

L. Cook



**PRODUCTION
DEPARTMENT
SAFETY
MANUAL**

EMPLOYEE'S SAFETY MANUAL



PITTSBURGH PLATE GLASS COMPANY
Chemical Division

P. O. Box 1000
Lake Charles, Louisiana

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SL 061318

SAFETY MANUAL REVISIONS

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**PITTSBURGH
PLATE GLASS COMPANY
CHEMICAL DIVISION**

A. T. RAETZSCH, Works Manager
P. O. Box 1000, Lake Charles, Louisiana

These safety rules represent minimum requirements and are only intended to cover average conditions. Since it is impracticable to cover all contingencies and emergencies, the earnest cooperation of all employees is requested in meeting unusual conditions not covered by these rules. Any exception to these rules will be made only by permission of your supervisor.

Accident prevention depends upon the interest of the individual in observing safety rules, keeping his mind clear and going out of his way to do the common sense things which prevent injury to himself and his fellow workers.

By the practice of these rules and the interest of everyone in safe operating and maintenance methods, we hope to prevent accidents and human suffering.



A. T. Raetzsch
Works Manager

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PART I

GENERAL SECTION

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DUTIES OF MANAGEMENT

The Works Manager will be the permanent Chairman of the Executive Safety Committee and shall assign his alternate to serve as chairman in his absence. He will appoint the members to serve on the committee; he will review the plant experience and keep up with progress being made in all phases of accident prevention.

It is the responsibility of management personnel from the top down to the first line supervisor to prevent accidents. It is their responsibility to see that the conditions under which employees work are safe; that all safety devices where needed are in place and functioning properly; that the necessary protective equipment is available and in good condition, and all employees know how and when to use such equipment and do use it; that good housekeeping is established and followed, and that all employees understand that safety is a part of every job and every job must be done safely. It is also the duty of all management personnel to set a good safety example for every employee.

THE EXECUTIVE SAFETY COMMITTEE

This committee will meet on the second Tuesday of each month. It will review and discuss all matters pertaining to safety. It will review all safety reports and recommendations which may be submitted by its members and decide on an established overall plant policy on safety matters. It will conclude on all matters discussed and see that definite corrective action is taken. It will act as a clearing house between the Works Manager, supervisors, and workers in both directions. It will dispose of the minutes of the preceding meeting and matters which have been carried over.

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Members of this committee are:
 Works Manager, Permanent Chairman
 Plant Superintendent
 Superintendent of Engineering
 Power Superintendent
 Safety and Training Director
 Industrial Relations Director
 Operations Engineer
 Chief Electrical Engineer
 Service Department Superintendent
 Safety Engineer
 Shipping Department Superintendent
 Production Superintendents
 Shift Supervisor
 Chief Development Engineer
 Chief Mechanical Engineer
 Safety Inspector
 Field Construction Engineer

THE SAFETY DIRECTOR

The Safety Director will be responsible for the coordination and administration of the accident prevention program. He will supervise the activities of the men in the Safety Department and see that their efforts are directed in the proper channels in order to obtain a well-balanced accident prevention program.

The principal activities of the Safety Department will be in the following areas:

1. Observation of unsafe acts and conditions and getting corrective action before accidents happen.
2. Investigations are made when unusual and lost time accidents occur, or at any time any supervisor requests an investigation in conjunction with his own investigation. Follow-up is to be

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made on all investigations to see if corrective action eliminate the unsafe act or condition.

3. Analysis of accidents as to types, causes, severity, and all other factors from experience which can serve as a guide for supervision in prevention work.

4. Inspection and study of machines and equipment to determine need for safeguards and the study of requirements for personal protective equipment.

5. Periodic inspection of safety equipment.

6. Safety educational work with all personnel.

7. Providing any information and advice as requested by supervision.

8. Inspection of equipment, tools, and buildings to determine if well-established safety standards are met.

9. Inspection of plant premises for housekeeping and sanitation conditions.

10. Making job studies of new processes to develop data with regard to hazards such as explosions or other conditions and keep Executive Safety Committee and supervision informed.

11. Consulting with plant physician on the medical aspects of safety.

SUPERVISOR'S RESPONSIBILITY IN ACCIDENT PREVENTION

Supervisors are responsible for the safety of the employee.

The principal duties of supervisors are:

1. To train employees to do all jobs safely.
2. To issue job safety instructions when required.

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3. To enforce safety rules and regulations.
4. To recognize and correct unsafe conditions.
5. To investigate all accidents and fill out the Supervisor's Accident Report.
6. To investigate all near-miss accidents and correct the condition or act.
7. To require workers to report for first aid when injured.
8. To conduct formal safety meetings.
9. To observe safety rules and safety practices.

**LEAD OPERATORS, MAINTENANCE LEAD-
MEN, WATCH ENGINEERS AND LEAD
LOADERS**

The principal duties of this group will be:

1. To make sure that the men understand that safety is part of their job. That they know how and do work safely.
2. Outline safe methods and proper ways of carrying on the work, and see that instructions from supervision are carried out.
3. To endeavor to get compliance with safety rules by the men.
4. To give specific job safety instructions with job assignments and see that the hazards of each job are pointed out.
5. To visit frequently and follow up on hazardous job assignments and see that the job is done safely.
6. To observe unsafe acts of workers and correct them.

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7. To observe and correct or report unsafe conditions and recommend necessary corrective action.

8. To investigate accidents when requested to do so by his supervisor.

9. To require workers to report to First Aid when injured on the job.

10. To instruct new employees and see that they understand that they have a personal responsibility in protecting their bodies from injury.

11. To see that workers have proper tools and protective equipment.

12. To observe the safety rules in order to set a good example for everyone else.

EMPLOYEE'S RESPONSIBILITY IN ACCIDENT PREVENTION

Each employee has a personal responsibility in accident prevention. He has a responsibility to his family, to his fellow workers, and to his employer by whom he is paid to work safely. In the performance of his duties, he will be expected to observe safe practice rules as well as instructions relating to the efficient handling of his work.

**WORKERS ARE REQUIRED TO RESPECT
AND PROTECT THE HUMAN BODY AND
SHIELD IT FROM INJURY.**

Some of the employee's responsibilities are:

1. To incorporate safety in every job procedure. No job is done efficiently unless it has been done safely.

2. To know and obey safe practice rules.

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3. To know disciplinary action for violation of safety rules.

4. To report all injuries to supervision immediately.

5. To follow instructions given by supervision.

6. To caution fellow workers when they perform unsafe acts.

7. To refrain from TAKING CHANCES.

8. To ask questions of supervision when there is any doubt concerning safety of job safety instruction.

9. To refrain from tampering with anything which they do not understand.

**ASK YOUR SUPERVISOR FOR HELP WHEN-
EVER NEEDED.**

GENERAL RULES FOR ALL EMPLOYEES

These rules apply to all employees of the company.

1. Each employee will be provided with a copy of his department handbook and have possession of it until he leaves the service of the company.

2. Each employee will carefully study and observe these rules, especially those applying to his particular duties, and he will be examined at intervals as to his knowledge of them. These rules will be strictly enforced and ignorance thereof will not be accepted as an excuse for their violation.

3. If a difference of opinion arises with respect to the meaning or application of these rules or the steps necessary to carry them out, the decision

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of the supervisor in charge of the work will be accepted.

4. It is impracticable to include rules to meet all contingencies. When emergencies arise, act under the directions of the supervisors.

5. It will be the duty of employees to attend safety meetings and take an active part in safety work.

6. All workers must understand the safety procedure on a job before work is started.

7. Employees will be careful always to place themselves in safe and secure position. The care exercised by others must not be relied upon for protection.

8. All employees are required to wear safety hats, safety glasses and a respirator upon entering plant gates, except that they are not required in plant offices.

(Job Safety Instructions)

1. No job instructions are complete until J.S.I. (Job Safety Instructions) have been given.

2. It is the responsibility of supervision to give J.S.I. with every job assignment when there is the slightest doubt that the workers may not be acquainted with safe methods of doing a job.

3. It is the responsibility of every employee to ask his foreman for J.S.I. on every new job assignment, or on job assignments where he may be unfamiliar with hazards.

EACH EMPLOYEE MUST ASK HIS FOREMAN FOR J.S.I. ANY TIME WHEN IN DOUBT. ANYONE WHO TAKES A CHANCE AND IS INJURED, CANNOT BE EXCUSED BECAUSE OF IGNORANCE.

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TAGGING PROCEDURE

The tagging procedure at this plant is a safety system used to prevent injury to personnel and damage to equipment or property. The purposes of the system are to establish safe conditions for a particular job or situation; to maintain safe conditions for the required time, and to clearly determine the end of the job or situation.

Whenever a supervisor or workman determines that unsafe conditions can possibly occur during or because of a particular job or situation, the tagging procedure will be used for the necessary safety clearances.

The tagging procedure is most frequently used when equipment is out of service for maintenance. In general, the procedure applies to all equipment being worked on except spare equipment in storage areas or shops.

Safety clearances are obtained by attaching "DO NOT OPERATE" tags to control points such as valves, switches, manhole covers, etc. These "DO NOT OPERATE" tags are known and referred to as Red tags. In order to maintain the safe conditions established by tagging, the cardinal rule is: **EQUIPMENT WILL NOT BE OPERATED WHILE TAGGED.**

This rule specifically applies to testing work done as a part of the job. For example, if motor rotation is to be checked before coupling to a pump, the tags on the starter must be removed by the responsible parties before energizing the circuit even momentarily.

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Five types of tags are used in the tagging procedure.

Red	A reusable plastic tag inscribed with the words "Danger—Do not Operate." The tag has spaces in which to write, in pencil, the date, the reason for tagging and a signature.
(Do Not Operate)	
Personal Tag	A white plastic tag is inscribed with the words "Do Not Operate", a number and the individual's name.
Boil-out Tag*	A red plastic tag used in lieu of Red (Do Not Operate) tags during boil-out of the caustic evaporation equipment.
Instrument Shut-Off Tags*	A white cardboard tag used primarily to indicate that an instrument is not in service.
Supervisors Personal Tag	White letters on red background.

The person responsible for the work requiring safety clearance (usually Service Department or Engineering) will contact the operating personnel directly responsible for the equipment or facility concerned (usually Lead Operator or Watch Engineer) and will notify them of the work to be done.

Operating personnel will determine if the equipment or facility can be cleared and will then isolate it so the job can be done safely. Operating personnel will tag all required control points with Red tags. If the item is tagged for maintenance purposes, only the date and signature of the per-

* See special rules.

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son applying the tags are required. If the item is tagged for any other reason, this reason must also be shown on the tag.

The person responsible for doing the work will inspect the job and will also tag the required control points with Red tags. This job is now considered clear. Proceed with caution.

Each man (mechanic, apprentice, helper, utility crewman, etc.) working on a clearance must place his Personal tags on the valves, switches, etc., previously tagged with Red tags after satisfying himself that the job can be done safely. Persons not normally furnished with Personal tags (usually supervisors or engineers) must tag the necessary control points with Red tags for personal protection when entering tanks or vessels.

Since the Personal tags signify that an individual is actually working on the clearance, the tags must be removed when the individual changes assignments and at the end of the day. Under no circumstances can a mechanic, apprentice, helper, or utility crewman remove another's Personal tag.

REMOVAL OF TAGS. When the job is complete, the individual workmen will remove their Personal tags and will notify the responsible party who has established the clearance with Red tags.

The person responsible for the work will notify the operating personnel concerned. When both parties are satisfied that all safety requirements are fulfilled, they then will remove their respective Red tags.

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SPECIAL RULES

1. (a) When electrical checks, repairs, or switching is to be done on equipment or the distribution system **within a definite plant area** (such as the Liquefaction Area or Caustic Area) electrical clearance must be obtained by the standard tagging procedure. Service Mechanics (Electricians) may sign Red tags in these instances in lieu of Area Maintenance Leadmen or Supervisors.
- (b) When electrical checks, repairs, or switching is done on the distribution system **between plant areas or between the Powerhouse and plant areas**, the electrical clearance must be accomplished under the direction of a supervisor or a leadman. The responsible person in these instances can delegate the signing of Red tags at his discretion.
- (c) Turbine Operators, upon instructions from supervisors or in emergency cases, are permitted to give electrical clearances on the breakers they normally operate.
2. It is not permissible to tag push button switches. The main disconnect devices must be tagged and then the start button pushed as a test before starting a job.
3. (a) When repairs to an instrument requires that a process line be opened, the standard Red tag procedure will be followed.
- (b) When an element of a control system requires checking or repairs, except as in

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paragraph 3 (a), clearance may be obtained by placing an Instrument Shut-Off Tag, signed by the Area Lead Operator, or Watch Engineer and a mechanic, at the control station.

- (c) When any secondary instrument (i.e. non-controlling indicator or recorder) is to be serviced or repaired, except as in paragraph 3 (a), clearance may be obtained by placing an Instrument Shut-Off Tag, signed by the operator using the instrument and a mechanic, at the instrument. NOTE: Personnel working on the above clearance will use Personal plastic tags as necessary.

- (d) Any supply lines, impulse lines, etc., disconnected by the mechanic(s) during the course of repairs described in (b) and (c) above, may be tagged with an instrument Shut-Off Tag signed by a mechanic only.

4. Lead Operators, Watch Engineers, Lead Loaders, Area Maintenance, Leadmen, Service Mechanics (Electricians), Shift Mechanics, and Supervisors may remove Red tags attached by others of their respective classifications after fully checking the situation to be sure that all safety requirements are satisfied.
5. Area Maintenance Leadmen may tag mechanical equipment in OUTLYING AREAS NOT ATTENDED BY REGULAR OPERATORS after obtaining verbal clearance from the responsible operating personnel.
6. The Inspector Repairman and Shift Mechanics may tag equipment on which they normally

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work after obtaining verbal clearance from the responsible operating personnel.

7. The Caustic Area Lead Operator and Area Maintenance Leadman may use special plastic tags in lieu of Red tags for caustic evaporator boil-outs only. The Lead Operator uses tags of black plastic, while the Leadman uses tags of white plastic.
8. The special procedure for tagging boiler inspections is described on page 64 of the Power Department Safety Manual.
9. To minimize the number of Red tags needed to "tag out" the chlorine scale tanks, a "tag rope" will be threaded through the valve stem hand wheels and tied off at the last wheel and tagged with a Red tag at its termination point. Personal tags of persons working on the tank must be secured at the termination point of each tag rope.
10. Tag ropes are to be made of good sash cord with one end secured to an iron ring made of $\frac{3}{8}$ " rod and the diameter of the ring to be at least six inches. In addition, the rope is to be alternately banded yellow and black every 12 inches of its length.

SAFETY SUGGESTION PROCEDURE

Safety suggestion forms are located in the various departments for use by employees when they wish to submit a suggestion. The mechanics for handling suggestions will be as follows:

1. The suggestor will write the suggestion on the original (red) sheet and make three car-

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bon copies. (Second copy blue, third copy yellow and fourth copy green).

2. The suggestor will tear out the first three copies and give them to his supervisor. The fourth copy (green) will remain in the book.
3. The supervisor will investigate the condition mentioned in the suggestion and note his action on all three sheets. If action is necessary by another department, he will pass the red copy to that department.
4. When final action is taken, it is so noted on the red copy and, if handled by another department, it must be returned to the supervisor who originally handled the suggestion. The red copy is given to the original suggestor with the final disposition written on it.
5. The blue copy is forwarded to the Safety Director, the yellow copy to the Superintendent in whose department the suggestion originated, with final disposition.

FIRES

Three general classifications of incipient fires have been developed by Underwriters Laboratories according to the type of extinguishing agent required.

Class A Fires

Fires in ordinary materials such as wood, paper, excelsior, rags, rubbish. The quenching and cooling effects of water or of solutions containing large percentages of water are of first importance in extinguishing these fires.

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Class B Fires

Fires in such flammable liquids as gasoline, oil, or grease. A blanketing or smothering action is of primary importance on incipient fires of this type. The foam extinguisher, carbon dioxide extinguisher and dry chemical types are satisfactory for use on this type of fire.

Class C Fires

Fires in or near live electrical equipment. A non-conducting extinguishing agent such as carbon tetrachloride or carbon dioxide and dry chemical is satisfactory for this type of fire.

FIRST AID ZONES

The plant property is divided into safety zones. The purpose of this division is to centralize control as much as possible when emergencies arise requiring first aid treatment to an employee or when the services of the plant fire fighting team are required. The emergency horns will blast signals indicating the zone in which the emergency exists

The plant alarm signals will be as follows:

Horn

Blasts Zone Directional Center Location

1-1	1	Guard Office
1-2	2	Machine Shop (Center East Wall)
1-3	3	Safety Office
1-4	4	Caustic Operator's Desk

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|-----|----|--|
| 1-5 | 5 | Cell Foreman's Office |
| 2-1 | 6 | South End Lower Roadway |
| 2-2 | 7 | South End North Rectifier Building |
| 2-3 | 8 | South End Powerhouse |
| 2-4 | 9 | River Pumphouse |
| 2-5 | 10 | Office Building K-105 (North Side) |
| 3-1 | 11 | South Side Anhydrous Caustic Building |
| 3-2 | 12 | Sodium Chlorate Building (East Door) |
| 3-3 | 13 | North Door Riverside Powerhouse |
| 4-1 | 16 | West Door of EDC, Ti-Ethane Control Building |

The directional centers are shown on framed posters throughout the plant and this is the point to which the emergency crew will go immediately when the signals are blasted on the alarm system, provided they do not know where the emergency exists.

When first aid or fire-fighting services are needed in any zone, an employee will proceed to the nearest intra-plant phone and dial 216. He will tell the guard whether first aid or fire-fighting services are needed and where the emergency exists; then proceed to the appropriate Directional Center involved to direct the Emergency Squad to the scene. The guard at the gate will then set the plant alarm system into action. The patrol guard will proceed to the safety zone in which the emergency arose.

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In case of an emergency requiring first aid treatment, employees on duty who belong to the Emergency Squad will proceed to the scene and take over and handle the case. The plant doctor should be summoned immediately by the plant nurse (guard if on evening and night shift).

NOTIFICATION

The Guard Office—Phone 328—should be called immediately and the following conditions explained when they exist:

1. After using any fire extinguisher.
2. After breaking a seal on a hose house.
A seal should never be broken except in case of emergency or inspection.
3. When a fire hydrant on the yard is opened.
4. When a sprinkler alarm rings.

EVACUATION PROCEDURE

1. When the emergency horns sounds a long warbling sound, it is signal for the following employees to evacuate and get into an area which will be free of air contamination:

- (a) All contractors' employees
- (b) Laboratory employees
- (c) Warehouse employees
- (d) Employees in the Personnel and Operations Building, the Administrative Building and the Plant Offices.
- (e) Service Department employees

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2. When the evacuation alarm sounds employees will be governed by the windsocks as to direction to take, but will travel at right angles to wind direction as much as possible.

3. Power, Production and Shipping Departments will be governed by what is deemed advisable by the superintendents of these departments.

4. The system presently being used as an emergency alarm will be used for the evacuation alarm. A central control switch is located in the Guard Office and the Shift Supervisor's office. When either is in the closed position, all emergency horns will blast simultaneously. Either of these two switches can be used. A long warbling sound will be the signal to evacuate.

The alarms will be sounded only by the Shift Supervisor, a supervisor in the Production or Shipping Departments, or by the Guard at the Guard Office. The evacuation horn will blast for three (3) minutes and should then shut off.

5. Windsocks have been installed in the following locations:

- (a) Top of No. 7 Cell Liquor Tank
- (b) Top of Caustic Storage Tank at Docks
- (c) Top of southwest corner of Liquefaction Structure
- (d) South area near salt pond
- (e) On top of Cell Building K-305 (east end)
- (f) PH Condensate Tank in Caustic Area
- (g) Construction Pipe Shop (east end)
- (h) Light Tower west of Car Shop
- (i) Top of north end of Shop
- (j) EDC Storage Tanks
- (k) Shipping Building (west end)

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These windsocks are intended to be used as wind direction indicators. The flag at the Personnel and Operations Building can also be used as a wind direction indicator. Additional locations will be added as plant expands.

6. Division Heads in Traffic, Industrial Relations, Purchasing, Accounting and Engineering will appoint leaders and alternates to lead and direct their employees into an area free of air contamination when the evacuation alarm sounds. All women in the in-plant area will be directed by department heads or supervisors in the affected areas. Members of the emergency crew (who will not be required to remain at their station) will go to the Guard Gate. If this area is inaccessible, then they should report to the south door of the Powerhouse.

7. All personnel are required to go to the plant fence which is in the safe direction of travel, when evacuating. All personnel are to remain in the clear, after the horns have ceased blowing, until they again sound two long blasts as an "all clear" signal. The "all clear" signal will sound only at the request of a supervisor in Operations.

EYE PROTECTION

1. Every employee is required to wear safety spectacle type glasses upon entering the plant gate, but are not required in plant offices.

2. All caustic, cell and liquefaction operators, the shift mechanics and all shipping personnel involved in caustic tank car, tank truck and barge loading, will be issued a pair of chemical goggles which are to be worn on their person at all times. In addition, all Service Department personnel

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normally assigned to work on caustic handling facilities will also be issued goggles to be worn on their person when working on or around such equipment. All other maintenance personnel assigned temporarily or on an emergency basis to these areas will pick up a pair at either the Tool Room, Safety Office, or Area Maintenance Storage location.

These chemical goggles are to be worn over the eyes if, in the opinion of the employee or his supervisor, a sufficient hazard exists to warrant their use. The goggles may be worn in place of the safety glasses, provided the primary hazard is not that of severe impact from a flying object. In this case, the goggles will be worn over the safety glasses. If the employee is wearing his goggles, this does not relieve him of the responsibility of keeping his safety glasses in his possession at all times.

3. A face shield must be worn when chipping, buffing, using portable grinders, babbiting, riveting, rivet cutting, or similar operations. These must be worn over the safety glasses.

4. A welder's hood must be worn when doing arc welding and safety glasses must be worn under the hood.

5. A face shield must be worn when doing lead burning.

6. Safety glasses must be worn under welding and cutting goggles.

7. Chemical goggles, or a face shield, must be worn when blowing off or cleaning with compressed air.

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Consult supervision when in doubt about eye protection. DO NOT TAKE CHANCES!

FOOTWEAR

All employees will be required to wear hard toe safety shoes with the exception of:

- (a) Those employees whose work requires them to wear hard toe rubber shoes.
- (b) All female employees and all male employees in Accounting, Personnel and Engineering (except field engineers and chemical engineers whose work habitually requires them to be in the plant).

LADDERS

It is necessary to do work from various types and sizes of ladders by both operators and maintenance men. This work should and must be done safely. Since there are various types of ladders in use in the plant it is necessary that the right ladder be used for every job. Always check with your supervisor if you are not sure about the type of ladder you should use.

1. Do not use ladders that are defective, damaged on the job, or that do not have the current color of the month. (See Figure 1).

A Red Tag shall be applied to a defective ladder stating the unsafe condition by the person discovering the defect. Your cooperation in either returning defective ladders and ladders that do not have the current color of the month to the Carpenter Shop or notifying your foreman of the unsafe equipment is requested. (See Figure 1 for color of the month).

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2. Ladders placed in passageways should be barricaded or protected by a standby.

3. When ascending or descending a ladder, the user must face the rungs or steps and have both hands free to grasp the rungs or rails.

4. All straight ladders must be equipped with safety shoes and a tie-off line at least eight (8) feet long and with a minimum diameter of $\frac{3}{4}$ inches. The top of a straight ladder must be firmly placed, if possible, and if both sides do not press evenly against the support, the ladder must be tied or held.

Note: The best angle for a straight ladder is about 75° with the horizontal. This will place the foot of the ladder about one-fourth ($\frac{1}{4}$) of its length from the object it leans against.

5. The two top rungs of a straight ladder must not be used to stand on unless the rungs are visually inspected for defects and ladder is tied off and a safety belt is used.

6. Only one worker is allowed to work on a ladder unless it is designed for two people.

7. Extension ladders must not be taken apart in order to use the two sections separately. They must be equipped with a pulley and cash cord for raising and lowering the top section.

8. Platform ladders must be fully opened and locked while being used.

9. Platform ladders over ten (10) feet in height must be equipped with outriggers, tied off, or held when standing on the platform.

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SCAFFOLDS

1. Scaffolds must be built of sound material and well-braced. Decking boards must be nailed down, tied down, or equipped with cleats that will prevent them from sliding or falling. No structural brace is to be removed from either metal or wooden scaffolds unless permission is secured from a supervisor.

2. Scaffolds must be equipped with handrails or hand lines, and toe boards, unless in the opinion of the supervisor they are not deemed necessary.

Note: A specific understanding must be reached regarding these safeguards at the time the scaffold is being erected and prior to being worked on.

3. A safe means of access must be provided to a scaffold.

4. When necessary to work outside the handrail of a scaffold, the decking boards must be fastened down, and a safety belt with the tail line tied off must be worn.

5. Do not use "Scaffold Boards" for any other purpose. Remove all loose material from a scaffold when one is finished with it so that it won't fall . . . and injure workmen dismantling the scaffolding.

Note: "Scaffold Boards" are plainly marked on the ends and center.

6. Do not throw material and tools to or from the platform of a scaffold. Use a hand line, if necessary, to raise and lower objects.

7. Scaffolds equipped with casters must have a locking device on the casters or the scaffold must be secured to keep from rolling while being worked.

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8. Sectional scaffolds, such as "Safeway", must be tied off or supported by outriggers when they are between ten and twenty feet in height. When exceeding twenty feet in height they must be supported by outriggers and tied off, if possible.

9. Swinging scaffolds must be discussed with your supervisor before being worked.

10. A fork truck pallet that is being used as a working platform must be equipped with hand-rails. The platform must be tied off to the truck to prevent it from slipping off the forks should they be accidentally tipped down and the truck must not be moved unnecessarily when the platform is in an elevated position.

Note: Powered scaffolds, such as the "Spider" scaffold, are invaluable in certain types of jobs. The use of them, however, by untrained personnel could be unsafe. All jobs on which these scaffolds are to be used must be studied thoroughly by the foreman and personnel involved so that specific Job Safety Instructions can be determined and understood by all concerned, prior to the start of the job. In addition, these rules must be observed.

11. Do not use a "Spider" scaffold unless you have been given specific training in its operation and you have been "checked out" in it by a qualified trainer. Discuss this matter with your supervisor if there is any doubt concerning it.

12. When a crane boom is used as the support for a "Spider" scaffold, the boom line must be dogged off; the hoist line if used for support must be dogged off, and the crane operator, removed from the crane before and while using the "Spider".

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er". When necessary to weld or burn from a "Spider", discuss the specific job with the supervisor in charge to ascertain any special precautions needed to eliminate the possibility of burning the hoisting cable. Special attention must also be paid to the necessity of providing a positive ground for the "Spider" frame-work to avoid arcing on the hoisting cable or mechanism.

13. Special hooks are to be used with "Spider". Be sure the supervisor is aware and satisfied.

SIGNS

1. Do not depend on a sign alone to afford protection where other more effective means are available.

2. Place signs in such a position as to afford maximum benefit.

3. Signs must be used when necessary and must be removed and returned when no longer needed.

4. Do not use signs which have been defaced.

5. Only the workers who put signs in place can remove them unless others are instructed to do so by the supervision responsible for the job.

BARRICADES

1. Barricades must be erected around the scene of jobs that present hazards such as falls, falling material, large scale spillage of chemical, etc. Barricades must be removed when the job is finished.

2. Do not enter a barricaded area unless you have a specific purpose for being in the barricaded area.

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SOLVENTS

Solvents are necessary for various cleaning jobs in the plant. The most common solvents are listed which can be used with reasonable precautions, except carbon tetrachloride, which must be used only at the request of supervision.

KEROSENE — Flammable — Flashpoint 100-160°F.

VAR SOL — Flammable (same as Kerosene) — Skin irritant.

PERCHLOROETHYLENE — Non-flammable — Toxic—vapors must not be breathed.

TRICHLOROETHYLENE — Non-flammable at ordinary temperatures. Slightly flammable at higher temperatures. Vapor must not be breathed.

SC-49 — Flashpoint 113°F.

CARBON TETRACHLORIDE—Non-flammable very toxic, vapor must not be breathed.

HANDLING CYLINDERS CONTAINING OXYGEN, ACETYLENE, CO., FREON, OR OTHER COMPRESSED GASES

1. Never drop any cylinders nor permit them to be struck violently.
2. When cylinders are not in use, the valve protection cap must be in place and tightened hand tight.
3. Oxygen and acetylene cylinders, regardless of whether full or empty, must not be stored together.
4. Cylinders shall not be used as roller, anvils, supports, or for any purpose other than as gas containers.

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5. Never use any tool for opening cylinder valve other than the one provided for that purpose.

6. Leaky cylinders must be removed to the outside.

7. Cylinders must not be placed near a source of heat.

8. Empty cylinders must be returned to cylinder storage place as soon as possible after being emptied.

9. All cylinders must be kept in upright position and well-tied or secured.

10. All empty oxygen and acetylene cylinders must be marked E-M-P-T-Y.

11. Oxygen cylinders must not be handled with oily or greasy hands nor should they be stored where readily oxidizable materials might come in contact with them. Oil and grease should never be used in regulators, valves, or connections. Under no circumstances may oxygen cylinder caps be used as a receptacle for grease or oil.

12. Never use oxygen as a substitute for compressed air or as a source of pressure.

13. Turn acetylene cylinders so that their valve outlets will point away from the oxygen cylinder.

14. The wrench for opening the valve on acetylene cylinders should always be kept in place when acetylene is being drawn from cylinders.

HOUSEKEEPING

1. Each employee is responsible for the cleanliness of the area in which he is working.

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2. Put trash, paper, etc., in trash cans provided for that purpose.

3. Materials must be piled or stacked neatly and no aisleway or doorway can be blocked unless there is another means of allowing for normal traffic.

4. Dirty and oily rags must be put in the containers provided for that purpose.

5. Cleaning up is required after finishing any job. No job is complete until all debris is removed.

6. Do not allow an oil puddle to remain on the floor. Mop it up with rags.

7. Keep hoses not in use neatly coiled and out of the way.

PLANT INJURY CLASSIFICATION

All injuries are classified according to the American Standards Association method of compiling industrial injury rates as follows:

First Aid Cases:	An industrial injury which requires only one visit to plant hospital.
Minor Injuries (Medical Treatment)	An industrial injury which does not interfere with employee's normal work, but requires two or more visits to plant hospital.
Sub-Major Injuries: (Temporary Partial Disability)	An industrial injury which does not result in loss of time, other than the remainder of the shift

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on which the accident occurred, but limits the employee so that he can only partially fulfill a regularly established job in his own area.

Major Injuries:
(Temporary Total Disability, Permanent

Partial Disability, Permanent, Total Disability, or Death)

An industrial injury which results in death or loss of time other than the remainder of the shift, exclusive of a 48 hour grace period for observation in case of head, chest, or abdominal injuries requiring x-ray, etc.

AUTOMOBILES, TRUCKS, SCOOTERS, SHOP TRUCKS, ETC.

1. Drivers of company vehicles must be familiar with the regulations governing highway traffic in the state. Safe driving practices must be followed whether other vehicles on the road do so or not.

2. Drivers of company vehicles are required to be courteous and where safety is involved they will grant the right-of-way to others regardless of the law. Signals should be given when turning or stopping. Speeding is to be avoided and vehicles must be driven at such a speed as to allow the driver complete control at all times. Citations received while operating a company vehicle will become the responsibility of the operator, provided the operator is found to be guilty.

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3. The following are safe driving practices which must be complied with on plant property.

Vehicles must be driven at such a speed as to be safe and allow the driver complete control at all times. Generally a speed of 15 miles per hour must be adhered to for all vehicles except a fire truck or ambulance.

The speed limit is five miles per hour at following points:

- (a) Roadway between caustic building and caustic storage tanks.
- (b) Upper and lower passageway in plant.
- (c) Roadway between liquefaction and ammonia compressor building.
- (d) Roadway between cell buildings.
- (e) Roadway between cell and rectified buildings.

4. Vehicles entering or leaving shops at upper passageway must stop and sound their horn before doing so.

5. No vehicle is to turn into any part of the cell rooms.

6. Employees are required to sit down when riding in a truck bed, and must not allow their feet to hang over outside of truck bed.

7. Drivers must stop their vehicle and observe both ways at all blind railroad crossings.

8. When safety belts are provided in company vehicles they must be worn when the vehicle is in operation.

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9. Bicycles will be governed by other vehicle rules. Stop at stop lights, stop signs and do not break limits especially in and around buildings.

10. Do not carry heavy loads in baskets on bicycles, large chain blocks, valves, etc.

LIFT TRUCKS

The following rules must be adhere to when operating fork lift trucks:

1. Supervisors will train employees who are required to use lift trucks and will provide the Safety Department with names of employees who are qualified to operate lift trucks.

2. No passengers are allowed on trucks.

3. Keep to right whenever possible.

4. Slow down when vision is obstructed and at cross aisles.

5. Come to a stop and sound horn at doors, corners, exist, etc.

6. Sound the horn when approaching pedestrians, but do not use horns unnecessarily.

7. Do not start, stop, or turn trucks suddenly.

8. Face in the direction you are traveling.

10. Inspect all loads to be moved; do not overload; do not move a questionable load; keep loads below eye levels; avoid carrying loose materials.

11. Never use the truck to carry loads for which it is not intended. Use the right truck for the right job.

12. Never use a loading plate that is bent or damaged.

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13. Do not use reverse control for brakes.
14. Do not drive with wet or greasy hands.
15. Slow down for wet and slippery floors.
16. Never drive high lift trucks with the platform elevated.
17. Avoid bumping into objects, especially in backing, and keep your feet inside the running lines of the truck.
18. Stunt driving, speeding, and horseplay will not be tolerated.

INJURIES:

1. All injuries which occur on the job must be reported to the supervisor regardless of their nature. Injured employee must apply to the supervisor for First Aid pass to clear through guard gate and must give the pass to the nurse. In case of a serious injury, a pass is not necessary.

2. When an injury occurs to an employee on the night shift, he will obtain a First Aid pass from the Shift Supervisor and take it to the guard gate. The Guard will administer first-aid in simple cases and give the injured employee two (2) copies of the supervisor's report form which he will take to the Shift Supervisor who will investigate the accident, analyze it on the form and send it to the foreman of the department. The Guard will inform the Shift Supervisor by telephone as soon as possible.

CHEMICAL BURNS AND INHALATIONS

1. Safety Goggles:

Your attention is directed to the explanation on safety goggles and of the eye protective equipment as outlined on page 18.

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2. Respirators:

Respirators must be worn when spray painting or working in a dusty atmosphere. Also consult your supervisor at any time when conditions indicate respirators are needed.

3. Gas Masks:

(a) All employees are provided with what is known as an escape mask; this mask is provided for the purpose of protection until a safe area can be reached. These masks are not intended for use in strong concentrations of chlorine.

(b) Full face masks are provided for use in strong concentration of chlorine and ammonia. You should know the locations of full face masks about the plant.

(c) All new employees will be instructed by the Safety Department in the use of a full face canister mask.

4. Special Masks:

Special masks are provide at designated spots in the plant for your use in emergency conditions. Instructions on the use of these masks will be given by the supervisor.

5. Chlorine Alarms:

Chlorine gas alarms (sirens) are located in liquefaction, chlorine tank car loading area, scale tanks, shipping building, chlorine docks and in the cell room. When those sound, employees will determine the wind direction as indicated by windsocks, and move out of the area at right angles to the direction of the wind as soon as possible to do so.

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6. Ammonia Alarm:

The ammonia alarm siren is located in the DH Plant and gives intermittent high and low wails. The same precaution should be taken as with the chlorine alarm.

7. Other Protective Equipment:

(a) All employees are required to wear a safety hat while in the plant as well as eye protection and respiratory protection as outlined above.

(b) Employees are to wear hard toe rubber shoes when working in areas where corrosive liquid is on the floor.

(c) Various type respirators, safety clothing, and other special items of protective equipment are available for your use when conditions warrant them and further instructions on their use will be given by your supervisor.

8. Safety Showers:

(a) Whenever you come in contact with chemicals of any nature in the plant through spillage, splashing, or other causes, you are to flush the affected area with large volumes of water. For this purpose safety showers have been provided at several places throughout the plant. Spot these locations and know where they are when you are in the area.

(b) At these same locations, bottles of body wash have been provided for further first-aid use. Body wash generally is used only after the affected areas have been flushed with large volumes of water. Each location also has a short hose for use when a large volume of water is

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needed in a local spot. Use these hoses to wash off contaminated tools but do not leave tools in shower pit. Do not remove the short hose from shower to hook up other hose for any reason.

ELECTRIC SHOCK

1. Since this plant is primarily an electro-chemical operation centered around the cell area, all employees should familiarize themselves with the safety rules covering cell room operations and rectifier operation.

2. Electric power tools should bear the color of the current month. (See Figure 1).

3. All portable electric tools must be grounded when in use.

4. Six (6) volt or thirty-two (32) volt extension cords must be used when a light is required in small tanks, boilers, or vessels, or when a light is required in wet places such as ditches, excavations, or sewers, etc. If 6-volt or 32-volt equipment does not give enough light in large tanks, 110-volt lights may be used only by permission from a supervisor and only after he has checked the installation.

5. One hundred ten (110) volt extension cords may be used normally but they must be equipped with 3-prong fittings grounding within the plant area.

6. Lamps on extension cords must not be renewed before pulling the plug from the receptacle.

7. Extension cords must bear the color for the current month.

8. All service mechanics (electricians) and members of the emergency squad are trained in artificial respiration. Refresher training will be required in six-month periods.

HAVE YOU ASKED FOR J. S. L?

FALLS

1. Safety belts are to be worn in unprotected, elevated places and on roof slopes in excess of 15° in pitch. They are to be worn when working near the edge of a roof, regardless of pitch, or at any time in the discretion of supervision they are considered necessary. A safety belt is required when work is being done on a roof between the yellow painted line and the roof's edge. The belts must always be tied adequately and with the tag line as short as possible. Whenever a safety belt is needed in doing any job, it must be checked thoroughly for defects before using by the wearer.

2. The handrail should be used when walking up or down stairways. Do not attempt to carry a load up or down a stairway that will prevent you from having a free hand with which to hold the handrail.

MECHANICAL FAILURES

A. Tools

1. The Proper tool should be used in any job which is done in this plant. Defective tools of any kind must not be used.

2. Portable electric power tools must bear color code of the current month. There are certain restrictions on tool usage in the cell room. Everyone should refer to the cell room safety rules for these restrictions when working in this area.

B. Hose—All Types

One of our widely used tools is hose for either air, water, or steam. Use the proper hose for the proper medium.

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1. Do not use an air hose for steam service.

Note: Consult your foreman if you do not know the identification of hose used in your section.

2. Do not use a steam hose for any other service. Steam hoses are equipped with Boss fittings. Do not remove Boss fittings from a steam hose or steam outlets.

3. Hose must be strung up overhead high enough to permit free passage if at all possible.

If necessary to string hose across roadways or passageways, ample protection must be provided for the hose against damage by vehicles, as well as taking means to protect pedestrian traffic against tripping hazards.

4. A. Do not disconnect a hose until the supply valve to same has been closed and the hose bled down.

B. Do not connect a hose between two fixed connections unless there is a bleed valve on one of the two ends.

5. Do not attempt to remove air tools from a hose without first closing the supply valve and draining the hose. Do not shut off the pressure to the tool by cramping the hose.

6. Clean and return hose to the proper location after using it.

7. Air must not be used for blowing off clothing while being worn. If it is necessary to blow off clothing, the clothing must be removed from the body before blowing off. An air hose must never be pointed so that a jet of air can strike any part of the body.

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C. Emery Wheels

1. Pedestal and portable grinders and buffers must be equipped with guards when being used.

Pedestal grinders must be equipped with work rests when being used. The position of the work rest should be checked frequently; it should never be more than $\frac{1}{4}$ " from the wheel and securely clamped in position.

Note: Buffers are not equipped with work rests.

2. Gloves will not be used when grinding on pedestal grinders unless the hands can be held a minimum of twelve (12) inches from the wheel. Do not use rags to hold an object while grinding or buffing.

When grinding small pieces, use vise grip pliers or other suitable means.

3. Only one person at a time will use a pedestal grinder, regardless of whether grinding or buffing.

4. Only authorized persons will be allowed to change wheels on grinders and buffers.

5. If at any time while using a grinder you hit or drop the stone, have it inspected by the area foreman in charge of the machine shop for cracks or other defects.

6. The chippers' goggle or face shield must be worn over your safety glasses when grinding or buffing with portable unit.

D. Boilers, Tanks and Vessels

1. Employees must not enter boilers, tanks, or any kind of pressure vessel until they have been properly tagged out and cleared up.

2. Employees must not enter, burn, or weld on a tank or vessel which has contained explosive,

HAVE YOU ASKED FOR J. S. I?

flammable or toxic liquids or gases, until such tanks and vessels have been freed of all flammable material and explosibility test run by the Safety Department or a supervisor.

3. Tanks and vessels must be well ventilated when employees are required to work on them.

4. Cathodic protection must be cut out of service when it is necessary to work on any vessels or piping so equipped.

EXPLOSIMETER

Questions frequently arise concerning limitations in the use of the MSA Explosimeter.

One of the first requirements of the MSA Explosimeter, or similar instruments, is that the gases and vapors to be tested must be in **AIR**. Oxygen must be present in the sample or the instrument cannot respond. Measurement is the result of catalytic surface combustion on the heated platinum detector filament. Oxygen is absolutely necessary for this reaction as with any other type of combustion. Therefore any conditions which exclude oxygen from the sample such as purging with steam, nitrogen, or CO, may prevent a response from the instrument even when combustibles are present in the sample. In a similar way, gas concentrations above the upper explosive limits displace air and reduce oxygen in the sample below the critical level, and the instrument cannot respond. So it must be kept in mind that the range of the Explosimeter is 0 to the "lower explosive limits" in **AIR**.

Do not depend on an Explosimeter alone to give safety clearance after purging—use Orsat.

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MISCELLANEOUS RULES

1. Horseplay of any nature will not be tolerated.
2. Do not walk or stand under suspended load.
3. Salt tablets should be taken when sweating freely.
4. Be on the alert for dripping chemicals anywhere in the plant.
5. All safety guards must be in place on moving equipment when not out of service for inspection and overhaul.
6. Employees must be fully dressed when on the job.
7. Do not walk between moving railroad cars.
8. Do not step or walk on Haveg or other plastic piping.
9. Do not lay heavy objects on or allow them to lean against Haveg or other plastic piping.
10. Always bleed pressure off any water, air, or steam hoses before disconnecting.
11. It is the duty of all employees to attend safety meetings when scheduled to do so.
12. Do not use Kelley connections on hoses in natural gas service. Use special gas connections.
13. Smoking is allowed in the plant except where posted.
13. The sides of trenches more than five (5) feet deep are to be shored unless they are sloped to the

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angle of repose. Before beginning an excavation job always check with the Electrical Foreman.

14. Gasoline must never be used for any purpose other than motor fuel.

15. Start electric motors with control switch or pushbutton. DO NOT OPEN starter box door and close starter contacts manually unless tests show that the motor feeders are NOT grounded or short circuited.

16. The handrail should be used when walking up or down stairways. Do not attempt to carry a load up or down a stairway that will prevent you from having a free hand with which to hold the handrail.

17. Do not enter underground sewers until properly cleared by supervision.

VISITORS

1. Large groups of visitors cannot enter the plant area without notification of the Operations Division to obtain the necessary clearance.

2. All visitors will be provided with safety hats, respirators and glasses at the guard gate or safety office in the plant.

3. Instructions on the use of the respirator will be given to visitors when the equipment is issued.

4. The guards who escort visitors will satisfy themselves that visitors are familiar with the use of the respirator.

5. Equipment will be turned in at the guard gate or safety office after the tour is finished.

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**VENDOR'S OR SERVICE COMPANY
EMPLOYEES**

1. When trucks from a vendor or transportation company are required to go into the plant with inbound materials, an employee from the warehouse must accompany them while in the plant. This excludes truck of carriers who go to cylinder loading platform at Shipping and the Storerooms. The Storeroom will notify the Safety Office if hazardous materials are to be unloaded or if a hat and glasses are needed.

2. The driver will be provided with a respirator only, which will be given to him by the guard, with instructions for its use. If a driver is required to go into the plant area, he will be provided with a hat and glasses at the Storeroom.

3. The Storeroom attendant will see that the driver does not wander away from his truck and around in the plant.

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COLOR CHART

JAN
JUL

FEB
AUG

MAR
SEPT

APR
OCT

MAY
NOV

JUNE
DEC

Figure 1

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COLOR OF THE MONTH PLAN

In order that certain tools and pieces of equipment are kept in a safe working condition, they will be inspected and repaired monthly. After the inspection and repairs are completed a portion of the object will be painted with a color corresponding to the colors shown in figure 1. None of the tools listed below are to be used after the seventh of each month unless they have the current color of the month marking applied to them:

- (a) Ladders
- (b) Extension lights
- (c) Extension cords
- (d) Portable electric tools

SNAKE BITE KITS

Snake bite kits are kept at the First Aid Station, Safety Office, and in the Guard Patrol Truck.

YARD SECTION

A "Blue Flag" must be used when loading, unloading, or working on or around railroad cars or tracks where standard railroad clearance is impaired.

The "Blue Flag" must be installed between the switch and the car nearest the switch. Where there is a switch at each end of the track, both ends shall be flagged.

A "Blue Flag" can be removed only by the person who installed the flag or a person authorized by him and then only after he is certain all personnel and equipment have been removed and the track is clear.

HAVE YOU ASKED FOR J. S. L?

GLASS WARE

1. Never use broken, cracked, or defective glassware. This should be discarded in the waste cans. Examine beakers carefully for chips before cleaning.
2. Use Caution—never put unnecessary pressure on glass. Do not stopper hot solutions.
3. Use tongs, gloves, and wet paper towels in transferring broken glassware to the waste cans.
4. Use wire baskets when moving five gallon bottles.
5. Use rag or gloves with cloth insulation when inserting glass tubing or thermometers into stoppers or rubber tubing, also wet objects to be inserted with water or glycerine.
6. Break glass tubing away from body. Always use a file, glass cutter, or hot wire before attempting to break glass tubing.
7. Fire polish all glass before putting into use.
8. Avoid subjecting glass to extreme changes in temperature.
9. Use tongs or asbestos gloves for handling hot glassware.
10. Chipped or broken glassware must never be placed in the sinks.
11. Extreme care should be exercised when placing sealed bottles under pressure. Mercury seals should always be used on bottles under pressure. Be sure bottles are in a wire basket.
12. Glass bottles are not to be carried in the arms against the body.

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MERCURY

1. Do not carry mercury in glass bottles or beakers. Always use stainless steel buckets or the regular shipping jug in which the mercury is received.

2. Wash hands or body with copious amounts of fresh water if they come in contact with mercury.

GAS MASKS

1. All-Purpose gas mask canisters are used throughout the plant and will give protection for chlorine, ammonia, organic vapors and carbon-monoxide in small concentrations where there is at least 16% oxygen in the air.

2. There are three gases being used in our plant which cannot be filtered by the canister type gas mask. They are:

Methane

Ethylene

N R E

It is very important that when going into an area where these gases or vapors are present, or where there is a possibility of there being less than 16% oxygen in the air, that a self-contained breathing apparatus, such as a Chemox mask, an Air Line mask, or a Scott Air Pak mask must be worn.

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Ladders

Straight, portable ladders must be placed at a safe angle to prevent breaking or slipping. The best angle for a ladder is about 75 degrees with the horizontal. (Note Figure 2) Have the distance "B" about $\frac{1}{4}$ of the ladder length "A". In other words, place the base of a 12 foot ladder 3 feet from object it leans against.

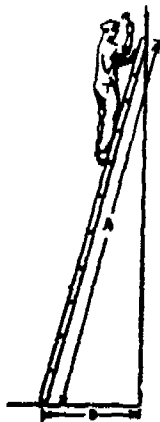


Fig. 2

HOW THE ANGLE OF A SLING ALTERS
ITS SAFE CARRYING CAPACITY

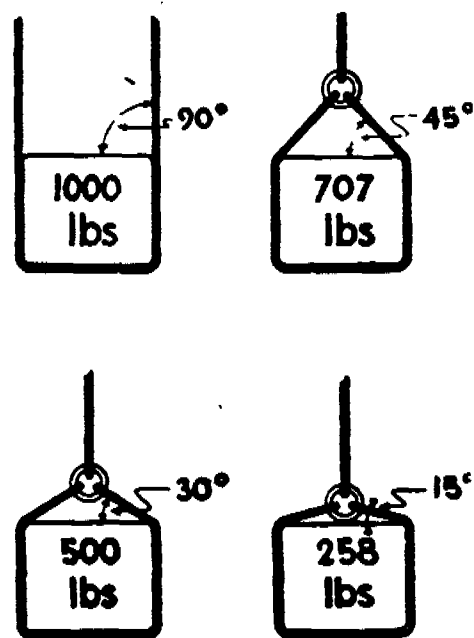


Fig. 3

USEFUL INFORMATION AND TABLES

How to Lift

1. You may be very strong but be careful what you lift. There is a limit to the strain your back muscles will stand.
2. Size up the load before you lift it. Get help if necessary.
3. Lift with your legs and not with your back.



Fig. 4

**MECHANICAL ARRANGEMENTS OF BLOCKS AND
TACKLES FOR VARIOUS RATIOS BETWEEN THE
MOVING LOAD AND THE PULL**

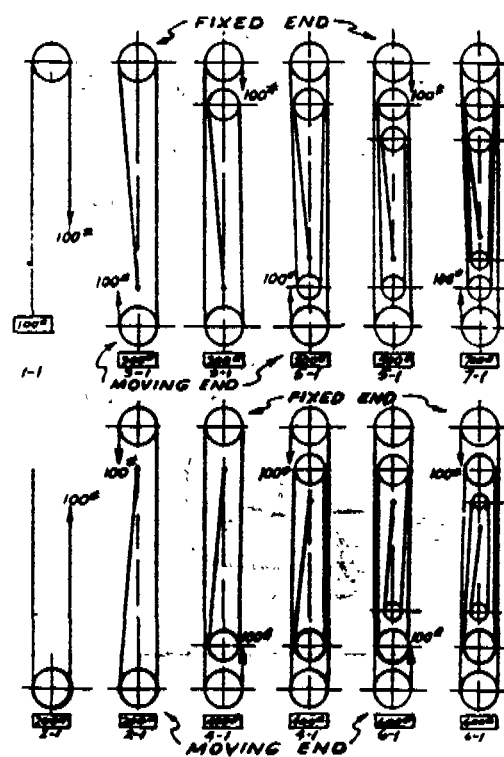


Fig. 5

Ropes and Block Sizes

The choice of proper size blocks for a rope of a given size has a lot to do with safety. Sheaves that are too small produce unnecessary wear on the rope and increase the friction load.

The best practice is to use the largest block that can be used, giving due consideration to ease in handling, etc.

Recommended block sizes are as shown in Figure 7.

Diameter	Size of Block Designated by Length of Shell in Inches
$\frac{3}{8}$ "	3"
$\frac{1}{2}$ "	4"
$\frac{9}{16}$ " - $\frac{5}{8}$ "	5"
$\frac{3}{4}$ "	6"
$\frac{13}{16}$ " - $\frac{7}{8}$ "	7"
$\frac{7}{8}$ " - 1"	8"
1"	9"
1 $\frac{1}{4}$ "	10"
1 $\frac{1}{2}$ "	12"
1 $\frac{3}{4}$ "	14"
1 $\frac{1}{2}$ "	15"
1 $\frac{3}{4}$ "	16"

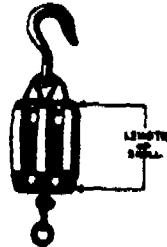


Fig. 7

Correct Method of Using Cable Fastening

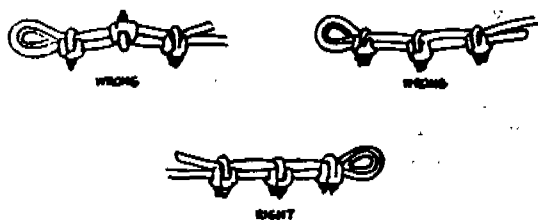


Fig. 3

Number of Clips Required to Make a Fastening Having 80 per cent of the Strength of 8-19 Plow Steel Wire Rope.

Dia. of Rope Inches	No. of Clips	Space Between Clips Inches	Efficiency of Fastening Per Cent	Length of Wrenches Inches
$\frac{3}{4}$	5	4 $\frac{1}{2}$	77.39	18
$\frac{7}{8}$	5	5 $\frac{1}{4}$	79.13	18
1	5	6	77.89	24
1 $\frac{1}{2}$	5	7	80.00	24
1 $\frac{3}{4}$	6	8	82.15	24

**SOME ROPE KNOTS, HITCHES AND
SLINGS THAT CAN BE DEPENDED
UPON**

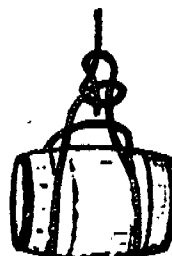
1. Double Sheet Bend — For joining two ropes together, especially those of unusual size — Will hold new and wet ropes.
2. Barrel Sling—Will keep parrel in vertical position.
3. Barrel Sling—Will keep barrel in horizontal position.



No. 1.—Double Sheet Bend.



No. 2.—Barrel Sling.
(Vertical)



No. 3.—Barrel Sling.
(Horizontal)

Fig. 9

**SOME ROPE KNOTS AND HITCHES THAT
CAN BE DEPENDED UPON**

1. Hawser Bend—For joining two large cables.
Each end is seized to its own standing part.
2. Catspaw Knot—For fastening rope to tackle.
3. Telegraph Hitch—For hauling poles, logs, etc.,
where they must follow in road.

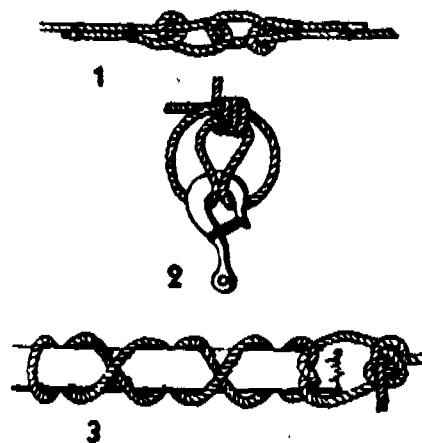


Fig. 10

ROPE KNOTS, HITCHES AND SLINGS THAT CAN BE DEPENDED UPON

The scaffold hitch is used to prevent the needle beams of suspended scaffolds from turning. The loose end of the rope is secured with a bowline knot.

1. Take two turns around the beam.
2. Bring end "A" forward between turn "B" and "C" then loop "B" over end of beam.
3. Pick up end "C" and adjust taut, tying into "A" with bowline.

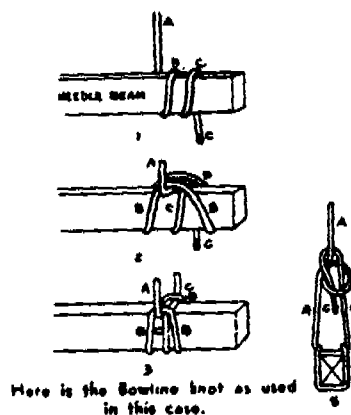


Fig. 11

**SOME ROPE KNOTS AND HITCHES THAT
CAN BE DEPENDED UPON**

1. Bowline—Gives a loop that will not slip under strain, and can be easily untied when strain is released.
2. Running Bowline—Passing long end thru loop makes a good slip knot.
3. Bowline on a Bight—Makes a comfortable emergency sling to sit in.

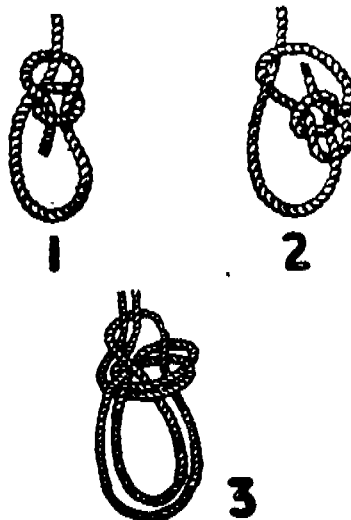
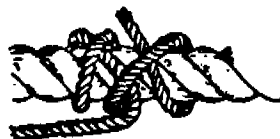


Fig. 12

**SOME ROPE KNOTS AND HITCHES THAT
CAN BE DEPENDED UPON**



Square or Reef Knot
For joining ropes together.



Rolling Hitch
For hauling spar, or large cable.

Clove Hitch
For fasten-
ing staging
to upright,
or in secur-
ing loose
ends.



Wall Knot
To prevent
unstranding,
and to act
as a stopper.

Fig. 13

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**SOME ROPE HITCHES AND SLINGS
THAT CAN BE DEPENDD UPON**

1. Double Blackwall Hitch — For hitching rope to a block for hoisting.
2. Fisherman's Bend—For fastening a rope to a ring or anchor.
3. Sheepshank—For shortening a rope or to pass by a weak spot.
4. Timber Hitch and Half Hitch—For lifting spars. Can be easily loosened when strain is taken off, but will not slip under a pull.

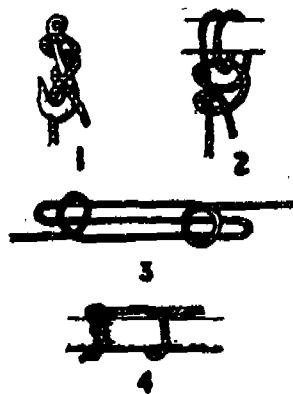


Fig. 14

Safe Working Loads

A short method of obtaining the same working loads of chains, cables, and ropes, is as follows:

Multiply the square of the diameter in eights by K. K. is equal to:

160 for plow steel wire rope

150 for wrought iron short link chain

12 for manila rope.

This applies to a single rope or chain with a straight pull.

Examples:

1" manila rope = 8 eights

8 squared = 64

64×12 = 768 lbs.

$\frac{5}{8}$ " plow steel wire rope = 5 eights

5 squared = 25

160×25 = 4000 lbs.

USEFUL TABLES AND INFORMATION

Eye Splices



Bad Practice

Wire rope knot with clip. Efficiency 50% or less.



Bad Practice — Thimble should be used to increase strength of eye and reduce wear on rope.



Good Practice — Note use of thimble in eye splice.



Good Practice — Use of thimble in eye splice.

Fig. 15

USEFUL TABLES AND INFORMATION

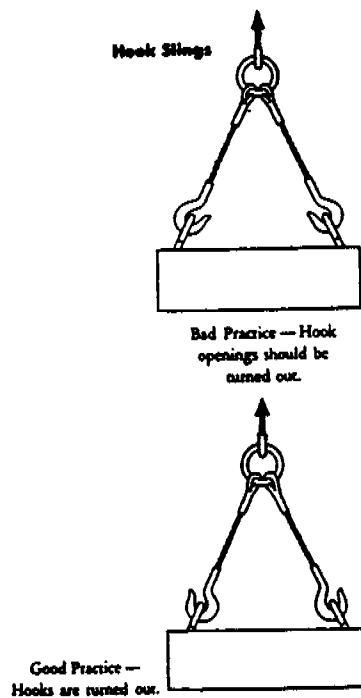


Fig. 16

USEFUL TABLES AND INFORMATION

Fig. 5—Number of Clips Required to Make a Fastening Having 80 per cent of the Strength of 8x19 Plow Steel Wire Rope.

Dia. of Rope Inches	No. of Clips	Space Between Clips Inches	Efficiency of Fastening Per Cent	Length of Wrench Inches
$\frac{3}{4}$	5	$4\frac{1}{2}$	77.39	18
$\frac{7}{8}$	5	$5\frac{1}{4}$	79.13	18
1	5	6	77.89	24
$1\frac{1}{8}$	5	6	80.00	24
$1\frac{1}{4}$	5	6	80.00	24
$1\frac{1}{2}$	6	8	82.15	24

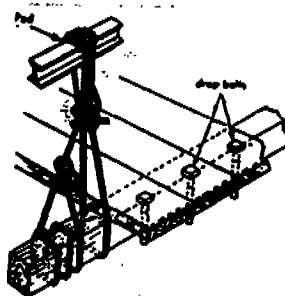


Fig. 19—Needle beam scaffold. Rope $\frac{3}{4}$ in. diameter or equivalent. Needle beams—4 in. x 4 in. or larger. Platform—2 in. thick or heavier, secured by cleats or drop bolts. 2 feet to 3 feet wide. Tie, nail or fasten boards or use drop bolts.

PART II

PRODUCTION
DEPARTMENT A
SAFETY
RULES

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CAUSTIC AREA SAFETY RULES

1. Safety glasses or goggles, safety hat, and respirator should be worn at all times in the Caustic Area. Goggles must be kept on person all the time and should be worn in position when there is any indication that safety glasses are not adequate protection. Goggles may be worn in place of, or in addition to, safety glasses. Caustic Area operators must have rubber safety shoes available on the job at all times and wear them when needed.

2. In case caustic is allowed to come in contact with the skin, wash off immediately with copious amounts of water. In case caustic comes in contact with clothing, the spot affected should be washed with water and kneaded with body wash to be sure all caustic is neutralized before allowing clothing to come into contact with body again. Coveralls are available at First Aid in case contamination of clothes is extensive. In case caustic comes in contact with the eyes, wash the eyes thoroughly with copious amounts of water from a safety shower hose for fifteen minutes, then report to First Aid. **DO NOT** use body wash in the eyes.

3. Protective gloves should be worn at all times where there is danger of caustic coming in contact with the hands.

4. Wash gloves immediately after handling caustic.

5. Rubber gloves should be worn when handling soda ash.

6. The pressure must be bled off hoses before disconnecting.

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7. Hoses with "Boss Fittings" should be used for steam. Hoses with "Kelly" quick opening connections may be used for air and water.

8. All wash-out and steam-out connections should be shut off at the pressure supply and drain opened when not in use to prevent caustic from entering the steam, air, or wash lines.

9. Valves and cocks should be opened or closed slowly to avoid shock on lines, especially transite lines.

10. When operating valves or cocks, keep out of direct line with same, and be on the alert for any spray that might come from the packing or grease fittings.

11. Make reasonable checks to ascertain that all packing glands are tight before operating valves and pumps.

12. Wash the caustic from the floors when spilled.

13. Do not work on any line or vessel until all pressure is released and the tagging completed.

14. When working on plugged lines, stay out of line with the open end.

15. When opening Vallez filters, be sure that the pressure is off and the filter is empty.

16. Do not insert hands or other objects in the body of Vallez filters while the leaf element is rotating.

17. Open by-pass or discharge line before starting Aldrich pump.

18. Do not trap liquid ammonia by closing two block valves on the same line.

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19. Vessels or lines in ammonia service should be emptied, isolated, swept with air and tested with the explosimeter before any maintenance work is started. Explosimeter tests must be run before any weld or cut is made and a new test made before each subsequent weld or cut.

20. All vessels operating with cathodic protection must be purged and checked with explosimeter before any maintenance work is started. Cathodic protection must be cut off before dumping the vessels.

21. Do not use Kelly connections on hoses in natural gas service. Use special gas connections.

22. Spilled mercury should be cleaned from the floor at once. Mercury and mercury vapors are poisonous. Mercury should never be heated. The application of heat increases the vaporization rate, which will make very short periods of exposure extremely dangerous.

23. Sound NH₃ alarm siren to alert personnel in area when there is any sizeable NH₃ leak. NH₃ alarm siren is an interrupted siren to distinguish from Cl₂ siren which is a continuous siren. Leave siren on until atmosphere is clear of gas.

24. Do not allow any part of the body to be exposed to open port on radioactive pot for Gage-tron level inductor at the DH plant.

25. The switch to No. 5 spur must be closed, derail placed in position, locked, and blue "tank car connected" flag must be placed between east end of NH₃ car, and derail before NH₃ car is connected or outlet valve on NH₃ car opened.

26. All safety guards must be in place on equipment before putting into service. Report any de-

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fective or missing safety guards, splash shields, etc.

27. The chlorine siren located at DH plant is actuated by anyone starting siren in liquefaction area. The chlorine siren at "B" salt Bird platform is actuated by anyone starting siren in cell area.

28. During boilout no one should enter vessels until sign at manhole reads "OK to Enter" with the exception of inspecting or entering top of evaporators to perform work. In this case sign over manholes should be reversed to read "Do Not Enter" while anyone is in area above Centrifix platform.

29. Do not leave valve wrenches on valves in such a manner as would tend to open or close valves due to the weight of wrench.

30. Keep valve wrenches off floor, and do not leave wrenches protruding so as to make an obstacle, or in a position that they would create a hazard by falling. Keep valve wrenches on wrench stands when not in use.

31. Know the locations of full face gas masks and how to use them properly.

32. Admit hot fluids and vapors into cold sections of pipe or equipment slowly to prevent hammers and unequal expansion of equipment.

33. Never use broken, cracked, or defective glassware. This should be discarded in the waste cans. Never put unnecessary pressure on glassware.

34. Chipped or broken glassware must never be placed in the sinks. If it gets into sinks accidentally, it should be removed as soon as it is observed.

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35. Extreme care should be exercised when placing sealed bottles under pressure. Seals capable of relieving excess pressure should always be used on bottles under pressure. Be sure bottles are in a wire basket.

36. Pipetting should be done with a suction bulb, never with the mouth.

37. Use bottle racks for carrying more than two sample bottles.

38. Make frequent checks to be sure respirator is in good order. Have full face masks replaced promptly after they have been used.

39. Know the location of fire extinguishers in your area and how to use them.

40. The hot water in the caustic area contains varying amounts of NaOH. Do not use hot water to wash any part of your body or clothes.

41. The plant air in the caustic area frequently contains caustic. Never blow plant air towards any person and never use plant air in such a manner that caustic in the air would create a hazard.

42. Do not isolate or block off any vessel containing liquid NH_3 without being certain that there is ample room for expansion of the liquid.

43. When caustic is diluted with water or with weak caustic solutions, heat is generated. This heat can be generated fast enough to form steam explosively. When adding water or dilute caustic to stronger caustic solutions, the addition should be made slowly and with ample agitation to prevent layers of different strength from forming with the possible hazard of sudden mixing. Exercise much caution anytime water is added to caustic.

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44. When clearing caustic lines in any fashion which may cause sprays, drips or splashing of caustic, as a minimum safety precaution enough personnel will be stationed as guards to prevent anyone from walking into an area in which they may have caustic splashed or drip on them and to prevent anyone from unknowingly walking through puddles of caustic. These guards are to be stationed continuously from before opening lines or drains until wash-up operations are completed.

CHECK LIST FOR BOILOUT TAGGING

The latest appropriate revision of boilout checklist should be used for tagging our evaporators for boilout repairs and inspections. Checklist may be obtained from Caustic Area Supervisor.

ANHYDROUS CAUSTIC SAFETY RULES

1. Do not use mercury thermometer for temperatures over 650°F. The boiling point of mercury is 674°F. and if the thermometer is heated to this temperature is it likely to explode.
2. Do not fill drums with molten caustic when anyone is within 10 feet of unshielded portion of loading platform (north or east side of platform).
3. Anhydrous Operators and Auxiliary Operators must wear long-sleeve shirts with sleeves rolled down while loading and handling drums.
4. Keep floor in operating area free of caustic.
5. Lower lift on trucks as soon as possible after moving molten caustic loaded drums from scales.
6. Caustic drums will not be loaded unless they are dry and free from water and all other foreign material.

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7. Caustic drums will not be loaded until they are placed on pallet so that they will not tip or fall off while moving.

8. Do not rotate the drum loading spout while the loading valve handle is in the "Down" position.

9. Face shields will be worn down at all times when exposed to, or handling molten caustic drums (such as sampling, installing lids, etc.).

10. Safety goggles or face shields should be worn by fork truck drivers when handling drums of molten caustic.

11. The loading pump must be off and loading valve tagged while working in the loading and topping section.

12. When not being used, the control knife switch for the loading pump will be left in the "Off" position.

13. In the immediate area where anhydrous caustic is being poured, steam and water valves will be closed at all times.

14. Do not leave drum loading station while drums are being filled.

15. While Dowtherm itself is not considered highly inflammable or explosive, Dowtherm does decompose at high temperatures to form Benzene. Dowtherm droplets dispersed in an air mixture can form explosive mixtures. Therefore, open fires and smoking should be avoided in vicinities of Dowtherm leaks or vapors. Equipment or piping containing Dowtherm should be steam-cleaned and checked before cutting or welding is permitted.

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16. Dowtherm is not toxic but will cause headache if concentrated fumes are breathed over a long period.

17. In case of tube failure in the Dowtherm unit, kill the fires as soon as possible. Dowtherm will burn at high temperatures—similar to kerosene—or the liquid will burn if supplied with a wick.

18. Cut off the towmotor engine while filling tank with gasoline.

19. All rules for lift trucks in General Section of manual should be observed by anhydrous caustic area lift truck drivers.

20. When caustic is diluted with water, heat is generated. This heat can be generated fast enough to form steam explosively and especially when water is added to anhydrous caustic. Extreme care should always be used to prevent water from being added to caustic in such a manner that explosive generation of steam would occur or that would cause caustic to spatter on anyone.

21. Caustic Soda, when contacted with steel, causes an evolution of hydrogen which, when mixed with air, can cause an explosive mixture. No open flames should be allowed around loaded drums, vessels, or storage tanks.

CELL ROOM SAFETY (Operators)

1. Rubber shoes, rubber gloves, and plastic hats must be worn by anyone coming in physical contact with the cells. Do not wear leaking shoes or gloves.

2. Each person working in the Cell Area should have a pair of chemical goggles in his possession.

HAVE YOU ASKED FOR J. S. I?

The goggles should be worn when engaged in work which may involve splashing of corrosive liquids.

3. Be on the alert for chlorine gas in the cell rooms at all times. Have a respirator on the body at all times. Check your respirator often. Know how to use a respirator properly.

4. Know the locations of full face gas masks and how to use them properly. In case of a chlorine gas break, sound the chlorine alarm and leave it on until the atmosphere is clear of the gas.

5. Smoking is forbidden in the cell rooms.

6. Extinguish a hydrogen fire with carbon dioxide or some other means of smothering it. Know the locations of the fire extinguishers in the cell rooms and how to use them.

7. In an emergency, the cell circuit load should be immediately dropped by tripping the cathode breaker at the cell bridge. This switch should be left in the "trip" position. Next, the anode breakers at the rectifiers should be opened and tagged until the emergency has been cleared. Before bringing the circuit back on, the operator must clear with the cell bridge and have the trip switch returned to the normal position. Check with the cell rooms before bringing the circuit on after any kick-off.

8. A supervisor, lead operator, cell operator or cell tender must check the connections before a cell jumper switch is opened or closed.

9. Operating personnel must tag the header pressure controller when an abnormal vacuum or pressure is desired on the header.

10. When necessary to change several brine feed tubes on a circuit, obtain a vacuum on the circuit before beginning work.

HAVE YOU ASKED FOR J. S. L?

11. When connecting cell hoses to the brine headers, or when other work is being done on the brine headers, shut the brine off the section of the cell circuit involved and obtain a vacuum on the circuit.

12. Stopper the hydrogen header securely when the hydrogen glass is removed. Use only a T-handle rubber stopper for this purpose.

13. No tool over twenty-four inches long shall be brought into the cell rooms.

14. All glassware (sight glasses, hydrogen glasses, orifice tubes and dog legs) are subject to corrosion and should be handled with extreme caution. Glassware should be discarded when cracked, jagged, or dangerously thin. Protect hands with a rag or some other material when working with glass that is likely to break.

15. Do not run in the cell rooms. Walk with care.

16. If splashed with cell liquor, wash first with water and then apply body wash (a 10% solution of ammonium chloride) to neutralize any small quantities of remaining caustic.

17. When a cell is cut out, either routine or emergency, remove connections on hydrogen and chlorine between cell and header and stopper headers as soon as possible.

CELL RENEWAL SAFETY RULES

1. Rubber shoes or boots, rubber gloves, and plastic hats must be worn by anyone coming in physical contact with the cells. Do not wear leaking shoes or gloves.

HAVE YOU ASKED FOR J. S. L?

2. Two men shall work together when connecting or disconnecting a jumper-switch to a cell and when removing or replacing the back cell connector plates.

3. When connecting a cell jumper switch, each cell cut-out man shall have the following equipment with him:

- (a) One steel wire brush
- (b) One putty knife
- (c) One ratchet wrench with $\frac{3}{4}$ " drive
- (d) One 1 $\frac{11}{16}$ " socket (for circuit 6 only)
- (e) One 1 $\frac{7}{8}$ " socket

4. Each cell cut-out crew shall have the following tools available in addition to those carried by each man:

- (a) One non-sparking hammer
- (b) One pipe wrench (not over 24")
- (c) Sandpaper or emery cloth

5. Place the plywood shield across the aisle from cell being renewed before beginning work on cell. When the cell cut-out is completed, the plywood shield must be placed on the hangers, or securely blocked against a hydrogen pipe support.

6. A hot cell is a cell in which the brine temperature is nearing the boiling point of 220°F. or higher. If the brine boils, the steam produced may cause the cell top to lift. Hot brine then cascades out and may splash anyone standing close to the cell. Regard 218°F. as the maximum safe temperature. A detailed procedure for hot cells is a part of the area operating instructions.

HAVE YOU ASKED FOR J. S. L?

7. Always lock the cell jumper-switch in the desired position.

8. Check that the jumper-switch is locked "open" before moving the buggy into position and connecting it to the cell. The jumper-switch should be locked "closed" only when the cell is cut-out.

9. Do not open or close any cell jumper-switch until the connections have been checked by either a supervisor, lead operator, cell operator or cell tender.

10. All tools used by cell renewal and over 18-inches long shall be insulated at one end. These tools must be checked periodically by a cell room supervisor. Any break in the insulation shall be reported to the supervisor immediately. No metal tool over 24-inches long shall be permitted in the cell room.

11. Use only the proper tool for a given job.

(a) Hammer only with a hammer.

(b) Use a striking-face wrench when necessary to hammer a wrench.

(c) Have a proper size socket for all bolts. Replace sockets that are worn to the point of slipping.

(d) Report any unsafe tool to a cell room supervisor.

12. Use only a non-sparking hammer when necessary to hammer hydrogen ells and nipples on "live" cells or hydrogen header.

13. Do not replace the back cell connector plates until the renewed cell has been cut-in and the jumper-switch moved out of the way.

HAVE YOU ASKED FOR J. S. L?

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14. On circuits 5 and 6 do not walk between a cell-connection jumper-switch and the cell back of the switch. Climb between the cells or walk around the end of the bank.

15. Do not leave any connection partially made up. All connections must be tight and complete. Contact surfaces must be clean.

16. Do not place any equipment on the anode lugs or the cell in back of a cell being renewed.

17. Do not, at any time, reach across the aisle from one cell to another, or in any way make contact across the aisle from one cell to another.

18. When a cell has been cut out for a period of over eight hours, follow this procedure: (1) Check buggy connections, (2) Drain cell of all cell liquor and brine, (3) Remove front connector plates.

19. Do not stand under any crane load. Do not leave crane load suspended.

20. Do not leave debris or cell putty on cell room floor. Remove debris and wash down area after removing a cell for renewal.

21. Do not leave glassware in cell parts carrier. Discard all broken or worn glassware and return hydrogen glasses to the cell bridge.

22. Stopper the hydrogen header outlet securely when removing the hydrogen glass to renew a cell. Use only a T-handle rubber stopper for this purpose.

23. When a vacuum on the chlorine header is desired by the cut-out crew for the purpose of removing or replacing a cell dog-leg, the cell re-

HAVE YOU ASKED FOR J. S. L?

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newal man's tag must be placed on the chlorine header pressure controller, and then removed when the job is completed. Do not attempt to remove or replace a cell dogleg until a vacuum on the chlorine header is indicated by the nearest header manometer.

24. Be on the alert for chlorine gas in the cell rooms at all times. Have a respirator on the body at all times. Check your respirator often and know how to use one properly.

25. On a cell circuit shutdown for the purpose of an emergency cell cut-out or jumper-switch removal, the circuit firing switch shall be tagged by the lead operator and the cell renewal supervisor. Do not begin work on a cell involving a cell circuit shutdown until told to do so by the cell renewal supervisor.

26. Smoking is forbidden in the cell rooms. Open lights are forbidden in the cell rooms without permission of the Cell Engineer.

27. Do not run in the Cell Rooms. Walk with care.

28. On circuits with jumper buggy monorails, place copper connectors on floor in position by the cell to be renewed before moving the jumper-switch into position behind the cell.

29. Work safely and without too much haste. Take no short-cuts that might create a hazard.

30. Do not cross over a cell circuit with the crane block. Cross the circuit at the middle aisle only.

31. Do not hide tools or place any materials in the cell jumper-switch.

HAVE YOU ASKED FOR J. S. I?

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32. Stopper the chlorine header securely when the dogleg is removed.

33. Do not use bus bars to heat lunch buckets.

34. Do not raise or lower perc pipe or remove brine feed from an operating cell without permission of operating personnel.

35. The cooling system and part of the drying system is made of Haveg or other plastic pipe. This material is fragile and will not support much weight or impact. Do not step or walk on Haveg or other plastic pipe. Do not allow heavy objects to rest or fall against Haveg or other plastic pipe.

36. When maintenance work is done on top of the cells or Haveg headers, etc., the cell room cranes will be tagged out when practical. When impractical to tag out the cranes, maintenance workers will hang their personal tags on the crane pushbutton switch, of both cranes, to alert crane operators of their being on top of the cells or headers.

CELL RENEWAL SHOP

1. Fork Trucks

(a) Do not drive without permission from your supervisor.

(b) Operator should test the horn and brakes, lift and tilt, each morning before bringing the truck down from the Battery Shop.

(c) Stop at all intersections, sound horn, look and make sure everything is clear before traveling on.

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(d) When something is wrong with a fork truck, hang a sign on truck "Needs Repairing" and notify foreman at once.

(e) Do not overload trucks.

(f) Drive carefully in hazardous areas such as center of cell buildings where chlorine Haves header drops through floor, also on wet floors and rampways. Fork lift traffic is not permitted in the north-south aiseways.

(g) Use steel manlift with handrails when working overhead.

(h) Travel backwards down rampways with a load.

2. Horseplay of any nature will not be tolerated.

3. Face shields should be worn on the following jobs: cathode washing, acid baths, diaphragm depositing, tinning, melting and pouring lead for anodes, melting and dipping mastic and buffing copper parts.

4. Food heating on or near tin and lead pot will not be allowed due to the possibility of food poisoning.

5. Adequate clothing should be worn for all jobs. Shirts with the sleeves rolled down should be worn when depositing diaphragms to protect against cell liquor burns. When working around the lead, tin, and mastic pots, shirt sleeves must be rolled down.

6. Rubber pants and rubber acid gloves and face shields should be worn when handling copper parts in acid baths.

7. Respirators should be worn when sanding or buffing copper parts.

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8. When dipping copper into tinning bath, be sure that everyone within splashing distance of the tin pot has been warned.

9. Be sure that all scrap lead is dry before dipping it into the lead pot. Wet lead is sure to cause a splash.

10. When skimming or stirring either the lead pot or the tin pot, be sure that the tools have been heated before putting them into the hot metal. Cold iron tools will always cause a splash when placed in molten lead or tin.

11. Always heat the anode lead mold with the hand burner before pouring the first anode lead each day. Hot lead coming in contact with a cold or wet mold is almost sure to splash.

12. Do not work under objects suspended by cranes. When moving loads with the crane or hoists, be sure that everyone is in the clear. Do not leave a crane load suspended.

13. When pouring mastic, do not let the temperature go above 600°F. The flash point is 608°F and at this temperature, it will probably start burning when being poured.

14. Always cool hot copper anode bars with water before dipping into the acid baths to avoid making acid fumes and splashing.

15. Never hold the carbon blades with the hands when operating the carbon cutting punch. Both hands should be on safety push buttons.

16. Never use wrenches for hammers. They are not the proper tool for hammering. This usually causes accidents as well as damages the wrenches.

NOTE: Use the proper tool for a given job.

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17. Due to the number and variety of operations being conducted in the cell repair area, it is necessary for everyone to consider the men working nearby and guard against injuries resulting from flying objects.

18. Because of wet floors and wearing of rubber shoes, there is considerable danger of slipping in the Cell Repair Shop. Walk, do not run.

19. Always wash hands thoroughly with soap and water before eating.

20. Hot sticks should be used for adjusting electrical shoes on shop cranes.

21. Wear safety hat, glasses and respirator at all times in cell repair.

22. When it is necessary to work on any piece of machinery, such as the concrete mixer, notify the cell repair foreman. This piece of machinery will be tagged out before being worked on.

23. Do not leave any connections partially made up. Be sure all connections on anodes are sanded and tight before going into cell rooms.

24. (a) Do not leave debris or cell putty on cell repair room floor. Keep things like this off the floor.

(b) Housekeeping is the individual's responsibility.

25. Be on the alert for chlorine gas in the cell rooms and cell repair shop at all times. Have a respirator on the body at all times. Check your respirator often. Know how to use a respirator properly.

26. Do not sacrifice safety for speed. Take no short-cuts that might create a hazard.

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27. When using air hoses or air-driven tools such as vibrators, be sure that the Kelly fitting at the shut-off valve is securely wired.

28. Do not point an air hose at any person, or use it to brush clothing.

29. Always bleed pressure off water, air, or steam hoses before connecting.

30. Do not wear gloves when using the putty extruder.

31. Do not walk under mixer scoop while scoop is in the raised position.

32. Use safety stands under the modified copper N-1 cathodes, while washing in cathode wash-room.

CHLORINE COOLING AND DRYING

1. The cooling system and part of the drying system is made of Haveg or other plastic pipe. This material is fragile and will not support much weight or impact.

(a) Do not step or walk on Haveg or other plastic pipe.

(b) Do not allow heavy objects to rest on or fall against Haveg or other plastic pipe.

2. Check that all blow seals, drain seals, and scrubber gooseneck overflows have sufficient water to maintain a seal. This is especially important if there has been a shutdown of any of this equipment.

3. Be on the alert for leaks or breaks in any of the Haveg or other plastic pipe and either repair the leak or notify a supervisor.

4. When around the drying towers, be on the alert for possible drips or fine sprays of sulfuric acid.

HAVE YOU ASKED FOR J. S. I?

5. Do not step in puddles on the floor, it might be acid.

6. Be sure that your safety glasses are protecting your eyes and have in mind the location of the safety showers.

7. In case acid is sprayed on your clothes or skin, do not become excited, but wash it off immediately. Sulfuric acid will not burn the skin if washed off at once.

8. In case of any acid spray, shut down the operating equipment involved from the switch room.

9. Always tag out any equipment that you have shut down for repairs and be sure that all tags have been properly removed from equipment that is being returned to service after repairs.

10. When starting up a sulfuric acid pump, always open the discharge valve first, then start the pump and last, slowly open the suction valve. Be on the alert for packing or valve leaks and be sure that shields are covering all flexible pipe connections.

Where two pumps are in the same service and one is running, to start the other pump, open the discharge valve slowly on the idle pump to check for leaks before starting.

11. Always hose off any acid that has been spilled or run out on the floor or equipment.

12. When starting the chlorine blower, always open the steam exhaust valve first, before opening up the 400 pound steam intake valve. This is to prevent blowing up the turbine.

13. When shutting down the blower, always close the 400 pound steam inlet valve first and

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then the steam exhaust valve. Then open, and leave open, the drain valve to insure no build-up on turbine.

14. Use the emergency phone only in case of emergency—except for checking once per shift.

LIQUEFACTION AREA SAFETY RULES

1. Safety glasses, hat and respirator are to be worn at all times. Safety goggles are to be worn over the eyes if a sufficient hazard exists to warrant their use (e.g., switching sniff pumps).

2. The alarm should be sounded at any time there is chlorine or ammonia escaping in the area. Know the location of chlorine alarm push buttons, gas masks and how to properly use them and fire fighting equipment.

3. When operations make it necessary to remain in an area where there is a detectable amount of chlorine or ammonia for more than two or three minutes, suitable protection should be worn. Even the least detectable amount will irritate the eyes, nose and throat if the exposure time is extended.

4. Know the location of the nearest safety shower when working around sulphuric acid. Sulphuric acid transfers to the Cell Area should be made after 4:00 P.M. and before dark on evening shift.

5. Use the emergency phone only in case of emergency—except for checking once per shift.

6. The cell room lead operator or supervisor should be notified in advance of any operational changes that might affect the cell header pressure.

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7. The lead loaders should be notified before making changes to the sniff or blow-down system, except for the routine use of the manifold.

8. The service mechanics (electricians) must not change the bus ties without consulting the lead operator.

9. Extreme care is to be exercised in the operation of valves and cocks:

(a) Open or close slowly to prevent hammering of lines.

(b) When extreme difficulty is encountered in opening or closing valves or cocks, steps to free same should be taken before applying undue pressure with "cheater" or wrench.

(c) Extreme care is to be exercised in the operation of cocks and valves connected to transite lines. An excessive shock will burst the line or blow a gasket.

10. All protective equipment, including face shield, should be worn while acid washing the carbonating tower. The area around the tower should be roped off to prevent personnel from entering the area while acid washing.

11. Bleed the pressure off all steam, air, and water hoses before disconnecting.

12. Bleed condensate from air or steam lines before connecting hoses.

13. When taking sniff or high pressure gas samples, the inlet and outlet cocks on the burette must be open.

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14. When igniting hydrogen in the Orsat apparatus, transfer only enough gas to the measuring burette to lower liquid level below the wire for the first ignition. Then transfer 10 ml. at a time for each subsequent ignition. Larger volumes will cause burette to explode when ignited.

15. When gunk samples are taken, warn anyone that might be in the area.

16. Spilled mercury should be cleaned from the laboratory at once. Mercury and mercury vapors are poisonous. Mercury should never be heated. The application of heat increases the vaporization rate which will make very short periods of exposure extremely dangerous.

17. Gunk contains large quantities of various skin irritants. Protective equipment should be used to prevent direct contact with the skin. In case direct contact is made, wash as soon as possible with soap and water.

18. Freon is a tasteless, non-toxic, and almost odorless gas at atmospheric temperature and pressure. It should be handled in well-ventilated places since large concentrations will cause suffocation. Freon should not be exposed to hot surfaces or flames since it will decompose into many toxic compounds such as: chlorine, hydrogen chloride, fluorine, hydrogen fluoride and phosgene.

19. Sodium dichromate, which is added to the calcium chloride brine, is toxic and is especially dangerous to the eyes. Protective equipment must be worn when there is danger of direct contact. Wash with soap and water immediately if contact is made.

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20. Any sulfuric acid leak around the storage tanks, lines, pumps, or sniff system should be corrected immediately and reported to the supervisor.

21. All acid tanks and lines should be washed and tested with explosimeter before any maintenance work is done.

22. All chlorine, NH_3 , and freon lines should be swept with air before any welding or cutting operations.

23. The lead operator will direct all testing for leaks in vessels, lines and equipment after maintenance work is completed.

24. Do not close both ends of a line containing liquid chlorine, liquid ammonia, or liquid freon unless adequate expansion space is provided.

25. Do not fill any vessel with liquid chlorine, liquid ammonia, or liquid freon in excess of the stated capacity.

26. All electrical wires must be treated as live wires in service until proven otherwise. A hot stick should always be used to pull and close fuses on compression equipment switch gear. A faulty hot stick should be reported immediately to the foreman.

27. Discard any broken lab equipment.

28. Warm up any steam line or turbine slowly to prevent water hammer.

29. Never operate the sniff acid separator with level above the top sample point. High level causes carry-over into sniff line to Powerhouse.

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30. Any time that the sniff system is employed to facilitate work on open vessels, notify other areas on the sniff system and explain the hazards of the condition.

31. Avoid mixing acetone and all organic compounds with chlorine, a reaction of explosive violence will occur.

32. Do not allow oil to come into contact with turbine or 400 lb. steam line due to danger of flash fire.

33. Never attempt to operate a positive displacement compressor with liquid in the cylinder. Should you experience liquid carry-over into the compressor suction, correct the situation immediately or shut the machine down.

34. In case of high concentrations of ammonia in the atmosphere, extinguish all fires and do not start any electrical equipment in the vicinity.

35. A supervisor must be present when any liquid chlorine line is to be unflanged or otherwise opened. Extreme caution must be exercised to insure that the unflanging or opening can be controlled at all times until it is determined that the line is evacuated of liquid or gas.

36. Avoid contact with oil from the ammonia oil still. Ammonia dissolved in this oil will cause skin irritation.

37. In case of a high concentration of ammonia or chlorine in the Compressor Building, shut down the plant air compressor.

38. When the hydrogen system will be switched around, immediately remove all personnel from

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condenser platform and block all entrances to platform with a chain and properly labeled sign.

39. Housekeeping is the responsibility of each man. A clean place is a safe place.

SPECIAL AREA MAINTENANCE RULES

1. All new or newly retubed condensers and new piping must be thoroughly cleaned of oil and grease before being placed in chlorine service.

2. A supervisor's permission must be obtained before cutting or welding on a chlorine line.

3. When lubricating plug cocks in chlorine service, use only the approved lubricants. Make certain that original seal lubricant is flushed out of a new cock prior to installation in chlorine service.

4. Apply "Hydrogen Area" safety rules to hydrogen lines routed through the Liquefaction Area.

SAFETY RULES—SODIUM CHLORATE PLANT

The unique safety precautions required in the sodium chlorate area are due to the physical properties of sodium chlorate.

Sodium chlorate is a stable compound which causes no trouble when handled properly. It does not burn, but as a strong oxidizing agent supplies oxygen for the burning of combustible materials. It must be kept away from combustible materials, particularly the clothing of personnel, rags, oil, paper, wood, paint, finely divided metal, etc.

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Special regulations established for the sodium chlorate plant are for your protection. Observe them carefully!

Do not add acid to monover solution. Poisonous hydrogen cyanide gas will evolve.

Sodium Chlorate Area Safety Rules

Like any other chemical, sodium chlorate can be handled, stored and used safely provided its physical, chemical and hazardous properties are fully understood and the necessary precautions are observed. Sodium chlorate is a powerful oxidizing agent and will support combustion, but in dry or solution form will not burn nor can it be made to burn. However, if heated above its melting point (478°F.) it will decompose and release oxygen gas. Combined with any combustible material, sodium chlorate constitutes a highly flammable mixture that can be ignited by means of friction, sparks, welding torches, lighted cigarettes, or other ignition sources. For example, rags impregnated with chlorate solution and allowed to dry present an ideal set of conditions for burning. It must be understood that some substances not normally considered combustible will burn readily when supplied oxygen from sodium chlorate. These include finely divided metals or mesh of aluminum, iron, copper, etc.

Other materials which will either burn slowly or not at all, under normal conditions, burn readily in sodium chloride. As a rough guide, any material which can be burned with an oxyacetylene torch should be considered as combustible in sodium chlorate under the proper conditions. Some of these combustions are so rapid as to be classed as explosions.

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The following safe practices should be carefully observed at all times:

1. (a) Special clothing and rubber overshoes will be worn by all operating and maintenance personnel working on equipment in the sodium chlorate building — with the exceptions of the rectifier room and motor control room. Operators can wear their personal rubber safety shoes if they are not worn out of the area.
- (b) Any coveralls splashed with sodium chlorate, or covered with sodium chlorate dust, must be removed immediately.
- (c) Personal underclothing should not protrude beyond sodium chlorate coveralls. Care should be observed to insure frequent washing of any personal clothing worn in the chlorate area. This will prevent chlorate build-up and avoid unnecessary hazards. Any such clothing visibly contaminated with chlorate liquor or dust should be removed immediately and washed in water before re-use.
- (d) All personnel entering the sodium chlorate operating area will wear the special overshoes provided. Special care should be taken to cover tops of overshoes with the coverall legs when there is a chance of spilling liquor or crystals into the overshoes.
- (e) Rubber gloves shall be worn when performing work on operating cells. Plastic or rubber gloves shall be worn in other areas of the plant. All gloves must be thoroughly washed with water after contact with chlorate.

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(f) Electric tools shall not be used when performing work on operating cells.

2. Smoking will not be allowed in the sodium chlorate building except in the control room and the office. Employees should not smoke while wearing clothing which is visibly contaminated by chlorate.

3. Special colored wiping rags shall be used in the chlorate plant. These rags are not to be removed from the area.

4. Welding, cutting, grinding, or any operation of this nature, will not be allowed in this area unless proper written permit has been obtained from the area supervisor.

5. CO₂ and dry chemical extinguishers are available for electrical fires. They are not effective on chlorate fires, only water should be used on chlorate fires. There are two firehose stations each containing 100 ft. of hose for use in extinguishing chlorate fires. Well water from the utility outlets is also available. There are numerous 10 lb. steam outlets throughout the cell area for extinguishing hydrogen fires.

6. If sodium chlorate should come in contact with either the eyes or any other part of your body, wash immediately with large amounts of water. There will be no body wash used in the chlorate area.

7. Ladders used in the chlorate area are to be constructed of metal or fiberglass. No metal ladders will be used in the cell room while the circuit is on the line.

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8. Other chemicals used in the area are HCl, 50% caustic, sulphuric acid and sodium dichromate.

SAFETY FOR THE IPP AREA

1. General

Because of the nature of this operation and the chemicals involved, the IPP area is restricted to authorized personnel only.

Vehicles will be allowed only in the area between the fence and the east end of the storage building.

Although there is an enclosed office in the process building, this office is not pressurized to prevent accumulation of vapors inside and consequently the IPP area is a No Smoking area throughout.

2. Chemicals in the IPP Area

All chemical materials used in the IPP area as raw materials, products or treating materials are listed below:

- (a) Hydrogen peroxide: H_2O_2
- (b) Caustic soda: NaOH
- (c) Isopropyl Chloroformate: IPCF
- (d) Benzene: C_6H_6
- (e) Cyclohexane: C_6H_{12}
- (f) Sodium peroxide: Na_2O_2
- (g) Isopropyl Percarbonate: IPP
- (h) Sodium sulfate: Na_2SO_4
- (i) Calcium chloride: $CaCl_2$
- (j) Sulfuric acid: H_2SO_4

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- (k) Acetone: CH_3COCH_3 .
- (l) Muriatic acid. HCl

3. Safety Rules

The following rules are applicable to the IPP area:

- (a) Personnel entering the area will deposit lighters, matches, ordinary flashlights or any other spark producing device at the entrance to the fenced area.
- (b) Smoking inside the fenced area is not permitted.
- (c) Vehicles will be allowed only in the area between the fence and the east of the storage building without a permit.
- (d) An equipment permit signed by the supervisor will be required before the following equipment can be carried into the IPP area:
 - (1) Welding machines
 - (2) Cutting torches
 - (3) Electrically driven hand tools
 - (4) Any other electrical equipment.
- (e) Only explosion-proof flashlights will be permitted in the IPP area.
- (f) All lighting circuits except in the electrical switch gearhouse must be off and tagged out before relamping of the area. This applies to lights in walk-in freezers as well.
- (g) If it becomes necessary to dump organic liquids into the drains, be sure to wash

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them down with plenty of water to wash the liquid out of the traps.

- (h) Do not leave containers of organic liquids open.
- (i) Use a self-contained breathing mask when it is necessary to work in an area of heavy organic vapors.
- (j) If benzene, hydrogen peroxide, IPCF, IPP, or IPP in solution is spilled on clothing, remove the clothing as soon as possible and wash the body with soap and water.
- (k) The vent gas blower should be operated continuously.
- (l) Remember to keep IPP as cold as possible at all times and to agitate warm IPP when practical.
- (m) Never put warm IPP into storage with other IPP.
- (n) Do not remove any explosive proof electrical covers unless the power is off and the circuit tagged.
- (o) Always check the walk-in freezers before leaving the IPP plant.
Be certain that:
 - (1) Defrost switch is in off position.
 - (2) Compressor switch is in on position.

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4. Cleaning of Tanks and Process Vessels

The area supervisor and maintenance supervisor will see that all vessels or tanks are cleaned and checked with an explosion meter before declaring them suitable for maintenance.

- (a) The tank or vessel will be emptied and all valves will be closed and tagged.
- (b) The vapor contents of the tank will be purged with an inert gas.
- (c) Blinds will be inserted in all inlet lines.
- (d) The equipment will be steam purged where possible to vaporize and remove all flammable materials. If steam cannot be used, an inert gas will be used.
- (e) Purge equipment with plenty of air.
- (f) The equipment will then be checked with an explosion meter before work is begun.

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