufactured for repair under pressure.
12. Use only approved solvents for cleaning purposes.

PAINTERS

1. Check ladders before using - make sure they are in good condition.
2. If ladder cannot be secured at top, have another man hold ladder at base.
3. Wear an approved type respirator when spray painting.
4. Gloves should be worn when removing broken glass, window panes, etc.
5. Place paint and oil covered rags in approved disposal containers.
6. Always check rigging, block, tackle, pulleys, ropes, etc. before using.
7. Do not paint near open or exposed electrical equipment.
8. Wear goggles while scraping, chipping, and washing surfaces.
9. Do not attempt to clean machinery in motion.
10. Know the location of the nearest fire extinguisher and how to use it.
11. Clean paint off hands and face before eating.

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12. Be sure scaffolding has been properly constructed and scaffold planks are in good condition.
13. Wear safety belts when working at heights of over 10 feet above the floor.
14. Avoid getting paint thinner on your skin. To clean paint off, use proper type of cleansing material provided.
15. Do not stand on or above the second step from the top of a ladder.

SHEET METAL WORK

1. Wear gloves while moving scrap metal or corrugated iron sheets.
2. Slight cuts and punctures are always possible sources of infection - get first aid for all cuts.
3. Wear approved goggles when soldering, using acids, melting lead, or hammering. A face shield should be worn in addition to goggles where there is a high hazard of splashes to the face.
4. Wear safety belt at elevations over 10 feet above the floor.
5. When using buffer or grinder, keep guard in place and wear goggles.
6. Have a fire extinguisher available when working with flame, torches, etc. Know how to use it.
7. Be sure you have a permit before lighting any flame or before using a spark producing device in a restricted area.

HOT TAPS

Hot taps are not recommended and are to be avoided when possible. If, however, hot taps are necessary, requirements of the Hot Work procedure outlined in the CCTC ESHA manual must be followed.

SCAFFOLDING

Scaffolding must be constructed to safely hold personnel and equipment and must meet the requirements of the Occupational Safety and Health Act (OSHA), listed in the code of Federal Regulations (CFR) 1910.

LADDERS

1. Do not use a defective ladder; report it to your supervisor.

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3. Ladders must be equipped with non-skid safety shoes.
4. Set the base of the ladder away from the base of the object to be climbed about one-fourth of the height of the ladder.
5. Secure the top of the ladder so it will not slip or fall.
6. Be sure you can reach work easily without leaning from a ladder.
7. Do not attempt to raise a long or heavy ladder without help.
8. Open stepladders fully and lock into position.
9. Do not work off of the top step or next to top step of a stepladder - get a longer ladder.
10. Never place any type of ladder on make-shift cribbing.

RIGGING

1. Only authorized personnel may operate equipment.
2. Do not ride a load.
3. Do not wear clothing that may get caught in rigging devices.
4. Never walk beneath or in front of a suspended or moving load.
5. Use tag lines on loads when necessary.
6. Never allow rigging- booms, loads, wires, rope, etc. - closer than 10 feet to electrical power lines.
7. Be sure all lines, cables, and rigging are properly designed to handle the load.
8. Test brakes after raising load a few inches.
9. Center boom over load before hooking up.
10. Be sure there is a mutual understanding on signals.
11. Keep hands and fingers out of pinch spots.
12. Report broken wires, frayed cables, etc. to your supervisor.
13. Lower booms to "support" blocks on ground at the end of each work day.
14. If cable comes in contact with acid, check it immediately. If necessary, clean the cable with water

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or an acid neutralizing solution (eg sodium bicarbonate).

INSULATING

1. Be extremely careful while working around hot steam lines.
2. When working at elevations greater than 10 feet above the floor, wear fall protection equipment.
3. Wear goggles when cutting wire or fasteners on insulation.
4. Bend down all wire ends and reinforcements to prevent injuries and tearing clothes.
5. Avoid walking on or using small lines to pull up on.
6. Never insulate over leaks, loose flanges, unions, or openings on any type of unfinished work.
7. Avoid insulating towers until all openings have been equipped with plugs, pipes, sight glasses, etc.

SPECIAL CASES

Permits

1. Tank Entry Permit - No person or persons shall enter tanks, vessels, sumps, excavations deeper than 5 feet, or other confined spaces until such places have been tested by qualified Operations and Safety personnel and declared safe for personnel entry. Use of an entry permit is mandatory. It is the responsibility of the supervisor of the department or area the confined space is assigned to see that the confined space is in safe condition for entry and that the person(s) to enter is (are) fully informed on the hazards of the job and understands the precautions to be taken. In all instances at least one person must remain at the entrance of the vessel while it is occupied by another person.

Further details of requirements for confined space entry are defined in the CCTC ESHA manual.

2. Hot Work Permit - Any work involving open flame or spark producing devices in areas containing flammable liquids, gases, and combustible dusts is not permitted without authorization. This procedure is necessary for preventing fires and for assuring that everybody concerned knows that a "Hot Work" operation is being performed.

Requirements and procedures for obtaining a hot work permit are defined in the CCTC ESHA manual.

3. Electrical "Hot Work" - Where possible, electrical power should be de-energized when working on electrical equipment. Before any work or tests may be done on energized electrical circuits operating at or over 60 volts, approval must first

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Supervisor.

When given, approval will be to an individual for a specific date, time, and type of job, unless the work area is considered to be safe for "blanket" approval. Approval may be revoked at any time circumstances constitute a hazard not present when the approval was given.

Work or tests on circuits operating at over 600 volts requires approval by the Engineering/Maintenance Manager, but only after every practical means to de-energize the circuit has been exhausted and precautions can be taken to make the job safe.

4. Camera Permits - A hot work permit will be required to use cameras having any type of flash device in hazardous areas.

5. Water Permits - The fire water system will not be used for any other purpose unless so authorized by the Operations Shift Supervisor.

Moved to Electrical Section
6. Temporary Wiring Permit - Because temporary wiring can become "permanently" dangerous, means of control must be adopted and adhered to. It is essential that temporary wiring is not permitted to become "indefinite" wiring. When it is at all possible, initial wiring should be permanent. It is usually much easier to obtain a permanent installation than to have wiring altered at a later date. If temporary wiring is necessary, make sure it is made permanent as soon as possible.

7. In all cases when not sure whether a permit is needed or not, check with your supervisor or with the Safety Supervisor.

Use of GFI's ← Addressed earlier as noted.

FIRST AID

Notify the CCTC Industrial Health Coordinator (Nurse) or Shift Supervisor if first aid is required.

FIRE PREVENTION AND EXTINGUISHMENT

This section will give you a general knowledge of fire fighting equipment, its use, its limitations, etc.

First, remove all possible causes of fire. Normally, good housekeeping and careful maintenance will prevent fires.

Do not use fire fighting equipment unless you have been trained in the proper operation of the equipment.

Each fire situation is different, but there are three general rules to follow: 1) If a fire is still in the incipient stage,

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put it out if possible. 2) If you cannot put the fire out, control it if possible. Attempt to keep surrounding equipment and vessels from igniting. 3) If you cannot extinguish or control the fire, and if you are endangered by flame or explosion, get away from the area, activate the fire alarm, and get such help as is needed.

Ordinary Combustible Materials (wood, paper, trash, etc.)

To fight a an incipient stage fire of ordinary combustibles, use water. By using water, the ignition temperature is reduced to below the flash point, and the fire goes out.

Flammable Liquids (ie Any liquid having a flash point below 100 degrees F).

To put out an incipient stage flammable liquid fire, use a CO2 extinguisher; a dry chemical extinguisher or water in the form of fog may also be used. If a straight stream of water is used it may spread the fire since many flammable liquids will burn on the surface of water.

Be careful, as flammable vapors may still be present after the fire is extinguished and the fire may reignite.

Electrical Equipment

Use CO2 or dry chemical extinguishers on an electrical fire. Do not use water. CO2 extinguishers are recommended where possible because they do not leave a residue and do not damage electrical equipment further.

Clothing

If your clothing catches fire - Do not run - If possible, wrap yourself in a blanket, rug, or woolen coat. If a safety shower is handy, use it. Otherwise, drop to the ground and roll over to smother the flames.

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