Safety in the School Shop

Hubert Dupin
Western Kentucky University

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Dupin,
Hubert W.
1945
SAFETY IN THE SCHOOL SHOP

BY

HUBERT W. DUPIN

A THESIS
SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

WESTERN KENTUCKY STATE TEACHERS COLLEGE

AUGUST, 1945
Approved:

Major Professor and
Department of Education

Minor Professor, Industrial Arts

Graduate Committee, Chairman

6/21/91
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Margie Kathryn Dupin.
Copies May Not Film Well!
CHAPTER I
INTRODUCTION

Safety has long been an important problem in the living together of organized society groups, yet at no time in the history of the school has there been a greater need for an extended effort in the safety program of our school shop.

The school shop is the source from which a group of well defined safety principles should emerge. Along with this group of principles should come a group of boys and girls who are trained to take their places in various industrial groups.

Industry is demanding that schools train students in safety measures which will be effective, for under the pressure of war, there has been a tendency on the part of teachers to neglect many safety rules that would ordinarily be rigidly adhered to under normal conditions.

Due to the expansion in the shop program in recent years, there have been some unsafe conditions created in our school shops which are not the fault of the teachers. The conditions to which I am referring are overcrowding and the use of buildings unsuited for shops. It is true that school officials might remedy some of these conditions which exist if they would only sense the need for improvement of the environmental working conditions. Some improvements which could be effected by the administrative officials of the school are, illumination, heating, ventilation, working space, floor coverings, and floors.

If we are to attain a relatively high state of perfection in the shop safety program, there must be a united cooperative effort on the part of everyone concerned to eliminate any condition which might cause the work
of the student to be hazardous. To eliminate such hazards may take extra money, hard work by the teacher, and extra effort by the supervisory and the administrative staff. However, it will pay dividends in the long run as safe working conditions that will protect the child from the loss of a limb or some other injury which will leave him handicapped for life. A great industrial arts educator once said, "I would rather a boy would live in ignorance the rest of his life than to see him maimed by something in the work shop."¹

The time has apparently come when the shop instructor must consciously undertake the formulation of a definite safety program which he can carry out in his own shop, which will function not only within the school but carry over into the students' lives outside the school.

Purpose of Study

The purpose of this study is to locate some of the existing problems of safety in the shop and remedy them by furnishing some means that the teacher may use in presenting a safety program in the school shop. Too many shop teachers have not realized the importance of safety, therefore, they have not organized their program on a safe basis.

¹ Statement made by the late R. W. Selvidge.
 CHAPTER II  
LIABILITY FOR ACCIDENTS  

There has been a growing tendency toward "suit consciousness" among victims of accidents. School districts, school boards, and individual teachers are being sued with increasing frequency by parents and injured pupils. In cases of a suit against a school district or board, the blame usually in the final decision rests on the teacher as he is the one hired by the board to carry out instructions. To be able to collect for any damage done it is necessary to prove that inadequate instruction was given or that the teacher was at fault through some other neglects such as leaving the room when some dangerous operation was in process.  

There are many states where suits may be entertained concerning accidents occurring in the school shops. However, in most cases lack of proof against teachers resulted in a decision in their favor. Proof of this is shown in many court records of various states where the school authorities have been sued for damages as a result of injuries received in the school shop. Some specific cases are given in Teachers Liability for Pupil Injuries published by the National Education Association.  

There are a few abstract principles on which negligent behavior of the teacher is determined.

1. It is not properly done; appropriate care is not employed by actor.

2. The circumstances under which it is done create risks, although it is done with due care and precaution.

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1 Safety Education in the School Shop (National Safety Council Inc., Chicago, Ill., 1944).

3. The actor is indulging in acts which involve an unreasonable risk of direct and immediate harm to others.

4. The actor sets in motion a force, the continuance operation of which may be unreasonably hazardous to others.

5. He creates a situation which is unreasonably dangerous to others because of the likelihood of the action of third persons as of inanimate forces.

6. He entrusts dangerous devices or instrumentalities to persons who are incompetent to use or care properly for such instruments.

7. He neglects a duty of control over third persons who by reason of some incapacity or abnormality he knows to be likely to inflict intended harm upon others.

8. He fails to employ due care or give adequate warning.

9. He fails to exercise the proper care in looking out for persons whom he reasons to believe may be in the danger zone.

10. He fails to employ appropriate skill to perform acts undertaken.

11. He fails to make adequate preparation to avoid harm to others before entering in certain conduct where such preparation is reasonably necessary.

12. He fails to inspect and repair all instrumentalities or mechanical devices used by others.

13. His conduct prevents a third person from assisting persons imperiled through no fault of the actor.

14. His written or spoken word creates negligent misrepresentations.

Although few of the above types of negligences appear to be outside the scope of the public school teachers likely conduct, it is easy to imagine situations arising in the ordinary schoolday life which might
involve most of the types of negligences as defined.\(^3\) The outline shows some of the many possibilities which the prudent teacher must take into consideration in planning and putting into operation a school shop safety program.

As a result of the feeling that school boards or individual teachers are liable for many accidents occurring while the child is in their care, several states have taken out insurance to protect themselves against damage suits which sometimes result in a great loss to the school board or individual teacher. There has been many insurances for the individual teacher. Many of these insurance policies have exemption clauses which really narrow the protection to the point where it is almost nullified by such exemptions, therefore, any teachers attempting to protect themselves by individual liability insurance should do well to seek the advice of the state insurance commissioners.

A. W. Horning in a survey made in 1936 based upon reports from 160 teachers 45 per cent were in favor of shop liability insurance. Although 45 per cent were in favor of insurance carried, by school board only 3 per cent were doing this.\(^4\)

In the same report there were sixteen schools sued for damage and in one instance the school dismantled the power driven machinery leaving the shop without all of its modern devices.\(^5\)

In studying plans and procedures of various states for liability

---

\(^3\) Teachers Liability or Pupil Injuries (Washington, D. C.: National Education Association, 1940).


\(^5\) Ibid.
insurance, I have found that it is the general consensus of opinion of most persons that are connected with the shop program that there should be some liability protection for the board of education and the individual teacher.

Moral liability for shop accidents.-- While the preceding discussion has stressed the legal side of the situation which has developed in connection with accidents in school shops, there is a need to recognize that even in the absence of legal liability the school and teacher have a moral liability. It is better that the student receive no shop training if the teacher does not assume the proper attitude toward safety.

Other Means of Reducing Liability

Permits, safety-first cards, proficiency cards, and safety certificates serve as a protection to both teacher and student. In many cases permits from parents to school officials, stating that their child may use the machines of the shop, have been the only protection the teacher had in court when sued for damage resulting from an accident in the school shop. Therefore, it is conclusive evidence that permits are very valuable in protecting the school officials. We must not, however, put all the emphasis on the value to the school officials since the pupil can also be benefited greatly by the use of different types of permits. The permits should be granted to the pupil after he has proven his proficiency on the machines he is to use by passing tests in the operation of the machine as well as a knowledge test covering the care, use, and safety precautions to be observed in the operation of such machines.

The permit that follows is recommended as a means of securing the parents consent for a pupil to use the machinery in the school shop.
Permit To Use Machinery

This certifies that I give my permission for ____________________________ to use the machinery in the Industrial Arts Department of the ________ Public Schools during the school year of ________ to ________ and that I will not hold the Board of Education or anyone connected with the school, City of ______________________ responsible should an accident occur to the child mentioned above.

Signed:

_________________________________ Father

_________________________________ Mother

_________________________________ Guardian

Date ________________________________

There are many different types of permits in use. The one that follows is used in Seattle, Washington, and points directly to the improvement of safety. 6

SEATTLE PUBLIC SCHOOLS
Department of Industrial Arts
SAFETY FIRST

Seattle, Washington ________ 194

Mr. ___________________________

_________________________________

Your son ________________________ wishes to work in the school ________

________________________ shop. In this shop are the following power driven

6 Department of Industrial Arts, Seattle Public Schools, Seattle, Washington.
This shop is in charge of an experienced instructor and mechanic. Every precaution is taken to prevent accidents. Your approval and cooperation is sought in order to impress upon every boy the importance of being careful. No boy will be permitted to work on the machines without the written consent of his parents or guardian.

______________________________  Principal

To the Principal

______________________________

Parent or Guardian sign here

An additional aid is the safety first pledge signed by the pupil. The signing of a safety first pledge does not relieve the teacher of any responsibility or reliability but will serve as a reminder to the student of his obligation in observing all safety measures. Drago reports that the safety first pledge is used in Rock Springs High School. A copy of this pledge appears on the following page.7

---

SAFETY FIRST

Rock Springs High School

I, _________________________________ PLEDGE myself to obey all of the safety rules of this shop, and if I am in doubt about any rules I will consult the instructor or reference list.

Another type of safety pledge is where the teacher and student sign a pledge. This pledge indicates cooperation between both pupil and teacher concerning safety. An example appears below.

SAFETY CERTIFICATE

This is to certify that I have received instructions in safety precautions in _______________ shop. The instructor has demonstrated to me how to safely operate each machine, and I have demonstrated my ability to use machines in a safe manner. I promise to observe all the safety rules in _______________ High School.

Signed ________________________________

Date ________________________________

This is to certify that _______________________________ the above named student, has been given safety first instruction and safety demonstrations in the machines and tools in _______________________________ Shop. He is now eligible to use said machines.

Signed ________________________________

Date ________________________________

8

Technical High School, Dallas, Texas.
A student should never be allowed to use a machine without direct supervision until he has demonstrated his ability to operate the machine proficiently without danger to himself or his fellow workers. The teacher should keep an accurate record of the pupil's progress on each machine since it shows the extent of individual student instruction and serves as evidence in event of dispute in accident cases.9

STUDENT'S PROFICIENCY CARD

Wood Shop

You are permitted to operate only those machines after which your name appears. The teacher will have you write your name there when you have been properly instructed how to operate that machine.

<table>
<thead>
<tr>
<th>Machine</th>
<th>Student's Name</th>
<th>Teacher's Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buzz saw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Band saw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jointer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jig saw</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This card will be kept on file in the shop to which the student is assigned.

There are many other means of keeping records of safety instructions given in the school shop. The content of permits and other means used will vary with needs and situations confronted. The forms given above will serve as a guide in working out a means of reducing liability as well as accidents by some of the ways named.

CHAPTER III

REPORTING ACCIDENTS

As it is impossible to prevent all accidents, there should be a well-defined written procedure to follow in handling accidents of the school, especially is this true of the industrial arts shop.

A standard form for reporting accidents should be adopted by all schools within a system. The form should contain all the information that will be necessary in comparing data and compiling facts which can be used to base any remedial measures necessary in reducing accidents.

When an accident occurs, corrective steps should be taken to prevent a recurrence of a similar mishap in the future. If the program is to be effective it must embrace the experiences of all shops in the system and also supplement the experiences by a wide survey of accidents occurring in other places.

A well-planned accident reporting system has four major objectives. 1

Accident reporting is a preventive device. It serves to alert the responsible agents of the shop program as to the focal points of trouble and provides clues to the danger points that need correction if similar accidents are to be avoided in the future.

Accident reporting is a defensive device. In court cases which often arise from accidents or injury in the shop the accident report may be very valuable in determining the party at fault. An actual trial may take place several months or even years after an accident has occurred. In such cases witnesses to the accident may not be available and in case

1

the memories have faded leaving no definite evidence that can bear upon the case. Nothing is quite so helpful to the teacher as a report of the accident compiled, at the time of the injury.

Accident reporting is a protective device. If the insurance company with which the teacher or board of education has an accident report upon which to base a clear case there will be less time lost and more justice in determining the fault or liability of accidents.

Accident reporting is a constructive device. The occurrence of an accident in a school will in most instances furnish an awakening spirit as to the need of safety education in the shop. It may open possibilities of adjusting the program to meet the shop's need in special problems.

The primary function of the accident report is not to compile statistical data, but to help administer more efficiently through learning how to avoid future accidents.

Every teacher should make an accident report for all injuries received. Students may assist in making these reports. The report should be made out in triplicate with one copy going to the school office, another to the parents and a third to be filed in the shop. The report may be patterned after the form which follows:
# Preliminary Accident Report

To be filled out immediately after an accident in the school shop.

**Make 3 copies**

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>1. Who was injured?</th>
<th>Name</th>
<th>Age</th>
<th>Grade</th>
<th>Shop</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Address</td>
<td></td>
<td></td>
<td>Telephone</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>2. What was the nature and extent of injury? (Describe fully)</th>
<th>Nature of accident</th>
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</table>

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<thead>
<tr>
<th>3. Who gave medical treatment?</th>
<th>First aid in school by whom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Physician</td>
</tr>
<tr>
<td></td>
<td>Hospital</td>
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<table>
<thead>
<tr>
<th>4. On what day and at what time did the accident occur?</th>
<th>Date</th>
<th>Hour</th>
<th>A.M.</th>
<th>P.M.</th>
</tr>
</thead>
<tbody>
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<tr>
<th>5. Where did the accident occur?</th>
<th>Exact place in shop where accident occurred</th>
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<table>
<thead>
<tr>
<th>6. Who saw the accident or was near the injured when the accident occurred?</th>
<th>Name</th>
<th>Age</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Name</td>
<td>Age</td>
<td>Address</td>
<td>Phone</td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>Age</td>
<td>Address</td>
<td>Phone</td>
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</tbody>
</table>

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<tr>
<th>7. What was the immediate cause of the accident? (Describe fully)</th>
<th>Immediate cause</th>
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<th></th>
<th>Unsafe practice</th>
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<tbody>
<tr>
<td></td>
<td>Unsafe conditions</td>
</tr>
<tr>
<td></td>
<td>Unsafe equipment</td>
</tr>
</tbody>
</table>
### PRELIMINARY ACCIDENT REPORT (continued)

<table>
<thead>
<tr>
<th>Other causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contributory causes</td>
</tr>
</tbody>
</table>

8. **What was the injured student's statement regarding the accident?**

9. **What was the mental and physical condition of the injured prior to the accident?**

10. **What can be done to prevent recurrence of this or similar accidents?**

11. **When will these corrective steps be taken?**

#### Report prepared by:

#### Witnessed by:

---

**Industrial Arts in Utah** (Salt Lake City, Utah: Department of Education, 1941).
CHAPTER IV
FIRST AID

Industrial arts teachers should have more than a superficial knowledge of first aid principles and practices. They are called upon frequently to administer first aid to the students inside and outside of the shop and it is to be expected that they will know what they are doing. There are adequately prepared text books on this phase of teaching. The American Red Cross and several life insurance companies will be able to supply teachers with copies of first aid manuals.

In a survey made by Schaude at Colorado State College, he found that only 75 per cent of the instructors reported an adequate first aid kit in the shop. There should have been a first aid kit in each shop reported since the access to a first aid kit belonging to some other department will not excuse the shop from the responsibility of providing a kit.

It will be advisable for the teacher to take some time in teaching the students first aid if it is not provided as a course in the school. The safety engineer and safety inspector should have some knowledge of first aid if they are to be efficient in carrying out their work.

There should be one first aid cabinet in every shop with a minimum of supplies as listed under Supplies For First Aid Cabinet. This cabinet should be centrally located and under the care of the safety engineer, the safety inspector, and the instructor.

1 A Handbook For Teachers and Administrators (Salt Lake City, Utah: State Department of Education, tentative edition, 1941).
2 First Aid (San Francisco, Cal: Metropolitan Life Insurance Company).
In addition to a first aid cabinet in each shop, there should be a first aid kit in each individual laboratory containing those items listed on the First Aid Chart For The School Shop.

It is advisable to place in each shop a chart similar to the one which is shown on page eighteen. Such a chart should be helpful in guiding the first aider who may not be sure as to the procedure to follow in case of minor injuries.

When considering first aid in the shop the following points should be remembered:

1. A first aid kit should be placed in each laboratory or every shop.
2. The first aid kit should be sufficiently stocked at all times and it is the duty of the instructor to be sure that such is the case.
3. There should be a set of simple directions posted or in the first aid kit for administering of first aid.
4. Proper attention should be given even to the smallest cuts or wounds. Without proper care they are apt to be very serious.
5. First aid, as the name implies, is the primary attention given to a cut, wound or accident. It is doubted if the teacher should continue to treat a student after the first attention. Such cases should logically be treated by the school nurse or a physician.

To be prepared for an emergency should be the goal of every person who accepts the responsibility of teaching Industrial Arts. The Industrial Arts teacher should feel responsible for the safety and welfare of students.  

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Supplies for First Aid Cabinet

1. Gauze
2. Tincture of iodine
3. Adhesive tape
4. Medicated cotton
5. Mercurochrome
6. First-aid Instruction Book
7. Tooth picks for swabs
8. Ungentine
9. Scissors
10. Smelling salts
11. Boric-acid solution
12. Spirits of ammonia
13. Disinfectant
14. Spirit of alcohol
15. Vaseline
16. Salve
17. Carbolic-acid solution
18. Peroxide
19. Splints
20. Spirits of turpentine
21. Bandages
22. Tweezers
23. Needles
24. Aspirins
25. Liniment
26. Spirits of camphor
## FIRST AID CHART FOR THE SCHOOL SHOP

<table>
<thead>
<tr>
<th>Injury</th>
<th>Caused by</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuts</td>
<td>Knife, Chisel, Broken Metal</td>
<td>Allow the wound to bleed freely but not excessively. This cleans the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wound and washes out some of the germs. Wipe away the blood with a swab</td>
</tr>
<tr>
<td></td>
<td></td>
<td>saturated in rubbing alcohol. Apply a 3% solution of iodine. Apply a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sterile dressing and bandage snugly.</td>
</tr>
<tr>
<td>Punctures</td>
<td>Nails, Scribers, Awls, Wire</td>
<td>These wounds may be small but deep, and require thorough cleansing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wash with alcohol and gently work iodine into entire depth of wound.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A sterile dressing should then be applied.</td>
</tr>
<tr>
<td>Lacerations</td>
<td>Saw, Jagged tools</td>
<td>Sufficient bleeding will usually occur. Deep wounds of this nature may</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cause arterial bleeding sufficiently severe to require a tourniquet or</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sterile compress. When bleeding is stopped, treat in the same manner</td>
</tr>
<tr>
<td></td>
<td></td>
<td>as cuts.</td>
</tr>
<tr>
<td>Burns</td>
<td>Open Flame, Hot furnaces, Hot vapor, Hot liquids</td>
<td>Clean burned area carefully with rubbing alcohol. Never use iodine on a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>burn. If there is a blister, open it carefully with a sterilized needle.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spread a burn ointment on a sterile gauze and bandage securely but</td>
</tr>
<tr>
<td></td>
<td></td>
<td>loosely over the burn.</td>
</tr>
<tr>
<td>Eye trouble</td>
<td>Foreign bodies in the eye</td>
<td>DO NOT RUB. Consult a physician if body is imbedded. Close the eye.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gently pull the upper lid down and over the lower lid. Hold until the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>flow of tears wash the object to the corner of the eye. If this fails,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>grasp the upper lid lashes between thumb and forefinger, pull downward</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and outward away from the eyeball. Look up under lid for object and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>remove with moistened corner of clean handkerchief.</td>
</tr>
<tr>
<td>Blisters</td>
<td>Chafing, Blinding, Pinching</td>
<td>Blood and water blisters (not burn blisters) may be caused by pinching,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hitting, or chafing. Apply iodine on one edge of blister. Sterilize a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>needle over an open flame. Puncture the blister at its edge in the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sterilized area. Gently press out blood or water.</td>
</tr>
<tr>
<td>Bruises</td>
<td>Blows, Falls</td>
<td>Bruises usually require no treatment. Application of ice or clothes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>wrung out of cold water relieves pain and prevent discoloration.</td>
</tr>
</tbody>
</table>

**What the First Aid Kit Should Contain**

- 1 bottle 3% iodine
- 1 roll 1 inch sterile gauze
- 1 roll 1 inch adhesive tape
- 1 bottle rubbing alcohol
- 1 tube burn ointment
- 1 small pair scissors
- 1 pair tweezers
- 6 triangle bandages
- 1 package sterile cotton

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W. W. Willis, "First Aid Chart for School Shop", Industrial Arts and Vocational Education, Vol. XXVII (1938)
CHAPTER V  
SAFETY PROGRAM

Teachers are the persons primarily responsible for shop safety programs, however, it is essential that they receive the full cooperation and support of the supervisory and administrative officials in obtaining the best possible safety conditions in the school shop.

If the teachers, supervisors, and administrators could only be made to realize the great responsibilities that are charged to them, our safety program would gain much in many ways that would bring about a greater degree of perfection. The following suggested analysis of responsibilities are given with this in mind. ¹

A. The Teacher's Responsibility:

1. To maintain safe working conditions and safe work practices in his shop.
2. To provide adequate instructions in safety for his students, and to foster student cooperation in safety procedures of the shop.
3. To make recommendations to his superiors for improvement of safety conditions in his shop.
4. To carry out immediately all recommendations in regard to safe working conditions or safety instructions that are received from his superiors.
5. To follow all safety rules and practices personally as an example to the students.
6. To keep up to date on the most modern and accepted safety practices in the occupation he teaches.

B. The Supervisor's Responsibility:

1. To have a program of safety education for the shop under his supervision.
2. To see that teachers carry out their responsibility in regard to safe working conditions, safe work practices, and safety instructions.
3. To encourage the exchange of good ideas on safety and safety instruction among his shop teachers.
4. To recommend and implement the procurement of needed safety improvements in the shops under his supervision.
5. To keep in touch with safety practices in the occupations that are being taught under his supervision.

C. The Administrator's Responsibility:

1. To endorse whole-heartedly a safety program in all school shops.
2. To implement the provision of safe working conditions, including properly safeguarding equipment in all school shops.
3. To implement the fulfillment of local and state requirements affecting safety in school shops, and to foster a close relationship between the school and the local, state, and national agencies which provide safety services to the school.
CHAPTER VI

SAFETY PROCEDURES USED BY SCHOOLS AND INDUSTRIES

There are several procedures that are used to teach safety in industry and the school shop. In setting up a safety program for the school shops, it would be well to investigate some of these methods which have been rather successful in the past in reducing accidents. Some of these procedures are as follows:

The use of safety talks. - The instructor may often use pep talks as a method to improve safety in the shop. If these talks are to be effective, they should be given at a time when the student will be most attentive. In a study made at Colorado State College, by A. W. Hornung, he found that of 160 schools studied, 83 per cent used safety talks in their method of instruction.

Discussion immediately following accident. - It is best when an accident occurs to stop all operation and call the group together to discuss the causes involved in the accident. This gives the worker first-hand knowledge in causes of various accidents and their prevention. The instructor should use tact in leading a discussion of this type. He should be firm in his corrections, yet avoid building a resentment on the part of the injured pupil. The instructor should be serious in his discussion always pointing out ways to remedy or prevent the recurrence of the same accident.

Individual demonstration. - In the demonstration of an individual tool or machine by the instructor, he should realize that the one who is

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1 A. W. Hornung, "An Accident And Safety Educational Program For Industrial Arts Shops of Texas and Other States", Colorado State College of Agriculture and Mechanical Arts, Fort Collins, Col., 1938.
to use the tool or machine cannot recognize the hazards that accompany its operation; therefore, he should place safety in the leading position in acquainting the worker with the tool for the first time.

Posters.- This method of giving safety instructions or information is through the visual sense. Posters may picture situations that are good or bad, right or wrong. Some posters are of the warning type. An example of such a poster is offered by the Metropolitan Life Insurance Company in a poster which portrays a pair of goggles with the caption, "You Don't Want To Peddle Lead Pencils on The Street." It is the writer's belief that such a poster will help immensely to reduce accidents. On the other hand, there are some posters that will, in my opinion, tend to make the student nervous and possibly increase the likelihood of accidents. For example, I saw a poster which portrayed a bloody finger which had just been clipped off by a universal saw. To me, this poster was horrifying and I think it would have been with hesitancy that I would have approached this machine to operate it.

Safety slogans.- This is similar to the poster idea except no pictorial representation is shown. The slogans may be mimeographed and placed on bulletin boards or on large banner strips suitable for placing on the wall.

Motion pictures.- Motion pictures carrying safety instruction have been developed by both fast and slow motion, which portray the complete production job. The points on safety are interwoven with the picture. The student will as a rule remember instructions through motion pictures better than some of the other methods. The motion picture is also in-

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strucuional in pointing out skills and techniques of various operations; therefore, making a perfect correlation between the two.

**Bulletin board displays.** - The bulletin board display is a rather common practice in most shops. There may be much pictorial material along with rules, regulations and slogans as mentioned above. The material should be well adapted to the situation and changed frequently. Bulletin boards for displays will be more effective if they are placed in the different shop laboratories and if they contain materials suitable to each laboratory.

**The reward method.** - To cultivate safety, schools and industries often offer merit badges or rewards to the workers for freedom from accident over a certain period of time. For example, the Honey-Krust Company presents merit badges to its drivers for each accident-free year of driving.

**Safety contests.** - In school and industry these contests are often very effective. However, some who have tried this method say that the student will often fail to report an accident to keep from demeriting himself or his group. The contest method may be used in such a way that it will not hamper the reporting of accidents. One of these is the contest by groups for accepted safety suggestions which has proved their worth in many industrial plants.

**Safety committees.** - It has been found that students and workers respond quicker to an activity if they are given some definite responsibility. The safety committee should be made up of students who have been elected from the student body at large. These committee members should feel free at all times to offer suggestions to the teacher concerning elimination of unsafe practices. The committees should be changed at fairly frequent intervals so as to give more students a chance to participate.

**Safety engineers and inspectors.** - These persons are closely related
to the safety committee and should lead in the work of the committeemen. The class may be divided into squads with an inspector over each squad and the engineer over all the class or classes or the inspector may be the person in charge of certain fields such as visual safety, first aid, and mechanical safety. The safety engineers and inspectors should keep in constant touch with the supervisor.

The group procedures which have been discussed are not to be considered individually as a means of putting on a successful safety program in the shop, but if used in correlation can be a means for obtaining a highly successful program.
CHAPTER VII
RULES FOR MILL ROOM PRACTICE

Of all the accidents that happen in the school shop, the ones in the mill room are usually the most serious. Since these accidents are usually most serious in nature, it is the duty of everyone concerned to do his utmost to reduce the seriousness of these accidents as well as reduce the accidents in number. Since everyone who teaches, administers, and supervises in the class room is concerned, the program must be a well defined setup, having for its objective a safer mill room procedure in which there is cooperative planning by everyone concerned.

To set up a safety program that would be considered adequate for the mill room, everyone concerned with the teaching must sense the need and put forth an extended effort to get information upon which to base the objectives of the program. To do this, the supervisor and teacher must know the machines upon which most of the accidents occur per man hours worked, the time of day at which most accidents occur, the immediate causes of these accidents, and the nature.

According to several research studies, rather conclusive evidence concerning the danger of certain machines have been satisfactorily proven. However, the proof is not conclusive enough to assert that it would be applicable to all situations since many outside circumstances enter into the problem. Among some of these factors may be the conditions under which the student is working; the variation in reactions to different teaching procedures; the tempermental differences of students, and the difference in plans, procedures, and techniques employed by the teacher.

The ranking of machines as of 1942 according to frequency of accidents
occurring were as follows: ¹

1. Jointer
2. Circular saw
3. Wood lathe
4. Grinder
5. Band saw
6. Drill press

The hours which seem to be most conducive to accidents are 11:00 A.M. and 3:00 P.M. This can probably be contributed to the fact that the pupils are more careless at this time, hasty in their work, and inattentive.

Some causes of accidents seemed to be, according to the Philadelphia Public School Study,² as follows:

1. Improper position of body, hands, etc.
2. Failure to carry out instructions.
3. Handling material.
4. Hasty work.
5. Inattentiveness.
8. Carelessness.
9. Defective equipment.
10. Inexperience.
11. Lack of instruction.

In considering the nature of accidents on various machines, injury to fingers, hands, thumbs, arms, face, and head seem to be most numerous. The fingers and hands receive more than all of the others combined.

In setting up a program of safety for the mill room, there are several factors that should be considered. Some of these factors have been previously mentioned in a general way, but at this time they become specific factors in insuring a minimum of accidents which might occur in the mill room. The factors which I am referring to are: proper arrangement of machinery, proper illumination, and proper ventilation. It is the duty of the administrator to see that these three things are taken care of when the building is being constructed and equipped. If this is done, it will save those who will be connected with the shop much time and grief in making readjustments.

Another important factor to consider in the mill room is the equipment. Is it adequately guarded, suitable for the work that is to be done, and in accordance with certain specifications laid down by state authorities? In buying equipment for the mill room, it is highly important that safety always be placed first. In buying new machinery, the purchaser should take into consideration the grade, efficiency, capacity, and whether the guards are designed as a part of the machine to improve the safety or merely to meet certain safety regulations of state laws pertaining to the guarding of machinery.

Most of the machines today are not designed alone with labor-saving devices, but also with the idea of eliminating hazards. Belts, gears, wheels, and other moving parts are enclosed to insure safety. The square head cutter on the jointer has been replaced by the cylinder-head cutter, thus reducing the degree of damage that is done in case of an accident.
These improvements have been brought about by the continuous study and work of engineers in industry, who have gotten much of their information from the school shop teacher.

In setting up a safety program for the mill room there are many techniques and devices used to instill upon the mind of the student the things which will be most helpful in reducing accidents. Among these are such things as safety talks, accident posters, safety rules, safety assignments, safety awards, safety slides, machine safety test, and safety bulletin boards.

It is the belief of the writer that safety rules presented in the right manner will play a bigger part in eliminating accidents than any other single thing named if they are presented properly and at the right time. It should be the policy of the teacher to follow each rule rigidly in demonstrating the machines. He should be a daily example in how to observe the rules of safety. The teacher should present the rules of the machines as needed rather than make the learning of each rule merely a memorizing process. If the rules are presented at the time needed, they will tend to become a habit; and as more rules are presented in this manner, a set of well developed habits become a part of the students’ everyday mill room practices.

In the procedure of teaching by rules in the mill room, the teacher should proceed with each specific operation, pointing out some of the things that might happen if certain specific and general rules are not observed.

In demonstrating or stressing rules in the operation of a particular machine, the instructor should be careful to present only the correct way of operating the machine, as the first impression is likely to be
The following are a group of general precautions of the mill room:

1. Avoid leaning on a machine while idle or talking to someone.
2. Avoid running, wrestling, throwing of objects, or any other similar unsafe practice in shop.
3. Keep the eyes on the cutting part when the machine is in operation.
4. Avoid running used stock through any machine without first having it checked by the instructor for nails.
5. Check the machines regularly for any defective part.
6. Avoid using dull machinery.
7. Use safety guards.
8. Avoid talking to anyone while operating a machine.
9. See that the moving parts of the machine are clear and that all stock or waste has been cleared from table and exhaust.
10. Stand clear of flying parts while operating the machine.
11. See that machine has sufficient oil at all times.
12. Avoid overloading. The machine has a given capacity.
13. Check machines often for any object that might get in the belt or any other moving parts.
14. Switches on all machines should be within easy reach of the operator.
15. All machines should be equipped with overload reostats.
16. Adjustments and repairs should be made only after stopping the machine.
Circular Saw

1. Make all adjustments on the machine with power turned off.

2. Use the ripping fence with the grain, and crosscut fence for across-grain cutting. A combination saw may be used in ripping or crosscutting if the cut does not exceed one inch in thickness.

3. Avoid raising the saw more than one-half inch above wood.

4. A stop block must be used in cutting off lengths. Avoid cutting off against fence.

5. Ripping without ripping fence and crosscutting without crosscut gauge is forbidden.

6. A push stick is necessary to feed narrow stock between the saw and the ripping fence.

7. When helping to "tail off", never pull on the wood. Just support it and allow the operator to feed and guide the stock.

8. Remove scraps from table with long stick of wood.

9. When ripping, a spreader should be attached at the rear of the saw to keep the wood from binding the saw and therefore preventing the wood being kicked back at the operator.

10. The saw guard must remain intact at all times while using except on special operations approved by instructor.

11. Take special precautions against "kick backs", and see that others are never standing or working directly in line back of the saw.

12. Dado heads are dangerous in that a wider tearing surface is exposed. Extra precautions are necessary to prevent the stock from "riding" back over the saw.

13. Any saw that "wobbles" is dangerous and must not be used.

14. Avoid forcing saw or "binding" material.
Jointer

1. The guard must always be in place and in functioning condition.
2. The student should make no adjustments except the depth of cut without the immediate supervision of the instructor.
3. Watch out for knots and split stock.
4. Minimum length of stock should be twelve inches.
5. Use a pusher on short stocks.
6. Allow machine to come to its maximum speed before starting out.
7. Keep fingers as high as possible on the stock and never drag the thumb or any part of hand or clothing at back of material.
8. Avoid working against the grain or forcing the cut too hard.
9. Follow through with stock and allow guard to come to normal closed position.
10. "Kick backs" occur on the jointer when infeed is lower and cut too heavy, also when hard knots are struck.
11. Avoid allowing stock to come in contact with cutter before it is firmly on the table.
12. Hold stock firmly when jointing at an angle, as stock will tend to slip away from fence carrying the fingers into the cutter head.
13. When the fence is moved from the extreme right, some guard protection should be installed to cover exposed blade.
14. Guard against laying anything on table that will be pushed into the machine.

Shaper

1. Blades should always be sharp.
2. Avoid overloading machine. Take two light cuts if necessary instead of one heavy cut.
3. Keep the guards on when operating.

4. See that blades are fastened securely.

5. Inspect material for loose knots and splinters.

6. Avoid getting hands too close to blade.

7. There should be a shoulder or fence for the stock to run against.

8. Keep the face out of line of flying splinters.

9. The machine should be kept properly oiled.

10. Run stock slowly when finishing across end, especially when wood is subject to "slivering."

11. Always run wood against the turn of the blade.

**Band Saw**

1. Make all necessary adjustments before starting.

2. Keep the upper guide as close to the stock as convenient.

3. Make all turns gradually. A sudden short twist may cause the saw to break.

4. Cutting should not be started until the saw has come to its maximum speed. Neither should cuts be made after power has been shut off.

5. Backing out for long distances may pull the blade off the wheel.

6. When small pieces catch in table throat, stop machine and call instructor.

7. Reaching back of saw to pull material through is dangerous.

8. Use stick to clear scraps from table.

9. Learn to control material with finger tips.

10. No one should stand at right side of band saw. If the blade should break, a serious accident may occur.

11. Upper wheel tilting device should be adjusted only by teacher.

12. Tilting the table or other setups are done only upon the per-
mission of teacher.

13. In backing out of long cuts, it is best to stop the machine and use wedge.

Jig Saw

The rules for the band saw will also apply to the jig saw as both machines are about the same in their nature of work, the difference being in the driving mechanism. The blade of the jig saw gets its stroke from a cam, while the band saw is driven by a wheel.

Surfacer

1. Avoid running short stock through the machine.

2. Avoid cuts that are too heavy. About one-eighth inch should be maximum cut on both ends.

3. Run stock that is approximately the same thickness.

4. Stand to one side when stock is going through.

5. Avoid letting the stock double and get hung as it is leaving machine.

6. Check machine to be sure that table is clear of knots or any other thing that might be kicked out upon starting machine.

7. Stand to one side when starting machine.

8. See that fast-running parts of machine have plenty of oil.

9. Edge planing is prohibited where tilting cannot be prevented.

10. Check stock to determine if the stock is the same thickness from end to end.

11. The machine should be checked regularly for any defects.

12. Stock should not be passed back over surfacer.
Mortiser

1. Be sure bit and chisel are properly set and secure in machine before starting.

2. Bit and chisel should be sharp.

3. Fasten stock securely before starting out.

4. Be sure bit and chisel will clear table on downward stroke.

5. See that bit and chisel will clear fence.

6. Start operation at slow or medium speed.

7. See that bit clears chisel about one-sixteenth inch.

8. Table or stock should not be moved while machine is in motion.

9. Test stroke of machine by hand before power is turned on.

10. Check all adjustments and attachments preliminary to operation of machine.

Belt Sander

1. Be sure the belt is glued straight.

2. Avoid sanding too much in one place.


4. Belt should be within about one inch of material.

5. Machine should be adjusted so belt will run straight.

6. Avoid letting any part of the body come in contact with belt.

7. Wear goggles.

Grinder

The grinder is a relatively safe machine tool to use; however, many minor accidents result from the improper use of this machine. The main reason for these accidents is the failure to observe a few very important safety precautions in regard to setting up and operating the machine.
The following are a few safety measures to observe in operating the machine:

1. Get proper instructions before attempting to use grinder.
2. Wear your goggles.
3. Be sure the abrasive wheel is properly guarded.
4. Abrasive wheel should be properly dressed.
5. Avoid holding small pieces of metal with fingers while grinding.
6. Avoid overloading grinder.
7. Hold the stock firmly.
8. Be sure the tool rest is properly adjusted.
9. Avoid adjusting rest while grinder is running.
10. Wheel should be checked regularly for any defects such as:
    (a) Improper wheel mounting.
    (b) Loose bearings.
    (c) Lack of oil.
    (d) Defects in stone.
11. Some causes of emery wheel ruptures are:
    (a) Overspeeding.
    (b) Side flanges unequal in diameter.
    (c) Side flanges too small.
    (d) Unrelieved side flanges.
    (e) Unbalanced wheel.
    (f) Side blow produced by heavy object.
    (g) Excessive vibration.

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The bench room has been considered by most teachers as the laboratory of the industrial arts shop having the most accidents. This is largely due to more students using the bench room than any other individual laboratory and also to the fact that the students as a whole are less accustomed to the use of tools, therefore, making the likelihood of injury greater to this group. Along with the realization that accidents are greater in this laboratory also comes another realization that these accidents, as a whole, are not nearly as serious in nature as those happening in other laboratories. Many of these accidents could be reduced in seriousness if the student would immediately report any injury to the safety engineer or instructor, so that first aid treatment could be given; therefore, reducing the chances of any complications that might occur if the injury is unattended.

The laxity of the safety program in the bench room can be attributed mainly to the attitude of both the teacher and pupil concerning the seriousness and need of attention of accidents occurring here. The teacher often minimizes the seriousness of many accidents thus leading the student to do the same thing and, therefore, magnifying the chances of more and greater accidents.

Safety should be given first place in importance in the bench room as well as all the other shop laboratories. If safety is to be placed first in importance, the teacher must consider it his duty to have as his first objective the improvement of safety in the bench room.

To carry out a safety program that will be efficient in its outcome, the teacher must follow some plan of teaching safety to the students. It is usually considered best, in teaching safety in the bench room, to
present rules and regulations along with regular teaching, as this correlates safety with the every day practices of the student work.

To be able to stress the proper rules it is necessary for the teacher to have an idea as to what some of the accidents are that occur in the bench room and what tools contribute to these accidents. It has been found that cuts, bruises, punctures, from splinters, nails, and tools, are the most common injuries; while the tools that contribute most of the injuries are as follows:

1. Chisel
2. Saws
3. Knives
4. Planes
5. Hammers
6. Draw Knives
7. Scrapers
8. Mitre saw
9. Screw driver
10. Wrecking bar

This rating of tools doesn't necessarily mean that the chisel is more dangerous for the report was according to the number of accidents. Some of the tools are used much more than others; therefore, making the probability of injury while using this tool more prevalent than with some tool that is seldom used. The teacher should keep this in mind in presenting the following group of rules relating to the bench room.

General Safety Recommendations

1. All tools should be kept in good working condition.
2. Care should be taken in handling materials in order that any worker near you may not be endangered.
3. Foolishness of "horseplay" in the bench room should be eliminated.

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4. Shavings and waste material should be removed from the bench room at the end of each day or oftener if they become excessive.

5. Never lean or pile tools or materials against anything.

6. When cutting with sharp tools such as knives and chisels, care should be taken to cut away from hands or body.

7. No hand tools should be permitted to lie on floor, ground or platform when not in use for any length of time.

8. All objects with sharp edges or points such as broken glass and bent nails should be thrown into container used for this purpose.

9. There should be a sufficient amount of non-glaring light in all working areas of the bench room.

10. Avoid leaving tools, especially sharp edged tools, on the edge of table where they may fall or be knocked off causing injury to feet or legs and damage to tool.

11. Care should be exercised in removing dust and shavings from tables and benches. The student through carelessness often may brush or blow small particles of dust or shavings in someone's eye.

12. Matches should not be carried in the shop.

13. Hasty work should be avoided in the bench room. Haste makes waste as well as causing many accidents.

14. The bench room should not be used as a pass way to another class room.

15. Piling stock on the floor should be avoided.

16. Where open racks are used to store lumber in the bench room, care should be taken not to pile materials haphazardly as sliding or tumbling down of lumber is often the result from this.
Hammers and Mallets

1. Use the hammer intended for job.

2. When driving nails with hammer, the nail should be set with light blow and then the hand taken away before striking again. This will save finger nails.

3. Avoid using hammer in such a way that it produces a glancing blow.

4. The head should be fastened securely on handle.

5. Hammers should not be used that have broken or taped handles.

6. Avoid using cheap hammers such as those made from cast iron.

7. The bell faced hammer should be used exclusively in the school shop.

8. An assortment of hammer sizes for different types of work is the best protection against hammer injuries.

9. Material from which mallets are made should be carefully selected.

10. The shape of the mallet head is likewise important.

11. Mallets are made of three different types of materials namely; wood, composition, and rubber. Care should be exercised in selecting the proper type for the various shop uses.

Saws

1. Saws should be kept sharp and well set at all times.

2. Keep handles of all saws tight.

3. Start the saw on an even forward stroke as fingers or hand are injured by carelessness in starting out.

4. Do not get the face too close to work when using coping saw as blade may snap causing injury to face or eyes.

5. In holding materials the hand should not be in the path of the saw.
6. All saws should be put in the rack at back of the bench when not in use.
7. When the thumb is used as a guide in starting the saw cut, the nail should be against the saw just above the teeth.
8. The stroke of the saw should be smooth and uniform.
9. The work should be held in such a manner as to avoid the likelihood of the saw teeth coming in contact with metal.
10. In using the web and coping saw, the blade should not be placed under too great a tension.

Wood Chisel

1. Always use the chisel for the job it is intended.
2. Keep the chisel sharp.
3. Watch for mushroom handles.
4. Push the chisel from you when possible.
5. Use the mallet for driving chisel.
6. See that handles are tight.
7. Always have hand or fingers behind cutting edge of chisel.
8. Keep chisel off floor.
9. When laying chisel on bench, the cutting edge should be away from worker.
10. Chisel should be returned to proper place after using.
11. In storing chisels in cabinet or tool room, never place where they will fall on anyone.
12. Control the chisel by using both hands when paring.
13. In handing a chisel to a fellow worker, it should be handed handle first.
14. Chisels should not be carried in pockets.
Other Tools

1. Screw drivers should be properly ground.

2. Pick up hand clamps by handle as pinched fingers are oft the result of picking clamp up by grasping the screws inside the jaws.

3. All tools having sharp edges or points should be hung so that they will not be easily dislodged and thus cause injuries to worker or damage to tool.

4. Tools should not be hung over the check-out window.

5. Handle all edged or sharp pointed tools handle first.

6. Hatchets heads should be kept tight on handle.

7. Care should be taken in handling nails and screws as there are sometimes slivers on them especially in the slot of screw heads.

8. Care should be exercised in adjusting or handling plane bits-
CHAPTER IX

METAL SHOP

In attempting to give a few rules for the metal shop, I have tried to keep in mind the machines and operations which contribute to most of the accidents of the metal shop. Information for such conclusion was obtained from a survey made by Paul L. Cressman and reported in a bulletin published by Pennsylvania Department of Education.¹

It was shown in this report that more accidents were reported in this group than any other shop discussed by the writer except the wood working shop. This is largely due to three facts: There were more tools and operations included under the group; there was likely to be more in such shops where the survey was made which was Pennsylvania, and there were more shops in this group reported due to the vocational interest of the area in which the survey was made.

I have combined a number of shops into the metal shop which includes sheet metal, forge and machine shop. The number of accidents in each of these shops was as follows:

<table>
<thead>
<tr>
<th>Shop</th>
<th>Number of Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine shop</td>
<td>126</td>
</tr>
<tr>
<td>Sheet metal shop</td>
<td>28</td>
</tr>
<tr>
<td>Forge shop</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>158</td>
</tr>
</tbody>
</table>

The individual tools which contributed to the most accidents in each shop were as follows:

<table>
<thead>
<tr>
<th>Shop</th>
<th>Machine</th>
<th>Number of Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine shop</td>
<td>Lathes</td>
<td>44</td>
</tr>
<tr>
<td>Sheet metal shop</td>
<td>Metal</td>
<td>5</td>
</tr>
<tr>
<td>Sheet metal shop</td>
<td>Hammer</td>
<td>5</td>
</tr>
</tbody>
</table>

¹ Safety Education in Industrial School Shops (Harrisburg, Penn., Department of Public Instruction, Bulletin 352, 1933).
Forge shop

Emery wheel, forge and hammer 1 each

The great number of accidents on the lathe can be attributed to the fact that there are more lathes in the machine shop than any other machine except the grinder.

With the few facts given, the teacher should keep in mind certain accidents which are likely to happen. If this is done and a group of well defined rules followed, many accidents may be avoided.

The following are a group of rules suggested by the writer:

General Safety Instruction for Metal Shop

1. No loose clothing should be worn in shop.
2. See that sleeves are rolled up.
3. See that aprons are worn, whenever possible.
4. See that tools are kept off floor.
5. Prevent "horse play" in shop.
6. See that no hot pieces of metal are left lying around.
7. See that oil is wiped off floor.
8. Warn tool boy against giving out any defective tools.
9. See that goggles are used on grinder as any other machine where there be danger from grit or metal.
10. When air hose is used to clean machine, care should be exercised so that no shavings or dirt will be blown in some other workers eyes.
11. Always use a belt stick when mounting belts.
12. Guards should not be removed from machinery.
13. Machines should never be cleaned or oiled while running.
14. All guards must be in place when the machine is used. Remove guards only upon O.K. from instructor.
15. Permission to start machine should be obtained from instructor.

**Engine Lathe**

1. Test all feeds before turning on power.
2. Neither the lathe or the counter shaft should be oiled while the machine is in motion.
3. In spindle turning, take care that the tail stock is firmly clamped before starting.
4. For slender pieces, especially brass, set the cutting tool on center and never above.
5. Be sure to stop lathe before taking work from center or chuck.
7. Never throw in back gear while machine is in motion.
8. When polishing or filing, look out for the lathe dogs or any projecting part of machine or work.
9. Be sure carriage lock is not set when throwing in traverse feed.
10. When chucking work, never leave the wrench in the socket.
11. Heavy pieces should be properly balanced.
12. When work is finished, throw out all feeds and do not leave tail stock offset or taper attachment in place.
13. Avoid making cuts that are too heavy.
14. Take pride in keeping your lathe clean.

**Safety Instructions for Shaper and Planer**

1. Be sure that work is securely in machine.
2. Shop machine before measuring job.
3. Keep hands or brush away from moving tool.
4. Take small and regular cuts.
5. Never attempt to adjust or tighten the tool while machine is in motion.


7. Always feed on return stroke.

8. Keep your head out of line of shaper ram.

9. After changing length or position of stroke, be sure to tighten the ram.

10. Unless something is wrong, do not shut off power during stroke.

11. Under no circumstances place yourself where you could be caught between the cross rail, the ram, the housing, and the work.

12. Be sure the tool and the head clears the housing and work.

13. Before leaving machine throw out all feeds and lock shaper handle.

Safety Instructions for Milling Machines

1. Stop machine before measuring work.

2. Stop cutter from rotating before removing the chips with a brush.

3. Be careful in handling cutters.

4. Fasten work securely in machine.

5. Stop machine before throwing in back gear.

6. Never leave a machine without releasing all automatic feeds.

7. Never remove or tighten arbor nut by power of machine.

8. Never run a cutter at too high a speed.

9. Never reach a cross arbor to regulate flow of cutting compound.

Safety Instructions for Drill Press

1. Loose clothing should not be worn while operating drill press.

2. Remove chuck key before starting machine.
3. Keep fingers away from chips and moving parts.
4. Clamp work securely before drilling.
5. Small pieces should be held with clamp or monkey wrench.
6. Avoid forcing drill.
7. Oil should be used on most metals when being drilled.
8. Keep fingers clear of abrasive wheels.
9. Feed slowly and continuously.
10. Never raise or lower table when machine is in motion.
11. Never throw in automatic feed until drill is started in hole.
12. Never throw in back gear when power is on.
13. Never attempt to stop a revolving piece of work in which the drill is caught. Shut off the power.

Bench Safety

1. Use files with handles.
2. Be careful of wrench slipping.
3. Use goggles when chipping.
4. Avoid chipping toward another worker or self.
5. Cold chisels with mushroom heads should not be used.
6. Much care should be exercised in grinding bits as many burns and abrasions are received in doing this job.
7. Much care should be taken in using file on hot metals.
8. Filing hot metals should be avoided if possible. It is necessary sometimes in tempering by color method or testing hardness of metal.

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9. Use good grade of tools in bench work. Cheap tools often break causing injury.

Heat Treatment Safety

1. Be careful of flare backs.
2. Furnace should not be allowed to reach an excessive temperature.
3. Use care in quenching work, especially where oil is used in tempering.
4. Water should not come in contact with hot oil, babbit, lead, or cyanide of potassium. (Cyanide of potassium is a deadly poison).
5. Never allow oil bath to catch fire through pressure heat.
6. Know how to combat oil fire.
7. Keep away from hot iron, lead or cyanide.
8. Select proper tongs to hold work.
9. Hot irons should not be held with waste.
10. Wear Asbestos gloves when possible.
11. When using cyanide in case hardening, do not breath the fumes. They are highly poisonous.
12. Use goggles in heavy forging.
13. Work should not be offered for inspection until thoroughly cooled.
14. Keep anvil face free of scale.
15. Avoid standing in line with the swing of anyones hammer.
16. When using sand to bend tubing, be sure it is absolutely dry.
17. Before putting work in forge or taking it out, be sure to shut off blast.

18. Hot metal should not be left lying on floor.

19. Very serious accidents have resulted from air hose. Never Touch anyone with the nozzle.

20. Never attempt to test for leaking gas with a flame.


22. No tanks that have contained gasoline or other explosive liquids are to be soldered, brazed or welded by pupil.

Safety Instruction for Sheet Metal

A. Stakes:

1. Carefulness in handling most important.

2. Watch out for sharp pointed ends.

3. Keep clean — and in a definite place.

B. Solder:

1. Be careful — it may be hot.

2. Watch for jagged, pointed ends.

C. Soldering Flux (Nokoroed-acid) (Muriatic):

1. Keep away from all other chemicals. In case of breakage the acids should be flushed — neutralized with sodium carbonate.

2. Keep well bottled with tight fitting cover and in safe place.

3. Use flux sparingly on all points.

4. Be especially careful not to get flux on hands or body.

5. In cutting muriatic acid with zinc use earthen container or glass jar.

D. Furnaces:

1. Be sure all fittings are tight.

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4 Safety Education in Industrial School Shops (Harrisburg, Penn., Department of Public Instruction, Bulletin 332, pp. 73-74).
2. In lighting - first light match, then turn on gas.
3. Be absolutely certain that gas is turned off when finished.
5. Avoid overcrowding near furnaces.

E. Soldering Copper:
1. Keep in certain, definite place when not in use.
2. Keep hands away.
3. Keep hands well cleaned.
4. Watch out for falling (hot) solder.
5. Never test with hands.
6. Do not carry around in shop.

F. Electric Soldering Copper:
1. Snap switch carefully when not in use and when finished.
2. Keep close check on cord and watch for torn insulation and breaks.
3. Always disconnect for repairs, etc.

G. Tinplate, Gal. Iron, Bl. Iron, Wire, Zinc, Copper:
1. Carefulness in handling cannot be over-emphasized.
2. Although injuries are usually small cuts they may nevertheless result seriously. Over ninety per cent of the sheet metal accidents are the result of the careless handling of these supplies.
3. Edges and corners are very sharp and one's whole attention should be toward the careful handling of these materials.
4. Watch out for your fellow workman also, lest you should injure him unintentionally in going about your own job.
5. In cutting tin be very careful to eliminate all sliver edges or ragged edges.
CHAPTER X

THE GENERAL SHOP

The rules for the general shop are the same as the rules used for the other individual shops with the exception of a few rules which may be added for use in the electrical shop and other courses not included in these rules.

Electrical Shop Rules

1. Follow the Electric Code as strictly as possible, remembering that serious accidents may result otherwise.

2. Always treat wires as live wires, until instructors have made sure they are dead.

3. Avoid trying to make any circuit hook up unfamiliar to you or with current on.

4. Use right size pliers or nippers for cutting wires.

5. Avoid using metal rules around electrical work.

6. Avoid operating electrical appliances while holding tools that will conduct electricity.

7. Wear rubber gloves when working around battery acid.

8. Avoid handling portable electric tools while standing on damp floor.

9. Avoid dragging lamp cords over metal pipe or on sharp edge.

10. A student must NOT, under any condition, cause another student to be shocked.

11. Always test live voltage before inserting any electrical device.

12. Never substitute anything else for a fuse.

14. Be careful that battery acid does not get in eyes or on clothing.

15. Shut off all electrical appliances when you are through using them.

Some General Rules of Instruction

1. Keep plastics away from flames.

2. Care should be exercised in handling etching acid.

3. All inflamables should be so marked.

4. Never use gasoline or other cleaning fluids near flame.

5. Care should be exercised in handling plastics or modeling materials.

6. Care should be exercised in handling leather tools, especially those with sharp points or edges.
To the casual observer the printshop may seem to be a very safe place within which to work. This idea has resulted in many people being injured and placing them in hazardous health conditions. Therefore, it is highly important that the teacher instruct the students concerning certain unsafe practices which will be detrimental to their present physical being as well as their future health.

There are many health hazards in the printshop which the students will encounter that cannot be entirely eliminated, however, there is much the teacher and student can do to alleviate these existing conditions.

Much has been done in industrial printshops as shown in the International Typographical Union report of 1933. The following concerning the increase in life span of those connected with the printing trades, were as follows: in 1892 the average age at death was 41; in 1908, 45.08; in 1915, 50.84; in 1924, 54.4; in 1928, 58.62; and in 1933, 60.77. This report showed an increase in the life span of 19.77 years, which cannot all be contributed to betterment of working conditions, however, a great per cent of the increase can be traced to a change in safety practices and environment. The change in environmental conditions has done much to reduce lead poisoning, carbon monoxide poisoning, benzine poisoning, and tuberculosis.

The number of days lost per 1,000 hours worked proved to be only .29 days which was very low compared to 28 other industries surveyed.

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Information requested in a governmental survey of major accidents in the printing trades over a period of five years gave a total of 159 accidents which were serious, or one for each 565 employees.²

Over half of the accidents in the above mentioned survey resulted in the loss of fingers, hands, or arms, and occurred for the most part in the press room. The student in the print shop should, therefore, be instructed in the common dangers of presses, and also to the folly of ignoring precautions that insure him against accidents that are easy to prevent.

If the teacher will set up a group of safety rules and see that the student always obeys, there should be very few accidents in the high school printshop.

The following are a list of suggested rules that may be used in teaching safety in the printshop:

**General Rules**

1. Machines must not be operated while instructor is out of the room.
2. No adjustments are to be made while machine is running.
3. Apron should be securely fastened and extreme care taken so that it does not come in contact with moving parts of machines.
4. Power should always be shut off after the machine is used.
5. Instructor's C.O.K. is absolutely necessary before any student operates a machine.
6. Never make a repair or attempt to clean a motor unless ordered by the instructor.
7. Never operate a machine until you have been assigned to do so by the instructor.

6. Talking to a student while he is operating a machine is forbidden.

9. Keep type and material out of mouth.

10. Care must be taken to see that paper is placed right side up on machine.

11. Machines should not be oiled while in operation.

12. No moisture should come in contact with molten metal.

13. Refrain from wrestling or running in printshop.

14. Keep floors free of paper and oil or grease.

**Safety Instructions for Platen Presses**

1. Never at any time attempt to take a sheet from the platen when it goes below the guides.

2. Avoid oiling or washing machine when in motion.

3. If a sheet falls under the press, do not take it out until machine is stopped.

4. Avoid attempting to run machine by hand from the rear of the press.

5. Avoid putting rubber on grippers while press is in motion.

6. Never take a sheet that has fallen between the feed board and platen on impression screws.

7. The machine should never be run so fast that the student will have to rush.

8. Odd shape sheets should not be fed to press.

**Safety Instructions for Cylinder Press**

1. If press be run by hand, always turn it over by the flywheel.

2. Press should not be oiled while it is in motion.

3. Care should be exercised concerning anything falling into press as injury to the machine as well as the worker is likely to occur.
Safety Instructions for Paper Cutters

1. Keep hand away from knife.
2. When cutting paper place both hands on lever.
3. The knife should never be taken out of cutter by student.
4. Never attempt to place one hand against the paper and pull lever with other.
5. The operator should be careful that no one is hit by handle when operating cutter.
6. Work alone when cutting. Scraps should not be caught as they come from knife.
7. When cutter handle is not in use it should be swung back against stop.

Safety Instructions for Stitching Machine

1. Fingers should not be placed under shoe.
2. Hands should not be placed on any movable part of the machine while it is in operation.
3. Consult the instructor concerning the thickness and type of material to be sewed.
4. Watch thread that it does not tangle causing needle to snap.
Health Hazards

Lead Poisoning:
1. Keep type from mouth.
2. Avoid dry sweeping.
3. Wash hands before eating.
4. The nails should be cleaned after handling poisonous materials.

Cleaning Liquids:
1. Provide proper ventilation.
2. Avoid splashing liquid on hands or clothing.
3. Use rubber gloves if susceptible.
4. Provide adequate washing facilities.
5. Use safety cans for benzine.
6. Cans containing inflammables should be painted red.

Clothing:
1. Long ties should be prohibited.
2. Avoid long loose smocks.
4. Apron strings should be tied in the back.

Few of these hazards apply to school print shops as students are in print shop only a few hours per week. They are called to attention here for the student who may enter this field as a vocation.
CHAPTER XII
SUMMARY AND CONCLUSIONS

Through a study of liability for accidents, it was found that those concerned with administering education are being sued more frequently and that the final responsibility rests on the teacher. Therefore, it was concluded that there should be insurance protection for the individual teacher and the board of education. It was also found that liability could be greatly reduced by proper use of permits, safety-first cards, proficiency cards, and safety certificates.

If accident reporting is to have the highest degree of success, schools within a given system should adopt a standard form for reporting any accident occurring while the child is under the supervision and administration of the school officials. This form should, if properly made and filed, serve as a preventive, a defensive, a protective, and a constructive device.

By studying the reports of several authorities on first aid in the shop, it was found that there was a universal opinion that the shop teacher should have a thorough knowledge of first-aid principles and practices. It was further agreed that there should be an adequately equipped first-aid cabinet in every shop. In a survey made by Schaudt at Colorado State College of Agriculture, it was found that only 75 per cent of the instructors reported an adequately equipped first-aid kit in the shop.

It was agreed by most authorities that the teacher is the one primarily responsible for the safety program, yet there were certain responsibilities that the administrator and supervisor must assume if the program is to be carried out in the best possible manner.
As a result of several surveys that have been made concerning the
safety procedures used by school and industry, it was found that no teacher
depended entirely on any one method but that there were several methods
used. The three that ranked highest were: use of safety talks, discussion
immediately following an accident, and individual demonstrations. Motion
tables were highly recommended, but inability of many schools to buy
motion picture projectors limited this method.

There were some differences in reports as to the machines having the
highest frequency of accidents. However, there was a general agreement
that the jointer, circular saw, and lathe, grinder, and band saw were the
top ranking machines in frequency of accidents with the jointer ranking
first on most reports.

It was found by a study of several surveys of the various shop labora-
tories that the bench room had many more accidents than any of the other
shop laboratories. This seemed to be largely due to the laxity of the
safety program and the inexperience of pupils working here as well as the
large number of workers.

Surveys showed that over half of the accidents happening in the print
shop could be attributed to the presses. Most of these accidents resulted
in the loss of a finger, hand or arm. It seems evident that, with a small
effort on the part of the teacher, the accidents in the print shop could
be greatly reduced.
Recommendations

As an outgrowth of this study the writer wishes to submit the following recommendations:

1. That there should be adequate insurance to properly protect the individual teacher and board of education.

2. That there be a well organized accident reporting system in each school.

3. Each child should be required to have a permit before operating any machine in the shop.

4. Each school shop should be required by law to have a fully equipped first-aid kit in each shop laboratory.

5. Each person responsible for the shop program should be guided in their responsibilities by a group of well-defined principles.

6. Each shop laboratory should make use of all help available in maintaining a safe place for the students to work.

7. Every shop teacher should give frequent tests on safety rules of the shop.

8. Adequate instruction should be provided each pupil before he is granted permission to operate a machine.
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*Industrial Arts in Utah*, Salt Lake City, Utah: Department of Education, 1941.


Safety and Safety Education (Washington D.C: National Education Association 1940).


"Effective Safety Instructions Through Boys' Clubs", Industrial Arts and Vocational Education, Vol. XXVII (March 1938), pp. 130-132


### AppenDix A

#### School Shop Accident Facts

<table>
<thead>
<tr>
<th>Category</th>
<th>Conditions of Relative Frequency and Other Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>By time of day</strong></td>
<td>2/5 occurring in morning, 2/5 in afternoon. Highest frequency during hour after 10 A.M.</td>
</tr>
<tr>
<td><strong>By day of week</strong></td>
<td>Highest frequency on Wednesday.</td>
</tr>
<tr>
<td><strong>By month of year</strong></td>
<td>Highest frequency during early and late months of year. Also high just prior to, and following vacation period.</td>
</tr>
<tr>
<td><strong>By age of student</strong></td>
<td>Marked increase in frequency at age of 14, reaching peak at 15.</td>
</tr>
<tr>
<td><strong>By type of school</strong></td>
<td>Only a slight increase in frequency in vocational trade school shops over industrial arts shops.</td>
</tr>
<tr>
<td><strong>By area of activity</strong></td>
<td>Hazardous work areas, as determined by frequency of accidents, as follows: woods, metals, transportation, communication, and graphic arts. (Most hazardous, first.)</td>
</tr>
<tr>
<td><strong>By hand tool</strong></td>
<td>Higher frequency of accidents in use of wood chisel than all other tools, combined. Other tools classified as especially dangerous: saw, knife, plane, hammer, file, and soldering iron.</td>
</tr>
<tr>
<td><strong>By machine tool</strong></td>
<td>Hazardous machines, as determined by frequency of accidents, as follows: jointer, circular saw, wood lathe, grinder, band saw, drill press, engine lathe. (Only most dangerous listed.)</td>
</tr>
<tr>
<td><strong>Machine tool versus hand tool</strong></td>
<td>Hand tool accidents twice as numerous as machine tool accidents. Machine tool accidents more serious.</td>
</tr>
<tr>
<td><strong>By size of class</strong></td>
<td>Accidents tend to increase with shop enrollment, up to 25, then the number of accidents decreases as size of class continues to increase.</td>
</tr>
<tr>
<td><strong>By experience of student</strong></td>
<td>First few weeks of experience most dangerous period.</td>
</tr>
<tr>
<td><strong>By intelligence</strong></td>
<td>Relationship between intelligence and accidents is in an inverse ratio. Strong tendency of lower intelligence groups to be accident repeaters.</td>
</tr>
</tbody>
</table>

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1 Safety Education in The School Shop, Chicago: National Safety Council, Inc. 1944.
APPENDIX B

A LIST OF PLAYS FOR SHOP-SAFETY PROGRAM.

"Court of Accident Investigation" by G. E. McClain, National Safety Council, Chicago, Illinois.


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APPENDIX C

RADIO PLAYS AND SCRIPTS

"Cheating the Reaper", Radio Script Exchange, American Red Cross, Washington, D. C.

"Death on the Highway", Radio Script Exchange, American Red Cross, Washington, D. C.


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APPENDIX D

COURSES OF STUDY IN SHOP-SAFETY


Michigan, Safety Education in the School Shop, Bulletin No. 226, Lansing, 1931, 10 pp.


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