



8-1953

A Proposed Course of Study in Safety for Industrial Education Students

Richard Edgar Gannaway
University of Tennessee, Knoxville

Follow this and additional works at: https://trace.tennessee.edu/utk_gradthes



Part of the [Education Commons](#)

Recommended Citation

Gannaway, Richard Edgar, "A Proposed Course of Study in Safety for Industrial Education Students. " Master's Thesis, University of Tennessee, 1953.
https://trace.tennessee.edu/utk_gradthes/4388

This Thesis is brought to you for free and open access by the Graduate School at TRACE: Tennessee Research and Creative Exchange. It has been accepted for inclusion in Masters Theses by an authorized administrator of TRACE: Tennessee Research and Creative Exchange. For more information, please contact trace@utk.edu.

To the Graduate Council:

I am submitting herewith a thesis written by Richard Edgar Gannaway entitled "A Proposed Course of Study in Safety for Industrial Education Students." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Education.

Clyde H. Wilson, Major Professor

We have read this thesis and recommend its acceptance:

F. A. Van Eynde, James N. Luton

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

August 12, 1953

To the Graduate Council:

I am submitting herewith a thesis written by Richard Edgar Gannaway entitled "A Proposed Course of Study in Safety for Industrial Education Students." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Industrial Education.

Clyde Nelson

Major Professor

We have read this thesis
and recommend its acceptance:

J.A. Van Eynde

James N. Luton

Accepted for the Council:

E.H. Waters

Dean of the Graduate School

A PROPOSED COURSE OF STUDY IN SAFETY FOR
INDUSTRIAL EDUCATION STUDENTS

2
33

A THESIS

Submitted to
The Graduate Council
of
The University of Tennessee
in
Partial Fulfillment of the Requirements
for the degree of
Master of Science

by
Richard Edgar Gannaway

August 1953

ACKNOWLEDGMENT

The writer is happy to take this opportunity to acknowledge his appreciation to those who have made this study possible. First, many thanks go to the Government of the United States, which was of great financial assistance, through Public Law 346, known as the G. I. Bill of Rights. He is indeed indebted to Professor Clyde H. Wilson, Head of the Department of Industrial Education, University of Tennessee, for his inexhaustible time and advice. The writer would also like to thank his wife, Bristol Smith Gannaway, for her encouragement and assistance.

R. E. G.

TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION	1
Statement of the problem	1
Limitations	2
Related studies	3
Need for this study	6
Source of data	8
II. BRIEF HISTORY OF SAFETY IN INDUSTRY . . .	9
Introduction	9
Early factory conditions in England . .	10
Early conditions in America	11
Early legislation	12
Workmen's Compensation Laws	13
National Safety Council	14
Other organizations rendering safety service	15
Summary	16
III. THE TEACHER'S PROTECTION AGAINST LIABILITY SUITS	18
Introduction	18
School boards not liable	19

CHAPTER

PAGE

III. (continued)

Preparing for accidents 20

Using safety forms and tests for
protection 22

Precautions against negligence 27

Recent movement for teacher
protection 31

Summary 32

IV. ORGANIZING AND OPERATING THE SCHOOL

SHOP SAFETY PROGRAM 33

Introduction 33

Preliminary steps for installing the
organization 34

How to organize a personnel
organization 35

Features of a personnel organization 36

Duties of the safety foreman 37

Other safety inspection services
available to schools 41

Written instructions on safety 41

Analysis of accidents 43

Keeping records of accidents in
school shops 48

CHAPTER	PAGE
IV. (continued)	
Summary	50
V. SUGGESTED SAFETY RULES FOR THE WOODWORK	
AND MACHINE SHOPS	54
Introduction	54
General safety rules for all shops . . .	55
Accidents on woodworking machines . . .	58
General safety rules for woodworking	
shop	60
Circular saw	61
Jointer	62
Planer	63
Bandsaw	63
Mortiser	63
Lathes	63
Grinder	64
Tenoner	64
Belt sander	64
General rules for machine shop	65
Safety rules for the lathe	68
The shaper	69
The milling machine	70
The planer	70

CHAPTER	PAGE
	vi
V. (continued)	
The grinder	72
The drill press	73
Supplemental aids for teaching safety. .	74
Visual aids in teaching safety	75
Posters	76
Movies on safety	76
Film strips	77
Photographs	78
Other aids	78
First aid	79
Summary	81
VI. SUMMARY AND RECOMMENDATIONS	83
Summary	83
Recommendations	85
BIBLIOGRAPHY.	87
APPENDIX.	91

LIST OF TABLES

TABLE	PAGE
I. Causes of Accidents-Mechanical	46
II. Causes of Accidents-Personal	47
III. Types or Kinds of Accidents	49
IV. Number of Machines and Frequency of Accidents Reported from 233 Schools From 1932-1936 Inclusive	59

LIST OF FIGURES

FIGURE	PAGE
1. Safety Form for Teacher's Protection	23
2. Sample Questions Taken From Safety Test. . .	26
3. A Typical Personnel Organization Chart . . .	38
4. School Shop Accident Report Form	51

CHAPTER I

INTRODUCTION

Statement of the Problem

The purpose of this study is an attempt to set up a course of study in safety for students of industrial education. It should be understood that industrial education students include potential teachers of industrial arts and vocational trade and industrial subjects.

The writer feels that safety education in most school shops is not emphasized as much as it should be and that more should be done to encourage safety education to those students who are planning to teach in the industrial education field. It is hoped that this study will be of help to present as well as future teachers of industrial education in discharging their responsibilities of explaining, organizing, and operating a safety program in the school shop.

Since one of the generally accepted objectives of both industrial arts and vocational industrial education is to encourage students to have basic facts about industry, the writer feels that the students should be taught safety standards that are commonly accepted by industry. It is realized that some differences will exist between the school shop safety program and an industrial safety program in

large industries where full time specialists are employed to operate the safety program.

Obviously, the first objective that all teachers should have in safety is the protection of the student, but the teacher should also be familiar with his own liability in case of an injury to a student. This phase of the study will also be included.

In the presentation of this study, major consideration will be given to the following questions: (1) Who is liable in case of an accident in the school shop, (2) how can a safety program be set up and operated in a school shop, (3) why should records be kept on accidents and what information should be obtained when an accident is caused, (4) what safety precautions should be taken with the usual types of wood-working machines, (5) what safety precautions should be taken with the usual types of metalworking machines, and (6) what material and medicine should be kept in the first aid cabinet.

Limitations

The problem of safety exists in practically every school activity in which the students are engaged, but a survey of all school safety problems is clearly beyond the scope of the study.

The chief concern of this study is safety education to industrial education students especially in woodworking and metalworking and no attempt will be made to cover separately every unit in an industrial education program. More emphasis will be given to the methods that authorities feel should be used by teachers of industrial education in organizing safety programs.

Due to the lack of record keeping in school shops, it is practically impossible to obtain accurate data on accidents and injuries in many school shops or in the school shops of the state as a whole. Space is devoted to this topic in a later chapter.

A committee on teacher liability for accidents in the school shop has been appointed by the American Industrial Arts Association to study the problem and work out details for its solution. At the time of this study, a report has not been made available and the results of the committee's study are not known.

Related Studies

The problem of safety in school shops and in industry is recognized by many school administrators, teachers, and leaders in industry. It is felt that there is still a big job to be done in safety. This is particularly true in school shops. There are several studies that have been made

in school shop safety which attack the problem in different ways.

A study of safety education in the secondary school, made by Stack in 1929 is of this nature.¹ Griffith in 1944 made a study in the evaluation of a safety course in the print shop. His study was based on data from state safety codes, insurance companies, and safety organizations.²

Studies in safety for the vocational schools have been made by Henig. Henig studied the causes of accidents in the Essex County, New York Vocational School for three years and set up a program for accident prevention.³ Miner made a study on how to teach safety in high school.⁴

More recent studies have been made by Dupin in 1945 which includes measures taken by supervisors, instructors and boards to reduce accidents.⁵ Another study in the

¹Herbert James Stack, Safety Education in the Secondary Schools, Educational Series, Volume IV (New York: National Bureau of Casualty and Surety Underwriters, 1929).

²H. O. Griffith, "Evaluation of a Course of Study in Safety for the School Print Shop" (Unpublished Masters' thesis, Stout Institute, 1944).

³Max S. Henig, Safety Education in the Vocational School, Vol. III (New York: National Bureau of Casualty and Surety Underwriters, 1928).

⁴Frances H. Miner, "How to Teach Safety in the High School" (Unpublished Master's thesis, University of Southern California, 1931).

⁵Hubart W. Dupin, "Safety in the School Shop" (Unpublished Master's thesis, Western Kentucky State College, 1945).

development of instructional tests in shop safety was made by Kranzusch in which tests were developed from illustrations of safe, unsafe, or irrelevant shop practices as judged by faculty members and graduate students of Iowa State College.⁶

Another study was made by Peregrine in which the legal liability of public school officials was studied. This study consisted of case histories that had been tried in Indiana.⁷

Judy made a study of the industrial arts shops in Iowa in which 726 accidents occurred in 252 shops. The principal value of this study is the fact that the need for shop safety education is very definitely established. Judy also studied the nature and causes of machine and hand tool accidents as well as first aid methods found in the school shops represented.⁸

Another related study was made by Humble which was an investigation of safety practices, safety provisions, and protection afforded pupils in school shops in the United States. Topics included are methods for safe guarding mechanical and physical equipment, safety practices for the

⁶Roy F. Kranzusch, "The Development of an Instructional Test in Shop Safety" (Unpublished Master's thesis, Iowa State College, 1941).

⁷Donald Peregrine, "The Legal Liability of Public School Officials in Civil Actions" (Unpublished Master's thesis, Purdue University, 1936).

⁸Wayne M. Judy, "Accidents and Safety Education in the Industrial Arts Shops of Iowa" (Unpublished Master's thesis, Iowa State College, 1932).

prevention of accidents and protection afforded injured pupils.⁹

The only related study that has been made at the University of Tennessee in the industrial education department was made by Lusk in which she set up a course of study in safety and hygiene for an all-day trade school. This study was a proposed program for each year of a four-year program in an all-day trade school.¹⁰

Need for This Study

Great progress has been made in the last twenty years in safety education. If the industrial education student is to be trained to teach other students or to go to industry, it seems logical that they should be trained in industrial safety. Students should be taught self-preservation and a good place to teach it is in the school shop.

Much valuable work has been done in some of the schools toward safety and this same work can be carried to all schools if school administrators and teachers are educated in safety. The administrator of a school shop should be familiar with liability laws in case accidents are caused.

⁹Milford Keith Humble, "Practices and Provisions for Protecting Pupils in School Shops" (Unpublished Ph. D. thesis, University of Missouri, 1937).

¹⁰Mary Katherine Harris Lusk, "A Proposed Course in Industrial Hygiene and Safety in An All-Day Trade School Program" (Unpublished Master's thesis, University of Tennessee, 1950).

The most important need for this study is to teach industrial education teachers how to protect the students under their guidance by employing recommended safety practices in the school shops.

Mays and Casberg pointed out these facts when they said:

Industry has long since accepted accident control in the factory as a major administrative function of management. The growing importance of safety as an instructional obligation of the public schools is rapidly becoming a matter of general public interest, but the administration of effective accident control in the school itself is lagging far behind that of industry.¹¹

It seems apparent from the above statement that much work needs to be done in teaching safety education in the schools. The school shop should be a place to develop the good habits in the students and to eliminate the bad.

The writer has had the privilege of visiting a number of shops during the past three years and talking with teachers of industrial subjects. It has been noticed in many school shops that safe practices are frequently being violated by the teacher as well as by the students. Violations were noticed particularly of the teacher leaving the shop while classes were in session and students using unguarded machines. It is to be expected that if the shop

¹¹Arthur B. Mays and Carl H. Casberg, School-Shop Administration (5th printing; Milwaukee: Bruce Publishing Company, 1950), p. 114.

teacher does not recognize safe procedures or does not care to use them, the student will not use safety precautions.

Source of Data

These data for this study were obtained through the National Safety Council, State of Tennessee Department of Labor, writers on the subject of "Shop Safety" and by personal visits to school shops and consultation with shop teachers. Many recent articles in industrial education magazines were consulted.

In making an inquiry into the liability of accidents in the school shops, a study was made of some legal cases decided in superior courts. Some data for this study were obtained from the University of Tennessee, College of Law library.

CHAPTER II

BRIEF HISTORY OF SAFETY IN INDUSTRY

Introduction

A brief review of industrial safety is included in order to note the steps that have been taken to improve safety conditions since the safety movement started. This brief review has been limited to items deemed to be of particular importance in their bearing on the present status of safety.

Due to the lack of record keeping in early times, there are no available means of determining the number of industrial accidents that happened prior to 1912. There is evidence that accident prevention was practiced in early times. Heinrich states that:

Since before the dawn of recorded history man has been distinguished by his industry. The homes of the cliff dwellers, the pyramids, ancient Chinese tapestries, and similar antiquities attest man's industry thousands of years ago. Because his desire for self-preservation and his fear of injury were no less strong then than they are now, accident prevention was undoubtedly practiced to some extent even in the earliest civilizations.¹

¹H. W. Heinrich, Industrial Accident Prevention (3d ed.; New York: McGraw-Hill Book Company, Inc., 1950), p. 416.

Until the industrial revolution, shortly after 1800, there were no large industries in the United States. Most activities were carried on either at home or in small shops. The United States was primarily an agricultural country and safety was actually left to each individual as self-preservation. Since England was the cradle of mechanized industry, it is expected that she would take the lead in organizing safety.

Heinrich states the following conditions existed in England in the early 1700's:

The birth of industrial power and of industrial safety were not simultaneous. The introduction of English workers to mechanized industry was accompanied by working and living conditions so bad as to defy adequate description. Debasement and social degradation came quickly in industrial centers. The population of Manchester grew to 200,000 though the city contained neither park nor playground. There was no system of water distribution, and workers were compelled after their day's work to go great distances for water and to wait in line with buckets.²

Early Factory Conditions in England

As was to be expected the factory conditions in England were poor. It was becoming apparent that something had to be done to improve the safety and welfare of the worker. Heinrich states that:

²Ibid., p. 417.

The social conditions were bad, but plant conditions were worse. Factories were little more than shacks. Light, ventilation, and sanitation in those low-ceilinged, narrow aisled structures were almost nonexistent. Rest rooms were unthought of. Two-thirds of the workers were women and children whose workday was from 12 to 14 hours. Machine guards were unknown. Occupational deaths and maimings were frequent.

Some governmental factory inspections were made in England as early as 1833, but it was not until early 1850 that actual improvements began to be made as a result of their recommendations. These efforts were the first attempts by government to improve industrial safety.³

Thus industrial safety began, and it is interesting to note the advances that have been made to protect the worker from working conditions that existed in those early times.

Early Conditions in America

According to Blake, America felt the effects of the industrial revolution about 100 years after England and experienced about the same conditions that England had gone through earlier. Massachusetts was beginning to develop textile industries. Workers were recruited from nearby farms, mostly women and young children. Many of the children were between the ages of six and ten years. America began to feel the need of industrial safety shortly after the civil war which ended in 1865.⁴

³Heinrich, loc. cit.

⁴Roland P. Blake, Industrial Safety (2d ed.; New York: Prentice-Hall, Inc., 1953), p. 12.

Early Legislation

Although the first legislation passed in the United States was a big step in the protection of the workers, the laws were not adequate in the light of later experiences.

Massachusetts was the leading state from an industrial point of view, and it is not surprising that it became the leader in industrial safety legislation. This leadership was due in large part to the humanitarian and social arguments voiced by the clergy and the press. In 1867, this state passed a law providing for the services of factory inspectors, and two years later it created the first bureau of labor statistics to study, among other things, the accident problem. Shortly after this, the same state established the ten-hour maximum working day for women. Then in 1877, the Massachusetts legislature voted to compel employers to put safeguards on hazardous machinery.

In 1885 Alabama passed an Employer's Liability Law, and Massachusetts did likewise in 1887. Although these laws were a long step in advance, since they made the employer liable for damages when workers were injured, they contained numerous loopholes. Chief of these were the so-called common law defenses: Contributory negligence, assumption of risk, and negligence of a fellow worker.⁵

It can be easily seen that at least one of these loopholes mentioned above could be used by the employer to prove his innocence. The law was a step forward but not very effective in protecting the worker.

⁵Ibid., p. 13.

Workmen's Compensation Laws

Probably the greatest step toward protecting the worker was taken when the workmen's compensation laws were passed in 1908. Blake points out that:

Dissatisfaction with the practical working of employer liability laws grew. Organized labor, the clergy, and the press campaigned vigorously for corrective action. This action came in the form of workmen's compensation legislation, whose basic principle is to require the employer to pay the injured worker's medical and hospital expenses, plus compensation intended to furnish him (and his dependents) at least a minimum subsistence during his period of disability.

The first compensation law was enacted by Congress in 1908, but the benefits were very meager, and they were limited to certain special cases of federal workers. The oldest law of its kind still in force in the United States was passed by New Jersey in 1911.⁶

The United States Labor Department states the following advantages of the Workmen's Compensation Laws over the Employer Liability Laws:

(1) Eliminates negligence as a factor in determining the right of an injured worker to receive benefits, by providing that the employer shall pay compensation to each worker injured in the course of his employment regardless of fault.

(2) Provide at least some medical care to repair the physical and/or mental harm caused by the injury and to hasten the return of the worker to his job.

(3) Establish a fairly exact method of computing the monetary benefits to be paid to an injured worker, tying the amount of the benefits to the wages of the injured man and providing a minimum benefit which is supposed to represent at least a subsistence income.

⁶Ibid., pp. 14.

(4) Provide that benefits shall continue at least during a period of readjustment in cases of permanent total disability and death, and in the more liberal acts, during the entire period of disability of the injured workman or the dependency of the widow and children of the deceased workman.⁷

National Safety Council

Although the National Safety Council is only one of a great number of similar organizations, it seems to be the largest and most active. It is beyond the scope of this study to include all the organizations that are promoting safety. The National Safety Council will be discussed and a number of other organizations will be mentioned. Heinrich describes the beginning of the National Safety Council in the following manner:

In 1912, in Milwaukee, Wisconsin, a small group of men interested in safety work gathered together under the Association of Iron and Steel Electrical Engineers, which had been founded in 1907. This group was composed of representatives of industrial corporations, government departments, insurance companies, and other interests, and they decided that by exchanging ideas on a cooperative basis, much greater headway could be made in the control of accident-producing conditions. From this meeting evolved the idea of a great National Association that would act as a clearinghouse for the best ideas in accident prevention. A larger convention was called in New York City for the following year, and

⁷U. S. Labor Department, Safety Subjects, Bulletin No. 67, Division of Labor Standards (Washington: Government Printing Office, 1946), p. 9.

at this meeting the National Council for Industrial Safety was formally organized. The first activities of the council were directed chiefly toward the reduction of industrial accidents. But, owing to the growth of the organization and the extension of its scope into the field of public safety, its name was changed in 1915 to the National Safety Council, and its constitution was altered to include a national program of public as well as industrial safety.⁸

There is no possible way to evaluate accurately how much the National Safety Council has contributed to safety, but experts in the safety field consider it a very worthwhile organization. Other than acting as a clearinghouse for accident reports, they publish several magazines and issue pamphlets and posters on safety.

Other Organizations Rendering Safety Service

There are a great number of organizations which provide specialized safety service. Some of the organizations as listed by Blake are:

- (1) American Society of Safety Engineers.
- (2) Associated General Contractors of America.
- (3) American Standards Association.
- (4) American Museum of Safety.
- (5) American Public Health Association.
- (6) American Mutual Alliance.
- (7) American Gas Association.
- (8) American Transit Association.
- (9) American Petroleum Institute.
- (10) American Railway Association.
- (11) Automobile Manufacturers Association.
- (12) American Industrial Hygiene Association.
- (13) Association of Casualty and Surety Companies.

⁸Heinrich, op. cit., p. 423.

- (14) Fire Mutuals.
- (15) International Association of Industrial Accident Boards and Commissions.
- (16) National Bureau of Standards.
- (17) Portland Cement Association.
- (18) State Safety Departments.
- (19) United States Department of Labor.
- (20) Underwriters' Laboratories, Inc.⁹

Space limitation does not permit a discussion of the above organizations but they are listed to show that a great number of such agencies do exist. These agencies are organized for the purpose of protecting people from accidents either on the job or in some instances off the job.

Summary

An attempt had been made to show the conditions that existed in the early history of safety and the steps that have been taken by the government and other interested organizations to protect the worker. Steps have been taken to relieve the worker of financial burdens in the cost of injuries as well as to make industry a safer place to work.

The factory inspection laws and the employer's liability laws which were among the first laws to be enacted proved to be inadequate in the light of later experiences. The Workmen's Compensation Laws, which were enacted in 1908, have probably contributed more toward the workers' protection than any of the previous laws.

⁹Roland P. Blake, Industrial Safety (2d ed.; New York: Prentice-Hall, Inc., 1953), p. 17.

There has been many organizations which have been set up for the promotion of safety in industry and for the public in general. Among these organizations the National Safety Council is probably the largest and most active. There is no accurate way of telling what each organization has contributed in safety service, but with the contributions of all, safety procedures and accident frequency have improved.

CHAPTER III

THE TEACHER'S PROTECTION AGAINST LIABILITY SUITS

Introduction

Anything that might be recommended to protect teachers from damages does not minimize the need and importance of a good safety program in the school shop. While the shop teacher's first responsibility is to insure safety and prevent injuries to the students under his direction, he should also be aware of his legal status in such matters.

It is felt that the teachers of industrial education should have some form of protection from costs and damages resulting from injuries in school shops. The foreman or supervisor in industry has protection from injuries to their workers through the Workman Compensation Act, which provides funds for medical expenses and compensation to the injured worker and/or his dependents. It is reasonable for the teacher to expect as much protection from injuries to students in the school shop as do foremen and supervisors in industry.

Obviously, the teacher should learn as much as possible about existing laws governing safety in the school shop.

These laws vary in different states, and the teacher should be familiar with the laws of the state in which he is employed.

In a recent article by Tischendorf on shop teacher liability he states:

There are relatively few accidents to pupils about the school which cause injuries requiring great expense for medical treatment. There are relatively few accidents for which teachers are held liable in court because of their negligence. These accidents are sufficiently numerous, however, to justify serious consideration by all states to provide the same protection for their teachers against liability as is true in several of our states.¹

School Boards Not Liable

Some may be of the opinion that if an accident is caused in the shop, the school board is liable. Tischendorf has this to say about it:

It has been well established that although an individual teacher may be liable for negligence or wrongs committed while in the exercise of his duty, the board of education most specifically is not liable. Therefore, the cost of defense of any legal action, together with the payment of damage, would rest exclusively with the teacher. There are, however, four states in which the school district may assume the teacher's cost in defending himself in court, and also may pay the

¹E. W. Tischendorf, "Shop Teacher Liability," School Shop, 12:11, February 1953.

damages awarded if the case is decided in favor of the plaintiff. The four states are Connecticut, California, New Jersey, and New York.

In the other 44 states, the school districts enjoy the sovereign right of immunity from liability for accidental injury to pupils while the pupils are under the jurisdiction of the school or any employees of the school district. It is in these states that the teacher is liable for the cost of defending himself in a legal action and for damages which might result from such action.²

The above statement does not mean that the teacher always has to pay for injuries. If it can be proved that the teacher was negligent, then he may be held liable and may have to pay the total cost imposed on him. When legal action is taken against a teacher, it is not always negligence, but often one of whether or not he can give evidence showing that he was not. If the teacher has not prepared for a possible accident, he may easily find himself with nothing but his own testimony for defense.

Preparing for Accidents

As has been pointed out previously, the entire program of safety must be based on the philosophy of prevention. The primary objective is to prevent injury to the pupil. In case of injury, the program must extend beyond the primary objective sufficiently to prevent a legal judgment against the teacher and the school district.

²Ibid., p. 11.

One method proposed is for the shop teacher to have some kind of written evidence, bearing the student's signature, that complete and thorough safety instruction has been given, and that the student participated in the safety program.

The essential points in any such plan are given by Rathbun as follows:

1. There must be written safety instructions which are available to the student at all times.
2. There must be proof that each student has studied the safety instructions.
3. The pupil should be tested by some form of written examination which bears the date and his signature.
4. The written examination should bear out evidence that the teacher has discussed all of the safety regulations in the presence of the pupil.
5. There should be evidence in the written examination that the pupil is familiar with all the technical terms, machine parts, etc., that are used in the safety instructions and in the teacher's demonstrations.
6. There should be an admission by the pupil to the effect that he has demonstrated his ability to use each machine in the presence of the teacher.
7. There should be a statement by the pupil to the effect that the teacher has demonstrated the use of each machine in the shop.
8. All tests and other forms of evidence of safety instruction should be kept on file as long as the pupil is in school.
9. In case of an accident, all evidence should be kept in a safe place until the injured person has reached legal age.

10. All material such as that suggested should be specific rather than general, and an individual record should be kept for each pupil rather than one record covering the program for an entire class or a group of pupils.³

Using Safety Forms and Tests for Protection

A form stating certain facts which the student is required to sign before using machines is a good method of providing proof that the pupil has completed the safety program. The form does not eliminate the test, but it does provide a more exact statement of the extent of the work covered.

The form shown in Figure 1, which can be printed on one page, is an example of what is being used in the safety program in a junior high school cabinet shop. It will be noted that the pupil may qualify to operate any number of machines. For example, after fulfilling the general requirements, which are mentioned on the form, the pupil may qualify to operate one machine at a time. This is a very important point of view of the fact that a demonstration is necessary by both the teacher and the pupil. Wholesale demonstrations are eliminated because this form makes it possible for the

³Jesse E. Rathbun, "Moral and Legal Aspects of Safety Education," Industrial Arts and Vocational Education, 35:380, November 1946.

SAFETY FORM^a

I have read the safety instructions regarding the operation of the following power-driven wood working machines. I fully understand the importance of these rules and regulations, and I am aware that the violation of any one of them is likely to cause injury to myself or others.

(-----) has demonstrated to me the proper method of using each machine named in the following list, and has pointed out the danger of violating any of the safety instructions. He has taught me how to avoid injury by observing the safety instructions and using the machines properly.

I have demonstrated my ability to use each of the machines named in the following list in the presence of (-----). I understand how to avoid injury through the proper use of the machine. I am confident that I can operate these machines without injury to myself or others.

(Name of each machine to be written in by the pupil only after he has completed his tests and other requirements regarding it.)

- | | | |
|-----|----------------|---------------------|
| 1. | -----Date----- | -----Signature----- |
| 2. | -----Date----- | -----Signature----- |
| 3. | -----Date----- | -----Signature----- |
| 4. | -----Date----- | -----Signature----- |
| 5. | -----Date----- | -----Signature----- |
| 6. | -----Date----- | -----Signature----- |
| 7. | -----Date----- | -----Signature----- |
| 8. | -----Date----- | -----Signature----- |
| 9. | -----Date----- | -----Signature----- |
| 10. | -----Date----- | -----Signature----- |
-

Figure 1. Safety form for teacher's protection

I have passed, 100 per cent, the written test covering the use of each of the above listed machines.

I hereby promise to observe the safety instructions and to follow the instructions given in the demonstrations.

I have read the above statements and I realize that my signature is proof that I have fulfilled all the requirements mentioned. I am not required to sign this statement. I may take woodwork and receive credit without using the machines. I understand that if I use a machine I do so at my own risk and because I wish to and not because I am required to.

Signature-----
Date-----

^aPortola Junior High School, San Francisco, California

pupil to wait until he has practical use for a machine before he asks for a demonstration, and he may wait until he can use his regular work to demonstrate his ability to operate the machine.⁴

The form in Figure 1 is used in conjunction with an objective test which covers conduct in the shop as well as all the safety instructions. Any number of questions can be included in the test without making it a laborious task since it is an objective type test. The test must be made up to meet the needs of the particular shop in which it is to be given. Sample questions of the test are given in Figure 2.

An argument often used against this type record according to Rathbun is:

The pupil cannot be legally obligated regardless of the method used. It is true that no agreement can be entered into with any pupil in the public schools which would tend to relieve the teacher of legal responsibility. Likewise, parents cannot sign a waiver relieving the teacher of legal responsibility in case of students injury. An all important point is the fact that there is no legal "out" in case the teacher is proved negligent. Then the entire plan for legal protection must center around an effort to be prepared to prove beyond a doubt that negligence was not the cause of the accident.⁵

⁴Form used in Safety Program, Portola Junior High School, San Francisco, California.

⁵Rathbun, op. cit., p. 380.

SAFETY TEST^a

Name -----

Bench No.-----

Period-----Grade-----

Directions: Write the proper answer in the parentheses. In most cases yes or no will answer the question. Do not guess.

- () 1. Should you use any machine at any time without permission?
- () 2. Are you allowed to make any adjustments when the machine is running?
- () 3. Is anyone except the operator allowed inside the safety lines?
- () 4. When operating the circular saw, are you allowed to push stock past the saw with your hands?
- () 5. Are you familiar with all the machine parts that are mentioned in the safety instructions and in this test?
- () 6. Has the teacher discussed with you or in your presence the safety instructions and why it is necessary to observe each?

Signature-----

Date-----

^aPortola Junior High School, San Francisco, California

Figure 2. Sample questions taken from safety test

Precautions Against Negligence

Certain practices engaged in by the teacher could easily be challenged if the occasion should arise. In case of question as to procedure on the part of the teacher, any irregularity is to be cited as damaging evidence. Deliberate acts of negligence are not going to be practiced by teachers, but there is a danger that certain practices to which teachers ordinarily give no thought could be cited as negligence. According to Rathbun the following precautions should be given consideration by every shop teacher:

1. Do not leave the shop with pupils working in it. Every shop teacher is aware of the fact that it is an act of gross negligence to leave a class unsupervised regardless of the purpose, but has equal consideration been given to the question of leaving a few trustworthy pupils in the shop during vacant periods or before and after school.
2. Do not permit power-driven machinery to be used while another teacher is in charge of your class. Frequently any teacher with a free period is sent to the shop while the regular teacher is called out on business. Lock the main power switch if this procedure is necessary.
3. Do not permit any equipment to be used which does not have the specific approval of the school board. Teachers frequently take personal equipment to the shop or permit pupils to do so. This practice is very convenient at times, but it can also prove disastrous. Ordinarily the teacher can depend upon the support of the school board in case legal charges are preferred, but such is not always the case if the teacher is operating the shop with private equipment.

4. Do not permit pupils to work in the shop except during regularly scheduled periods. It might prove embarrassing at times to try to explain why school shops are operating outside of school hours. Such procedure seldom has the approval of the school board, and any program not authorized by the school board is illegally conducted.
5. Do not permit a pupil from another class to work with machines even though he may be qualified to use them during his regular shop period. This involves such activities as making up lost time, project work in other classes, and extracurricular projects. If such procedure is necessary, the work should be done by pupils of the regular class.
6. Clubs and so-called activity periods should be limited to classes or groups officially scheduled to the shop. After-school clubs are a source of pleasure, but in case of a pupil injury the teacher may be left without any official support from higher authority.
7. Pupils should not be sent outside the shop to perform hazardous duties. Every shop teacher is familiar with the unreasonable demands for extra work around the building and on the grounds. This is particularly true in the smaller schools where maintenance and repair are not regularly provided for.
8. The course of study should not make the use of power-driven machines compulsory. Students should never be required to use machinery. Teachers should take particular care to make this clear to the pupils. It is surprising to see how many pupils get the idea that everyone is required to work with the machines in the shop. It would be disastrous if an injured boy came out with the argument that he did not want to use the machinery in the shop but was required to do so by the teacher.
9. Do not willingly allow a dangerous worker in your class. Occasionally a boy who is so irresponsible that the teacher cannot afford

- to run the risk of permitting him to mingle with the other students, enrolls in a shop class. Unfortunately teachers seldom are given the authority to exclude such pupils from the class. In such cases, the teacher should make a written report to the proper administrative authority who then must remove the pupil or assume full responsibility.
10. Do not neglect to make a written record of every injury occurring in the shop. This procedure often seems to be a nuisance, but it is very important that the teacher have complete details of every injury. In case of serious accident, names of witnesses should be included in the accident report. In cases where permanent injury is likely to result from the accident, records and evidence should be kept until after the injured person has attained the age of 21 years. There are known cases where the teacher has had to face legal action two times as the result of a single accident; once the injured boy's parents acting as his legal guardians and again by the boy himself after he had become 21 years of age.⁶

If the above items are given due consideration in a course of study in safety, it is possible that many acts of negligence will be eliminated by the prospective teachers. Item number one seems to be one of great importance. This precaution is one in which frequent violations have been noticed in school shops. The teacher should never leave students in the shop while any of them are operating power-driven equipment. If it becomes necessary to leave the shop, the power should be cut off and locked if necessary.

⁶Ibid., pp. 381-2.

The teacher should take every precaution in allowing the use of only that equipment which is provided by the school. If the student gets injured on some personal equipment, it is possible that an act of negligence may be proved against the teacher.

Frequently students like to work extra outside of their shop period or students from other classes want to do work in the shop. Neither of these practices should be permitted. It might be hard to justify why work is being allowed in the other than for regular classes set up by the school board.

Another violation which has been frequently observed is assigning duties to students outside the shop, which probably would be considered hazardous in case of an injury and a resulting suit. Precautions should be taken in assigning any student a job outside the shop, which is of a hazardous nature.

Occasionally a student may register for shop classes who are accident prone or too irresponsible. The teacher should note these cases as soon as possible. This type of student should not be permitted to enroll in a shop class where power-driven machines are being used, if a previous record is known.

Probably one of the most important precautions the teacher should take is recording the accidents when they are caused. If careful records are kept and studied, it is possible that many of the causes can be eliminated, many of them before another injury is caused.

In cases where serious injuries or permanent disability may result, the records should be kept on file until after the student has reached the age of 21. It is possible for legal action to be brought against the teacher by the student after the student has become 21 years old, even though legal action was taken by the student's parents.

If the prospective teacher is familiarized with the precautions listed above, and if they are followed in their teaching, it is felt that much progress will result in his liability protection.

Recent Movement for Teacher Protection

According to a recent issue of School Shop a national program, being sponsored by the American Industrial Arts Association, to obtain protection for all teachers from personal cost damages evolving from accidental injuries to pupils is under way. A committee has already been appointed to make a study of the teacher liability program.⁷ At the

⁷E. W. Tischendorf, "Shop Teacher Liability," School Shop, 12:11, February 1953.

time of this study no information was available as to the results of the study by the committee.

Summary

The question of legal responsibility relative to the safety program in the school shop can be divided into three phases; namely, safety instruction, safe working conditions, and practices engaged in by the teacher. Without question, the teacher could be negligent in any of these. In case of proved negligence, it is difficult for the teacher to defend himself successfully in any court. The problem confronting every shop teacher is to avoid any act of negligence by meeting the moral responsibility with which he is charged. It should be understood however that the teacher has not provided for legal protection by meeting his moral obligation. To make certain of legal protection the teacher must produce written evidence that the student has had sufficient safety instructions on all the machines that the student operates. The teacher should make sure that negligence can not be laid to him by taking necessary precautions against acts of negligence on the part of the teachers.

CHAPTER IV

ORGANIZING AND OPERATING THE SCHOOL SHOP SAFETY PROGRAM

Introduction

Since it is possible that many teachers will be called on to operate a program of safety, the suggested techniques and methods will be discussed. The easiest way to establish a personnel system is for the teacher to develop the plan in all its details and then present it to the class. This method is the fastest and can be used year after year, but it can never become the students' own plan. A more democratic method of class organization would seem to be desirable.

There are several different types of personnel organizations that are being used in the school shop. These organizations vary to fit the needs of different type shops and range from a mere clean-up schedule to an effective supplement to the teacher program. Any plan that is picked by a teacher should be as near like an industrial personnel organization as possible.¹

¹Gordon O. Wilber, Industrial Arts in General Education (Scranton, Pennsylvania: International Textbook Co., 1949), p. 195.

A true personnel plan, however, will have at least three major purposes:

1. To train for leadership and followership.
2. To explore industry.
3. To relieve the instructor of routine duties.²

The job title of "safety engineer" is usually included in the personnel organization, and it is this job which is of interest in this study.

This job should be rotated in order that every boy will have an opportunity to become acquainted with its responsibility.³

Preliminary Steps for Installing the Organization

For a safety program to be effective it must have the full support of the administration. There must be forceful, continuous executive leadership. The first step in getting the organization should be explaining the program to the administrators of the school shop in order to get their permission for such an organization and gain their support in operating the program.⁴

²Ibid., pp. 195-6.

³Safety Training for Vocational Schools and School Shops (Chicago: National Safety Council, 1938), p. 9.

⁴Roland P. Blake, Industrial Safety (2d ed.; New York: Prentice-Hall, Inc., 1953), p. 87.

If the school is large enough to require head or heads of departments, they should be consulted and asked to give wholehearted support to the program. It is possible that the department head will want the organizer of the program of safety to meet with the departmental group for a discussion of the plan. During this meeting many of the problems of the safety plan may be solved and cooperation may be gained with other members of the group in setting up the safety rules that are to be followed by everyone in the shop.⁵

How to Organize a Personnel Organization

The class-developed personnel plans are considered by some authorities to be the best method of developing an organization. According to Wilber this process of development gives excellent motivation for the study of various types of organizations within industry. This type plan will probably cause students to feel that it is their plan, and they will become more interested in such a plan.

The teacher should study plans of near-by plants and make this information available to the students who can set up their organization according to plans used in similar plants in industry. The teacher should act in a consultant's capacity to the students and explain the job titles. As

⁵Lonnie Gilliland, "Personnel Organization for the School Shop," Industrial Arts and Vocational Education, 35:292, September 1946.

much information as possible should be given the students about different types of personnel plans and how each one operates. A plan that will suit the shop best should be selected. If it is possible to make visits to different industries and study their personnel organizations, the students may be able to learn more about different plans that are used. If such trips are made they should be well planned and supervised by the teacher.⁶

Features of a Personnel Organization

Wilber has the following to say about the features of a personnel organization plan:

1. The plan should be developed from within the group (with the help and advice of the instructor), rather than imposed.
2. There should be a definite assumption of responsibility by certain members in the organization.
3. There should be a definite statement of the duties and responsibilities of each officer.
4. The personnel plan should be more than a mere clean-up schedule.
5. Officers should be changed when they have exhausted the educational possibilities of a given position.
6. Offices may be filled by election from the group, by appointment by the instructor, or by a regular system of promotion.
7. Major officers should be given an opportunity to meet and discuss problems of the personnel organization during class hours.⁷

⁶Wilber, op. cit., p. 197.

⁷Ibid., pp. 201-2.

The chart in Figure 3 is a typical chart of an organization which may be used in school shops. It should be noted that the instructor is the high authority, and under the instructor comes the student designated as superintendent. The only person with authority over the superintendent is the instructor. The instructor delegates authority to the superintendent to see that the other jobs are carried on satisfactorily. The librarian, tool room foreman, clean-up foreman, safety engineer and finishing foreman have equal authority in their own jobs and are responsible only to the superintendent. Each foreman is responsible for carrying out the duties that have been delegated to his particular job title.

Duties of the Safety Foreman

In large classes where it is impossible for the instructor to supervise each activity and where he does not have paid assistants, it has been found a good practice to train pupils, who display unusual ability, to act as safety foremen and safety engineers.⁸ Industry has used a plan similar to this for a number of years and has found that safe

⁸Roy G. Fales, "The Pupil Managed Shop," Industrial Arts and Vocational Education, 35:7, July 1933.

PERSONNEL ORGANIZATION CHART

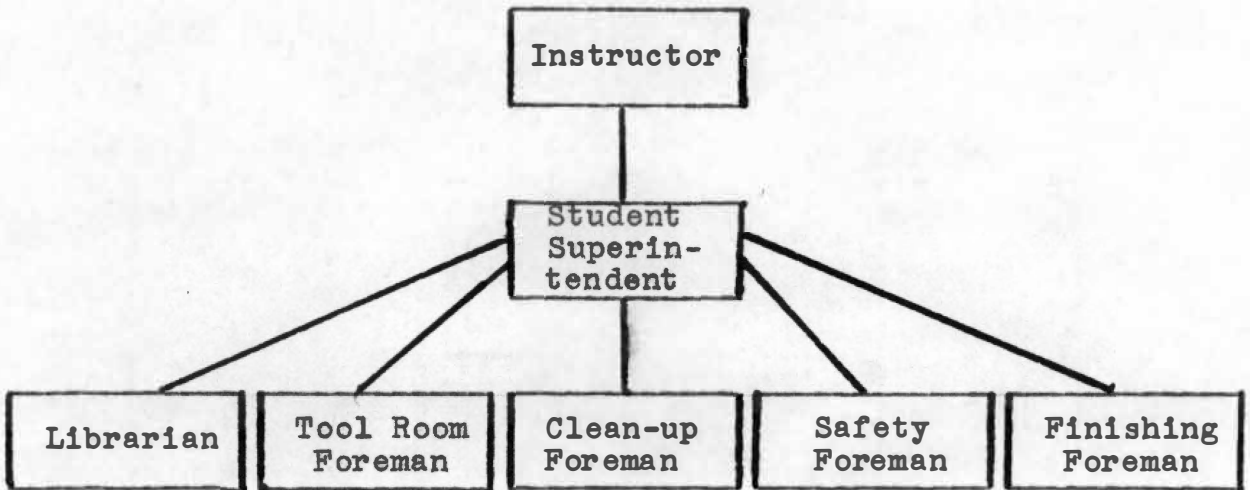


Figure 3. A typical personnel organization chart

working conditions are provided, and the number of accidents is reduced.⁹

The duties which are assigned to student assistants with respect to safety should be specific and should be worked out in advance by the teacher. An excellent example of this is found in some of the Detroit schools; obviously, in a safety program the listing of responsibilities for the safety foreman is of prime importance:

1. See that all neckties are removed or tucked in.
2. See that sleeves are rolled up.
3. See that aprons are worn, whenever possible.
4. See that goggles are worn at the grinder.
5. Set the tool rest on the grinder.
6. See that tools are kept off the floor.
7. See that oil is wiped up off the floor.
8. See that oily rags are placed in the covered metal containers.
9. See that there are no mushroomed tools used.
10. See that no files are used without handles.
11. Inspect the first aid cabinet.
12. See that all cuts are properly dressed.
13. Prevent "horseplay" in the shop.
14. See that finger rings are removed.
15. See that the crib boy does not give out any defective tools.
16. See that no safety guards are removed from the machines.
17. See that no pieces of hot metal are lying around unmarked.
18. See that a machine operator does not walk away from his machine while it is running.

⁹Curtis Billings, "Making the School Shop Safe," Industrial Arts and Vocational Education, 22:377-8, December 1933.

19. See that belts on a countershaft are shifted with a belt stick.
20. See that lathes are stopped before shifting the belts on the spindle cones.
21. See that no rags are used around the machines while the main power switch is on.
22. See that work on the drill press is held in a vise or firmly clamped.
23. See that boys do not stand directly in front of the grinding wheel.
24. See that every machine is released before throwing the main power switch on.
25. Report all accidents to the instructor and make out accident reports to be handed to the instructor.
26. Report any infraction of the "Safety Rules and Regulations," or any other unsafe practices that come to his attention.
27. In his notebook, the safety engineer shall tell each day what he did to prevent accidents.¹⁰

It may be desirable or even become necessary in some instances to divide the above listed duties of the safety foreman into smaller groups and delegate other students to see that the safety rules are enforced. Those safety rules which pertain to hand tools may be enforced or checked by the tool room foreman. It is obvious that many of the rules for using hand tools could be controlled from the tool room.

The rules pertaining to personal dress and housekeeping may be grouped together and assigned to a student. Those rules pertaining to power-driven machines may be assigned to another student. Regardless of how the safety rules are

¹⁰Ibid., p. 379.

divided and assigned to individual students, all students should report any infraction of the safety rules.

Other Safety Inspection Services Available to Schools

There are other sources that can be of assistance in operating the safety program. It is not expected for the teacher to be an expert in the field of safety engineering; therefore, a competent inspector should be used periodically to inspect the building and machines thoroughly. Some large schools employ a regular safety engineer for this purpose, but these services can usually be obtained through the state safety inspector by asking for their assistance.

Manufacturers of school shop equipment are usually very cooperative in assisting schools in safeguarding equipment. They have developed guards for many old power tools as well as new ones. They can also provide excellent written material and drawings that may be used in teaching the proper and safe methods of operating machines.

Written Instructions on Safety

It is important that pupils appreciate the dangers involved in the use of machines and that they know the rules and practices necessary in avoiding them.

All accidents in which the school may be divided into two general classes: (1) Those caused by faulty

conditions of the room and the equipment; and (2) those caused by inefficient instructions and management.¹¹

Written instructions on safety practices are used in many schools, but this is not universal. One hundred and seven of 223 teachers reporting on a study made by Humble used some type of written safety instructions. Many teachers realize the importance of written instructions. Other teachers have become discouraged because of the difficulties and work involved in preparing written instructions.¹²

Selvidge and Fryklund point out certain advantages for the use of written instructions as a method of teaching. These advantages may be summarized as follows:

1. The teacher has sufficient time to carefully select instructional material.
2. The instructions may be examined and arranged in the most effective learning order.
3. Written instructions are more brief and more accurate than oral instructions.
4. Written instructions are permanent in form.
5. The responsibility for learning the material is placed on the pupil, where it belongs.
6. The student develops a sense of responsibility and self-reliance through using them.
7. They are less expensive than oral instructions.
8. The teacher who uses them has more time for oral instructions, when it is needed.¹³

¹¹E. E. Ericson, Teaching Problems in Industrial Arts (Peoria, Illinois: The Manual Arts Press, 1930), p. 192.

¹²Milford Keith Humble, "Practices and Provisions for Protecting Pupils in School Shops" (Unpublished Ph. D. thesis, University of Missouri, 1937).

¹³R. W. Selvidge and Verne C. Fryklund, Principles of Trade and Industrial Teaching (Peoria, Illinois: The Manual Arts Press, 1930), p. 127.

The teacher should make an analysis of the operation of each machine and list in order the things which should be known by the pupils in operating the machine safely. This list should be used in developing specific instructional material.

Analysis of Accidents

Several types of forms that are used to record accidents and other pertinent information are being used in school shops. There seems to be no standard form and no standard definitions for all the terminology used in recording accidents. Some authorities include anything that interrupts the orderly procedure of work as an accident and others say that an accident has to cause an injury or property damage.

In order to understand the terms used by industry in recording accidents, the following terms will be defined using the National Safety Council definition:

1. Accident
2. Accident type
3. Agency
4. Disabling injury
5. Frequency rate
6. Severity rate
7. Man-hours
8. Injury
9. Unsafe Act

These terms are the ones believed to be used most frequently in reporting accidents in the school shops, written articles and statistical data pertaining to accidents.

1. Accident includes any suddenly occurring unintentional event which causes injury or property damage.
2. Accident type usually describes the event leading to injury or property damage.
3. Agency or Agent is the principal object, such as tool, machine or equipment, involved in the accident, and is usually the object inflicting injury or property damage.
4. Disabling injury is an injury causing death, permanent disability or any degree of temporary total disability.
5. Frequency rate is the number of disabling occupational injuries per million man-hours exposure.
6. Severity rate is the total of time charges for occupational injuries per thousand man-hours of exposure. Time charges include actual calendar days of disability resulting from temporary total injuries and scheduled charges for deaths and permanent disabilities. These latter charges are based on 6,000 days for a death, with proportionally few days for permanent disabilities of varying degrees of seriousness.
7. Man-hours are the total number of hours worked by all employees of an industrial organization or an industry. The man-hour is the equivalent of one man working for one hour.
8. Injury implies generally a death, permanent disability or temporary total disability.
9. Unsafe act is that violation of a commonly-accepted safe procedure which resulted in the selected accident type.¹⁴

¹⁴Accident Facts (Chicago: National Safety Council, 1953), p. I.

If a person is injured because of a fall, the fall is the accident, the bruise or fracture that follows is the injury, and the reason for the fall is the cause. An accident may have several causes. The person receiving the injury may have fallen over a box in an aisle, and he may have been acting unsafely by running in the aisle. The injured may have poor eyesight, or illumination could have been inadequate. Any of these items would come under the "cause of accident" column.¹⁵

Also listed as accident causes are such items as lack of protective clothing or lack of guards. Correcting these conditions will not prevent an accident from happening but will minimize or remove the possibility of injury if an accident does occur. Causes may be subdivided into mechanical and material faults, unsafe acts of persons, and the reasons why these conditions exist. These divisions should be listed separately. Causes of accidents are listed in Table I and Table II.¹⁶

Before there is an injury there is an accident--such as the fall of a person or an object, or coming in contact

¹⁵Safety Training for Vocational Schools and School Shops (Chicago: National Safety Council, 1938), p. 21

¹⁶Ibid., p. 21.

TABLE I

CAUSES OF ACCIDENTS-MECHANICAL^a

-
-
1. Improperly guarded
 - a. Unguarded
 - b. Inadequately guarded
 2. Defective
 - a. Rough
 - b. Slippery
 - c. Sharp edged
 - d. Poorly designed
 - e. Low material strength
 - f. Poorly constructed
 - g. Inferior composition
 - h. Decayed, broken, frayed, worn, cracked, etc.
 3. Hazardous arrangement, procedure, etc.
 - a. Unsafely stored or piled
 - b. Congestion of working spaced
 - c. Inadequate aisle space, exits, etc.
 - d. Unsafe planning and/or layout of traffic or process operations
 - e. Unsafe processes
 - f. Overloading
 - g. Misaligning
 4. Improper Illumination
 - a. Insufficient light
 - b. Glare
 - c. Unsuitable location or arrangement (producing improper shadows or cotracts)
 5. Improper ventilation
 - a. Insufficient air changes
 - b. Unsuitable location or arrangement of system
 - c. Impure air source
 6. Unsafe dress or apparel (of the person injured)
 - a. Goggles (none or unsafe design)
 - b. Gloves (none or unsafe design)
 - c. Aprons (none or unsafe design)
 - d. Shoes (defective or unsafe design)
 - e. Respirators (defective or unsafe design)
 - f. High heels
 - g. Loose hair
 - h. Loose clothing
 - i. Inadequately clothed
-
-

^a"Safety Training for Vocational Schools and School Shops" (Chicago: National Safety Council, 1938), p. 25.

TABLE II

CAUSES OF ACCIDENTS-PERSONAL^a

-
-
1. Improper attitude (mental defects or disturbances)
 - a. Willful disregard of instruction
 - b. Violent temper
 - c. Recklessness
 - d. Distraction
 - e. Abstraction
 - f. Sluggish mental reaction
 - g. Nervousness, excitability, etc.
 2. Lack of knowledge or skill
 - a. Unaware of safe practice
 - b. Unpracticed or unskilled
 3. Bodily defects
 - a. Eyesight
 - b. Hearing
 - c. Weakness--muscular
 - d. Fatigue
 - e. Existing hernia
 - f. Sluggish physical reaction
 - g. Crippled
 - h. Existing heart trouble or other organic weakness
-
-

^aIbid., p. 26.

with a machine. This is commonly called the "type" of accident. Before the type, there is in every case either unsafe act of a person, or an unsafe physical or mechanical condition which permits the accident to happen. The types of accidents are listed in Table III.¹⁷

Keeping Records of Accidents in School Shops

Elaborate record keeping is not practicable in most school shops. Nevertheless, it is a good plan to include enough in the records that the causes of accidents can be studied and eliminated. Every accident, regardless of whether or not it causes injuries, should be reported. Circumstances associated with minor injuries are frequently similar to those of serious injuries.¹⁸

Such records enable an administrator to measure the effectiveness of his safety program, and they point clearly to neglected points of danger. This record will also show where emphasis in instruction and inspection should be placed. These reports should be studied promptly by the administrator or a safety committee and summarized statistically at the end of the semester. The accident causes should be recognized and if due to mechanical causes, immediate steps should be made to correct the cause. Every accident should be

¹⁷Ibid., p. 22.

¹⁸Ibid., p. 27.

TABLE III

TYPES OR KINDS OF ACCIDENTS^a

-
-
1. Inhalation, absorption or swallowing (as in asphyxiation, shock).
 2. Falls on level.
 3. Falls--one level to another.
 4. Slips (not falls) such as might result in strains, hernias, etc.
 5. Struck by falling, flying, sliding, or moving objects.
 6. Caught in or between (as in machinery).
 7. Contacts that produce burning or scalding.
 8. Striking against--contacts with sharp or rough objects which produce cuts, slivers, punctures, etc.
-
-

^aIbid., p. 24.

recorded in detail and kept as part of the permanent shop records.¹⁹

A form suggested by the National Safety Council is shown in Figure 4.

Summary

Industrial education students should have a working knowledge of different types of personnel organizations used in industry. They should know how the plans can be organized in a school shop and how to operate the plan after it has been inaugurated.

Duties of each job title should be assigned by the teacher and these duties should be used in classes for class discussions. Students should be familiar with outside agencies that are willing to give expert assistance to the safety program.

Written instruction should be worked up by the teacher and each student must be given a set of instructions. These written instructions should be used in the course of study and gone over thoroughly during class periods.

Whenever an accident occurs or a student receives an injury, it is a good policy to analyze the accident from all possible angles so that intelligent action can be taken to

¹⁹Arthur B. Mays and Carl H. Casberg, School Shop Administration (Milwaukee: The Bruce Publishing Company, 1950), p. 125.

SCHOOL SHOP ACCIDENT REPORT FORM^a

Preliminary Accident Report

(To be filled out by employee's supervisor or student's instructor and sent to central safety committee-----Building, Room-----).

When did accident occur? Date-----19---Time-----A.M.
P.M.

Did injured person stop work? Date---19--Time-----A.M.
P.M.

Name of injured person-----

Student or employee-----
(Student course)

First aid given by whom?-----

Employee Occupation-----

What was he doing when injured-----

Has he been instructed regarding hazards of his job?--
By whom?-----When?-----

What is the nature of his injuries?-----

Where did accident occur?-----

What agency (machine, tool, appliance, etc.) was involved?-----

Was it guarded?-----

Figure 4. School shop accident report form

Was accident due to defective condition of property,
floors, stairs, etc.?-----

Describe-----

Describe how accident occurred-----

Did you see the accident?-----Who else saw it?-----

1.----- 2.-----
(Name) (Name)

3.----- 4.-----
(Name) (Name)

What can be done to prevent a recurrence of a similar
accident?-----

Date-----19--- Signed by-----
(Instructor)

^aArthur B. Mays and Carl H. Casberg, School Shop
Administration (Milwaukee: The Bruce Publishing Company,
1950), p. 125.

Figure 4. School shop accident report form (continued)

prevent recurrences. The terminology used by industry in recording accidents should be understood and used by the teacher or anyone recording or analyzing accidents.

The causes of accidents may be grouped into two major causes, namely, mechanical or material faults and personal faults. Studies of these causes will probably give a better understanding of why accidents are caused.

An elaborate record keeping system is not required in the school shop such as those used in industry, but enough should be recorded about accidents that they can be of value in eliminating other accidents by correcting the causes. Records of permanent injuries should become a part of the permanent records of the school just in case legal action is attempted on the part of the guardian of the student or the student when he becomes 21 years of age.

CHAPTER V

SUGGESTED SAFETY RULES FOR THE WOODWORK AND MACHINE SHOPS

Introduction

One effective method of teaching safety in the school shop and in industry is by the use of a booklet containing safety rules that are applicable to the shop in general and safety rules that apply to a particular machine.

This method is used by the Los Angeles, California school district. The booklets are issued to each student, and the safety rules are used for class discussions.¹

Safety is not learned by just memorizing codes and slogans. Students are eager to find out facts by experimentation. It is apparent that safety instructions should not stop with the issuance of a booklet containing the safety rules and regulations, but it should be stressed continuously.² It is said that proper instructions can reduce the possibility

¹Safety-Vocational and Industrial Arts, Los Angeles City School District, Division of Instruction and Curriculum. Vocational and Practical Arts. School Publication No. 290.

²Chris H. Groneman, "Safety in the School Shop," Industrial Arts and Vocational Education, 40:26A, May 1951.

of accidents by 20 per cent. Most accidents are the result of negligence on observing the proper cautions, or they are due to failure of proper instructions.³

General Safety Rules for All Shops

The following general safety regulations which apply to both instructor and students are to be used for class discussion at the time instruction is given in the use of hand tools, machines, and miscellaneous equipment.

1. Students should be cautioned not to use power-driven machines until they have received proper safety test. After these preliminary steps, the instructor should give close supervision to each student during his first experiences in the operation of hazardous equipment.
2. Power-driven machines must not be operated while the instructor is out of the room.
3. The instructor should personally supervise each student in his first attempt to operate hazardous equipment.
4. All safety guards must be kept in proper position while the machines are being operated. If guards are out of order, the machines must be closed down and fuses removed.
5. If a student finds a machine out of adjustment or in need of repair, he should report it immediately to the instructor. In no case should it be operated.
6. Special set-ups may be made with the approval of the instructor and must be checked by him before the power is turned on.
7. The operator is responsible for seeing that all students are clear of machines before power is turned on.
8. Only one boy who is operating a machine is allowed within the safety lines painted on the floor.

³Ibid., p. 28A.

General Safety Rules for All Shops (continued)

- Other boys must not talk to him or distract his attention in any way.
9. No adjustment should be made on a machine until it has come to a dead stop.
 10. Students should be warned not to start or stop a machine for another.
 11. The power should always be shut off after a job has been completed on a machine. The operator must not leave the machine until it has come to a dead stop.
 12. Belts must not be shifted from one pulley to another by hand. If a shifter is not available, a hammer handle or stick should be used.
 13. Machines must not be used for trivial operations.
 14. Hand tools are dangerous unless properly used. Students should study the safety precautions covering their use.
 15. A student should notify his teacher whenever he sees anyone violating shop safety orders. This should not be considered "snitching," it may save another serious injury.
 16. Instructors should draw the attention of students to the hazards involved in the careless handling of tools at the tool room window and the piling of tools on the tool room issue shelf.
 17. Goggles shall be worn by instructors and students while pouring molten metal.
 18. Celluoid visors shall not be worn in the school shop.
 19. Loose neckties, sleeves, aprons, et cetera, must be securely fastened or removed before operating any machine. Long hair is also a hazard and, like loose clothing, may become entangled in moving parts.
 20. Gloves shall not be worn while operating power machines.
 21. It is advisable to remove finger rings when operating power machines.
 22. Tools and materials should not be allowed to project out over the edge of work benches. Students in passing may injure themselves.
 23. The floor space around a machine must be kept clear. Materials and waste must not be permitted to accumulate on or near a machine.

General Safety Rules for All Shops (continued)

24. Attention should be called to the danger involved in using dull tools, machine cutters, saws, et cetera.
25. Instructors should warn boys not to attempt to lift heavy equipment or material about the shop.
26. Highly nervous or irresponsible boys should not be allowed to use hazardous equipment.
27. Students in the seventh, eighth, and ninth grades shall not be permitted to use the circular saw, band saw, jointer and welding equipment.
28. Gasoline, kerosene, alcohol, shellac, and paints must never be used or stored near an open flame.
29. Rags that contain lindseed oil, gasoline, alcohol, shellac, paint, varnish, or lacquer should be kept in a metal covered receptacle.
30. Only safety matches shall be used in the school shop.
31. Playing or scuffling in the shop is extremely dangerous and consequently is absolutely forbidden.
32. If a student receives an injury, no matter how slight, he should report it at once to his instructor.
33. No student shall be allowed to test a car away from shop without the permission of the principal.⁴

The 33 general safety rules listed above apply to all shops in the school, where power-driven machines are being used. There may be other rules which should be added to fit individual needs of specific shops. Some of these rules have been discussed in earlier chapters.

⁴Safety-Vocational and Industrial Arts, op. cit.,
pp. 9-12.

After a study of the rules has been made in the class and tests have been given and passed 100 per cent, the teacher should demonstrate the operations to the student before he is allowed to operate the dangerous machines. If machines are not properly guarded or they are out of adjustment, dull, or in need of service, they should be rendered inoperative by removing the fuse which controls the machine.

Considerable emphasis should be put on the importance of keeping only the operator of the machine near it when an operation is being performed on the machine. The wearing of safe clothing for any particular job should be stressed by the teacher. Other topics for class discussion on the safety rules should include good housekeeping, proper attitude in the shop, and reporting all accidents.

Accidents on Woodworking Machines

According to a study made by Lange of power woodworking machines, it was found that the greatest number of accidents reported were from using the jointer. Table IV shows the number of machines and the number of accidents reported from the machines. It is interesting to note that the most dangerous machines studied are the jointer, table saw, and band saw. It should be noted that the number of lathes studied was 516 and only 19 accidents reported. Sixteen accidents were reported from using the grinder (from the use

TABLE IV

NUMBER OF MACHINES AND FREQUENCY OF ACCIDENTS
 REPORTED FROM 233 SCHOOLS FROM
 1932-1936 INCLUSIVE^a

Name of Machine	Number of Machines	Number of Accidents Reported
Jointer	172	92
Table Saw	197	69
Band Saw	162	25
Wood Lathe	516	19
Grinder	198	16
Jig Saw	69	11
Drill Press	130	6
Mortiser	60	2
Shaper	75	2
Tenoner	10	2
Buffer	28	1
Job Press	28	1
Disc Sander	9	1
Belt Sander	37	1
Total	1669	248

^aFred G. Lange, Handbook of Safety and Accident Prevention (Peoria, Illinois: Manual Arts Press, 1926), p. 88.

of 198 grinders, therefore the percentage of accidents is greater on the grinder than on the lathes.

According to this study, more emphasis should be allotted to the protection of students when they are operating these machines. The jointer, shaper, and the table saw are considered by many authorities as being the most dangerous power tools used in the school shop.⁵

General Safety Rules for Woodworking Shop

In Pasadena, California, safety rules for use in each type of shop are printed in separate booklets. General safety rules, as well as specific safety rules, are included in each booklet. Each student is provided a blank which he is to sign when he feels he understands all the rules and regulations. The score the student makes on the safety test is also entered on this blank.

A copy of the general rules pertaining to all shops and to specific machines are given.⁶

1. Students must not use woodworking machines before they have had proper instructions by the shop teacher.
2. All safety guards must be kept in place while machines are being operated.
3. Machines must not be operated while instructor is out of the room.

⁵Roland P. Blake, Industrial Safety (3d ed.; New York: Prentice-Hall, Inc., 1953), p. 248.

⁶Safety Book, Public Schools of Pasadena, California.

General Safety Rules for Woodworking Shop (continued)

4. Wrenches and all other tools must be removed from machines before power is turned on.
5. When making special set-ups, be sure that all adjustments are securely fastened. All special set-ups must be checked by instructor.
6. Loose neckties, loose sleeves, and loose aprons must be fastened or removed before operating machine.
7. All boys not operating machines must stay outside of white lines painted on floor.
8. Students must not distract attention of boys using machines. Students must not allow their attention to be diverted while operating any machine.
9. Power should always be shut off before leaving machine.
10. Machines should not be used for trivial operations. Instructor's permission should be secured before turning on power.
11. In case of any accident, no matter how trivial, report at once to instructor in charge.
12. No one is permitted to operate machines except students regularly enrolled in woodworking classes.

Circular Saw

1. The guard must be kept down over the saw while the machine is being operated.
2. The saw must not project above the stock more than one-fourth inch while making cut.
3. A push stick must be used when ripping stock less than six inches wide, unless stock is reversed.
4. In ripping narrow, short stock, rip part way through, reverse, and finish.
5. The splitter guard must be in place when ripping.
6. The clearance block must be in place when cutting off stock against fence.
7. Sliding table must be locked except when in use.
8. Fingers must be kept clear of track of saw, and hands never allowed to cross saw line while machine is in operation.

Circular Saw (continued)

9. All special set-ups and dado heads must be inspected by instructor before power is turned on.
10. Students must never attempt to clear away scraps close to the saw with their fingers. If necessary to remove the scraps, they should be pushed away with a stick about two feet long.
11. The dado head must be taken off saw arbor after using.
12. Resawing must not be done without special permission of instructor.
13. Cylindrical stock must not be cut on circular saw.
14. Stock must not be ripped without using ripping gauge. Stock must not be cross-cut without using cut-off gauge. This applies also to all dado head work.
15. Care must be taken in handling cut-off gauges, dado heads, and other removable equipment.

Jointer

1. Guards must be kept in place at all times when jointer is being operated.
2. Jointer must not be used for stock less than 12 inches long and two inches wide, or one inch thick.
3. A push stick must be used when jointing narrow or flat pieces of stock.
4. All special set-ups must be inspected by instructor before the jointer is started.
5. The flat side of a piece of stock must not be run over the jointer without special permission of the instructor.
6. The end grain of a piece of stock should never be run over the jointer without special permission of the instructor.

Planer

1. Planer table must never be raised or lowered while stock is being run through.
2. Stock must be fed into planer in such a way that hands do not come near feed rolls.
3. Never attempt to look into planer while stock is being run through.

Bandsaw

1. The saw guide must be adjusted to within one-half inch of work before saw is started.
2. The guide must not be adjusted while saw is in motion.
3. When cutting stock, students must not allow their fingers to come closer than two inches to saw.
4. Cylindrical stock must never be cut on bandsaw.
5. No stock should be cut on bandsaw that does not have sufficient flat side to rest on to prevent tipping.

Mortiser

1. See that the set screw holding the bit is securely tightened.
2. Remove wrench from the set screw, and see that door covering is closed.

Lathes

1. Students must not wear loose sleeves/or neckties while operating lathe.
2. Hands and arms must be kept clear of revolving parts.
3. Rough stock, or stock that is not cylindrical, must never be turned at a high speed.
4. Large diameter stock must never be run at a high speed.
5. The tool rest must be kept as close as possible to the stock being turned, but must not be adjusted until lathe is stopped.
6. The tail stock must be securely locked before lathe is started.

Grinder

1. When using grinder, see that safety glass is in place or else wear goggles.

Tenoner

1. When operating tenoner, stock must be securely held down in carriage.
2. Stock finishing less than eight inches between shoulders must not be run on tenoner.
3. When operating tenoner, great care must be taken to keep hands away from cutterheads.

Belt Sander

No special safety measures are necessary except to keep hands clear of belts.

There are other safety rules that could be added to the foregoing list for different machines in the woodwork shop. It is possible that the students could add additional rules to the ones mentioned for the specific machines and in this way, students may feel they have contributed more to the safety program.

It is possible that safety rules pertaining to all shops can be printed in the same booklet and issued to each student. Some schools use this method and other schools use individual booklets for each shop.

It is obvious that each shop needs a set of rules that should be followed in that particular shop. Due to space

limitations, no attempt will be made to include safety rules for each industrial education shop. Only those rules of a general nature and those relative to woodwork and metalwork will be given.

General Rules for Machine Shop

Many of the injuries that occur in industrial education shops, happen in the machine shops. The forepart of the rules for the machine shop deal with those of a general nature to be observed in the machine shop, while the other rules that follow deal with safety rules for specific machines that are usually found in a school machine shop. The following rules are of a general nature:⁷

1. Cultivate a machinist's attitude toward tools, machines, and operations.
2. Long sleeves and long ties are dangerous; they may catch in rapidly moving parts of a machine.
3. Do not wear gloves when working on moving machinery.
4. Remove safety guards only when the nature of the work demands that the guards be removed, and upon the approval of the instructor only.
5. Never operate machines when the instructor is not in the shop.
6. Do not wear rings.
7. Never attempt to stop a machine after the power has been turned off by catching the belt or by applying friction with the hand.
8. Oil machines at regular intervals. Break the main switch when so doing.
9. Check frequently all adjustments of bolts and nuts on all machinery.

⁷Louis Barocci, "Safety in the Machine Shop," Industrial Arts and Vocational Education, 39:218, May 1950.

General Rules for Machine Shop (continued)

10. Keep the floor free of oil and grease. Should grease or oil be dropped on the floor, cover it immediately with sand or sawdust.
11. Keep passageways clear of all obstacles.
12. Hand tools to one another; never throw them.
13. Insist that the shop always be lighted sufficiently and that it be well ventilated.
14. When repairs are being made on machinery, always break the current by removing the fuses or locking the switch.
15. When someone wishes to talk to the operator, shut off the machine at once.
16. Always place scraps and short length material in proper receptacles.
17. Do work on overhead machinery only under the direct supervision of the instructor.
18. Do not operate a machine with a creeping clutch.
19. Never take a chance with a dangerous operation. You may lose.
20. Always have spoke pulleys properly guarded.
21. Never hammer hardened steel surfaces together.
22. When using the hand drill, decrease the pressure and increase the speed when the drill commences to break through.
23. Before using hammer heads see that they are secure.
24. Always store waste and oily rags in a fire-proof receptacle.
25. Never permit chisels to become mushroomed; dress them frequently.
26. Never use a file without a handle. Insist on safety handles (the type which will not come off accidentally).
27. Watch your stance when lifting heavy material; lift with your legs, not your back.
28. In tightening vises, use hand power only.
29. When someone is standing in line with the flying material, do not cut off rivets or bolts.
30. Do not use defective tools or equipment. Keep everything in working order.
31. Never use belt fasteners on hand shifted belts.
32. If an overhead belt catches and begins to wind around the shaft, get away. Shut off the power immediately.

General Rules for Machine Shop (continued)

33. When replacing a belt, stop the machine and adjust the belt on the driver pulley first.
34. When shifting overhead belts, always use a stick reaching nearly to the floor.
35. Whenever they are in motion, always guard all gear and drive chains.
36. Always wear goggles at shapers and grinders, while welding, chipping, or pouring metal, and when lighting furnaces, even though the operation may take only a moment. Flying chips from cutting tools and sparks from grinding operations have caused many serious injuries.
37. Do not store materials or tools on unguarded overhead trestles or platforms from which they might fall.
38. Before throwing on power, always examine a machine carefully to make sure that every part is in working order. If possible, move the machine by hand before throwing on power.
39. Lock the switch or hang an "Out of Order" sign on a machine that is out of order.
40. Avoid the use of projection setscrew heads on revolving parts.
41. Have toolroom boy make daily inspections of hand tools to be sure they are safe for use when they are issued.
42. Use only heavy rubber covered cord for all extension cords. Connect extension cords only to wall outlets, never to lighting circuits. Whenever possible, avoid the use of extension cords by arranging for permanent electrical installations.

The 42 general rules for the machine shop listed above may seem to be too extensive, but through the experience of some machine shop instructors, they are the rules which should be included in a booklet of rules. Obviously, all of the rules will not apply to many of the machine shops. Those rules having to do with belt drives have been included

to meet the needs of those shops which still use belt driven machinery. There may be other rules which should be added to meet the needs of individual shops.

Safety Rules for the Lathe

1. A rubber mat carefully laid before the lathe removes the danger of slipping.
2. When you must leave the machine, always turn off the power.
3. Drill center holes of the work sufficiently deep.
4. Wear goggles when the work is such that it throws fine chips.
5. Always screw the chuck firmly against the spindle shoulder, so that, when the lathe is reversed, the chuck will not unscrew and fall off.
6. Always stop the lathe before backing a tool out of the hole.
7. Always stop the lathe before changing the position of the tool post.
8. Never attempt to clean lathe centerholes while the machine is running.
9. Never put on or remove a chuck or face plate when the spindle is being driven by power.
10. Never leave the wrench in the socket after chucking the work.
11. When doing spindle turning, be sure that the tailstock is firmly clamped before turning on power.
12. The safest way to file work on a lathe is with the left hand. This places the body away from the revolving part of the machine.
13. For slender work, especially brass, set the cutting tool on center, never above center.
14. When changing to or from back gears, be sure that the clamp nut is in place and tightened.
15. When the machine is in motion, never oil the lathe nor countershaft.
16. When using either lead screw or friction feed, be sure that the other feed is out.
17. Before taking job from centers or chuck, always stop the lathe.
18. Never handle or play with hot spiral turnings.

Safety Rules for the Lathe (continued)

19. It is good practice to place a piece of wood under the chuck or faceplate when removing it from the spindle. This may prevent injury both to fingers and lathe.
20. Before turning on the power, be sure that the work is securely fastened in the chuck of the faceplate.
21. When throwing feeds, be very careful to see that the carriage is not locked.
22. While the machine is running never throw in the back gear.
23. Keep away from a rapidly running lead screw, especially if it has a longitudinal way.
24. Never "fool around" or touch a running gear.
25. Keep machine clean and in first class order. Be prideful of a well-kept lathe.
26. When throwing in transverse feed, be sure that the carriage lock is not set.
27. Keep the countershaft well oiled to prevent the lathe from starting when the clutch is out.
28. When using either the lead screw or friction feed, be sure the other feed is out.
29. Heavy and rapidly revolving pieces should be carefully balanced.

The Shaper

1. Never inspect the work by standing in line with flying chips.
2. Do not attempt to make any tool adjustments while the machine is in motion.
3. Remove all chips with a brush; do so when the machine is not in motion.
4. Never point to a tool which is in motion. Keep the fingers away from moving parts.
5. Before turning on the power, test the machine setup by hand.
6. Should your work be knocked loose from its setting, immediately shut off the power.
7. A shaper with a creeping clutch should be considered out-of-order and no work permitted thereon until the clutch has been repaired.
8. Do not shift gear levers while the machine is in motion. Replacing gears is expensive.

The Shaper (continued)

9. When using a vise, check it carefully before starting the cut to see that it is securely fastened.
10. When an angular job has been finished, always set the head back to zero.
11. When adjusting the head or table of a shaper, the beginner ought to turn off the power. Many a novice has turned the work in front of the tool instead of away from it.
12. Keep the passageways about the machine clear and clean.
13. Always feed on the return stroke.

The Milling Machine

1. Whenever the nature of the work permits, feed the cutter against the work.
2. Before starting to cut, see that the cutter is clamped properly on the arbor and that the work is held securely.
3. Before throwing in automatic feeds, remove all loose handles and cranks.
4. Never attempt to loosen the arbor nut with the use of machine power.
5. Always use a brush to remove chips from a revolving cutter.
6. Never reach across a revolving cutter to attempt to regulate the flow of the cutting solution.
7. Before throwing in automatic feeds, check to see that the automatic stops are set.
8. Before throwing in back gears, always stop the machine.
9. Never leave a machine unattended without releasing all automatic feeds.
10. Never run a cutter at too high speed.
11. When the machine is in motion, do not use a steel scale, fingers, or waste to remove chips.
12. Keep your eyes and mind on your job.

The Planer

1. Before starting a planer, check carefully to see that the work will clear the cross rail and

The Planer (continued)

- housing. Also see to it that the platen clears everything at the extreme point of travel.
2. Always feed on the return stroke.
 3. Do not ride on planer table.
 4. Never reach across the platen of a planer while the machine is in motion.
 5. Keep your legs and body clear from shifter lever on the side of the planer.
 6. Always place safety dogs at the end of the planer platen to prevent its running off the ways.
 7. Remove chips with a brush and only when the machine is not in motion.
 8. Do not stand in line with the action of the platen.
 9. Keep the ways clear of chips.
 10. Never shift a dog during the stroke.
 11. If the shifter handle cannot be locked when attempting to repair the machine or set up the work, always turn off the power.
 12. At no time, under any circumstances, place yourself in a position in which you could be caught between the cross-rail, the housing, and the work.
 13. At no time, place yourself in such a position that you might be caught between the platen and the bed.
 14. Never place tools in the holes in the platen.
 15. Never stand in line with flying chips.
 16. Never use the platen of the planer for an anvil.
 17. When leaving the machine, throw all feeds out, shift belts on idlers or gears into neutral position, and lock the shifter handle.
 18. When you have finished an angular job, always set the head back to zero.
 19. Obstructions on the passageways of a planer while it is in motion may cause the operator to fall into the machine. Keep the passageways clear.

The Grinder

1. When grinding, always wear goggles or use the safety glass guard. Replace the elastic head bands whenever necessary.
2. Under no conditions must the distance between the tool rest and wheel exceed one-eighth inch; keep the tool rest as close to the wheel as you can. Work which jams between the rest and the wheel may pull the hand into the wheel.
3. It is dangerous to work on an emery wheel which is not guarded with a protection hood. Do not operate any unguarded grindingwheels.
4. Discard all wheels which do not run true and cannot be trued by dressing.
5. Apply work gradually to a cold wheel.
6. Avoid grinding on the side of a light wheel. Do side grinding only on wheels designed and built for side grinding.
7. Use only wheels running true.
8. Never run wheels faster than the speed intended for the wheel. Check this carefully.
9. Keep the path of the wheel travel clear of any obstruction.
10. When starting the grinder, do not stand in line with the wheel.
11. It is dangerous to grind work held with pliers. The work may slip from the pliers and catch between the wheel and the machine rest and cause an accident.
12. Unless you have the diamond-type dresser, use only wheel dressers equipped with guards.
13. Before mounting a new wheel, check the wheel's rating speeds. Never force a grinding wheel on an arbor. Safety flanges of the proper size should be adjusted against felt or rubber-faced washers and should not be clamped too tightly. Loose clampings keeps pieces of the fractured wheel from flying about if the wheel should break.
14. Grinding wheel belts must be run slack.
15. Excessive pressure against the grinding wheel causes overheating and breakage.

The Drill Press

1. Before starting to drill, always remove the key from the chuck.
2. When operating the drill press, be careful regarding loose clothing and long hair.
3. Do not attempt to shift the belt from one pulley to another until the machine has come to a complete stop.
4. Before starting to drill, be sure that material is firmly held in the press vise or clamped to the table.
5. Before starting to drill, center-punch all work.
6. Keep the drill cool and sharp by using the proper lubricant for the job.
7. Brush chips away with a brush only. Do not use scale, hands, or rags.
8. Before starting to drill, be sure that the table and head are securely clamped.
9. Never attempt to stop a revolving piece of work. Shut off the power and allow the press to stop.
10. When the drill has entered the work below the flutes, frequently withdraw it and remove chips.
11. When drilling thin material, clamp the material between two pieces of wood; then drill.
12. Do not throw on the automatic feed before the drill is started in the hole.
13. Always remove the chuck and taper shank drill with a drift. Catch it as it drops out.
14. When the drill is breaking through the work, feed slowly.
15. When a drill slips in a chuck, do not attempt to tighten it until the spindle has come to a stop.
16. Never strike a drill, chuck, or socket with a hammer. Use a piece of wood or a lead hammer.
17. While the power is on, never throw in the lock gears.
18. When drilling large holes, always clamp the work securely to the table and use stops to prevent the work's tearing loose and causing injury.
19. In operating the drill press, do not lean over so far that hair or clothing may be caught in the revolving spindle or belt.

Along with the first lesson on a particular machine, the list of rules given above which applies to that machine,

should be studied by the student. By using this list of rules, a test can easily be constructed and given to the students. The student should be required to pass the test 100 per cent before he is allowed to operate the machine.

Supplemental Aids for Teaching Safety

Some of the techniques that are used in operating a safety program have been discussed earlier in this study. Those that have been discussed include the use of tests, written instructions, analyzing accident records and analyzing jobs for safety purposes. There are still other techniques that can be used to make a safety program more effective which deserve consideration in a study of safety. The extent to which industry has used supplementary methods of teaching safety indicates their value.

Struck in his book Creative Teaching states the following activities have been used effectively:

Discussion of shop hazards and different types of accidents that might happen in shop.

Expression of opinions as to the cause of accidents that might happen in shop.

Discussion for the need of safety rules for use of machines and tools and the value of thorough understanding of how machines and tools are operated.

Discussion of value of right emotional attitude toward use of tools and machines.⁸

⁸Theodore F. Struck, Creative Teaching (New York: John Wiley and Sons, Inc., 1945), p. 367.

Struck also lists the following suggestions:

Demonstrate operations of machines and list safety rules for each. (Bring out necessity of obtaining instructor's permission before using machines.)

Demonstrate proper use of chisels, hand saws, planes, screwdrivers, wrenches, knives, dividers, and other pointed and sharp tools, pointing out hazards of incorrect uses of each.

Demonstrate correct methods of handling lumber.

Explain miscellaneous hazards of shop, such as accidents resulting from careless handling of tools, scuffling, or other horseplay, or careless handling of materials.

Appointment of a committee in each class to study the needs of the shop and make suggestions for accident prevention.⁹

It is obvious that the above listed methods of teaching safety have their merits. By using discussions it is apparent that the students will take more interest in a safety program. Many good suggestions by the students can probably be used in the safety program.

Visual Aids in Teaching Safety

A visual aid, as the term is used in connection with teaching safety, may be defined as any type of visual stimulus used to supplement instructions by the spoken or printed word. Recent developments in visual instructions have tended to focus interest and attention on the effectiveness of education when supplemented by suitable visual instructional

⁹Struck, loc. cit.

material.¹⁰ There are many types of visual aids that can be used in teaching safety, some of which will be discussed.

Posters

In order to keep students on the alert in safety, those in charge of safety education should make use of posters be changed once a week to give at least one new safety warning each week.¹¹

Posters, pictures, and graphs of a wide variety are available from many sources. One large source for posters, et cetera, is the National Safety Council. Posters are also available from commercial concerns, insurance companies, and government agencies. Many types of posters are available and some can be secured, free of charge, by the schools.

Movies on Safety

The motion picture has found its way into many schools. The use of movies on safety can probably be used very effectively in supplementing a safety program in the school. Through the use of the motion picture many unsafe practices can be shown more realistically than could be done in a demonstration.

¹⁰Gordon O. Wilber, Industrial Arts in General Education (Scranton, Pennsylvania: International Textbook Co., 1949), p. 125.

¹¹Asa S. Knowles and Robert D. Thomson, Industrial Management (New York: The Macmillan Company, 1947), p. 311.

Students usually are eager to see any motion picture, but more than a passing interest is necessary. The instructor should see the picture before it is shown to the students. He should prepare definite questions, concerning the film, which the students should be expected to answer. This tends to call attention to the purpose of the film.¹²

There are many sources in which safety films may be secured. There are several commercial establishments which supply many different types of films. Some manufacturers of equipment and machines make safety films, as well as others, available to schools. The National Safety Council has a great number of films on safety that are available to its member schools.

Film Strips

The use of film strips as an aid to instruction is of relatively recent origin. Certain features of both the motion picture and the slide are combined by printing a number of related pictures on a strip of film (usually 35 millimeter). These pictures are projected on a screen in much the same manner as are ordinary slides. A special device on the projector makes it possible to stop and start the pictures at

¹²Gilbert G. Weaver and Elroy W. Bollinger, Visual Aids (New York: D. Van Nostrand Company, Inc., 1950), p. 236.

any time. The film strips are usually available through the same sources as the motion picture films.¹³

Photographs

A collection of pictures of shop accidents, which can be kept in the shop library, is an effective way to convince pupils of the value of safety. Photographs of injuries which have occurred in a particular shop may be supplemented by pictures gathered from other schools or from industry.

Photographs of accidents serve as good material for the bulletin boards. They should be changed from time to time, and it may be advisable to omit them for a certain period.¹⁴

Other Aids

There are many other ways of supplementing safety instructions which have not been discussed. The student should at least be familiar with other methods. Use has been made of displaying articles that have prevented accidents such as broken goggles that were worn while using a grinding wheel.

¹³Wilber, op. cit., p. 136.

¹⁴Milford Keith Humble, "Practices and Provisions for Protecting Pupils in School Shops" (Unpublished Ph. D. thesis, University of Missouri, 1937), p. 84.

Industry has made use of contests between different sections of the plant or between different plants. The "suggestion system" in which the students can make suggestions in safety procedures is another method which can be used. Safety suggestions can also be put in the school paper or magazine.

All of these supplementary aids probably will not be used simultaneously, but some of them should be used in all shops to supplement the safety program. No attempt will be made to suggest their relative importance, for this could vary with different schools, depending on their needs.

First Aid

In order that emergency treatment can be given in the school shop, students should know something about giving first aid treatment. Assistance in teaching the student first aid may be secured through the Red Cross or the school nurse or physician. These services should be used in teaching first aid if possible.

First aid should be administered as soon as possible after an accident occurs, regardless of how trivial the accident may seem to be. Sometimes immediate action saves a life. In all cases correct first aid measures reduce suffering and puts the patient in a better position to receive

treatment. The duty of the first-aider ends where the duties of the physician begins.¹⁵

If a nurse is available in the school, the injured person should be referred at once to her. If a nurse is not available, others with first aid training should be called on to administer first aid treatment. There should be at least one qualified person to administer first aid in each class. If the injury is a severe one, the tendency is to remove the patient as soon as possible to a hospital. In case the injured is suffering from shock, from broken bones or severe bleeding, moving him may be very dangerous, and a doctor should be called to the spot with a minimum loss of time. It is a good idea to have a list of doctors who may be called in case of injury.¹⁶

A first aid cabinet should be a part of every shop's equipment when there is no school nurse or other professional attendants available. Containers should be kept clean and completely stocked with approved materials always. They should be the responsibility of one person at a time. The practice of letting each student take care of his own injury should be discouraged.

¹⁵Safety Training for Vocational Schools and School Shops (Chicago: National Safety Council, 1938), p. 16.

¹⁶Ibid., p. 17.

The first aid equipment, as recommended by the National Safety Council is as follows:

Pair of scissors
Thumb forceps
Tourniquet
2 oz. aromatic spirits of ammonia
2 oz. four per cent aqueous solution of boric acid
2 oz. tincture of iodine solution, two per cent
1 tube of vaseline mixed with three per cent bicarbonate of soda (for burns)
4 oz. two per cent mercurochrome - or mild tincture of iodine (two per cent).
Assorted sizes sterile gauze bandages
1 spool of adhesive plaster, 1 inch wide
1 package of sterile gauze wooden applicators wound with cotton (to be used for applying mercurochrome or iodine to wounds)¹⁷

Summary

Some schools make use of rule booklets, which contain rules for only one shop or rules for all the shops. General rules are usually given which pertain to the shop in general and then specific rules are given for each individual machine. Some of these rules may not apply in every instance and others may be omitted that should have been added to meet individual needs. The public schools of Pasadena, California, make use of such a booklet of rules. These rules should be used for class discussion and additional rules added by the students if necessary. Rules that apply to each shop

¹⁷Ibid., p. 18.

should be made available to the students who take classes in the shop. Rules that apply to the machine shop in general and those rules for specific machines have been included. These rules may be printed in the same booklet with other shop rules or they may be printed individually. Rules for specific machines should be given and studied along with the first lesson on operating a particular machine.

There are supplemental aids which should be included in a safety program in order to increase its effectiveness. Some of the aids which will probably increase interest in the safety program are: (1) Demonstrations, (2) posters, (3) movies, (4) film strips, (5) photographs, (6) suggestion system, and (7) first aid.

Every shop should be equipped with a clean, well supplied first aid cabinet. Some instructions should be given in first aid. There should be at least one student who can administer first aid properly. If the school employs a nurse or a physician, the treatment of injuries should be left to them. If serious injuries are caused in the shop such as shock, broken bones, and severe bleeding, the injured person should not be moved unless it is done by someone trained for the purpose. If the school does not employ a nurse or a doctor, a list of doctors should be readily available.

CHAPTER VI

SUMMARY AND RECOMMENDATIONS

Summary

An effort has been made to develop a course of study in safety for industrial education students. It has been the aim of the writer to correlate safety practices used in industry with safety practices in the school shop. It is felt that a safety program operated in this way will better qualify prospective teachers whose students may later be employed by industrial organizations to be more efficient workers. It is realized that some differences will exist between industrial safety and school shop safety.

Important steps that have been taken to improve conditions in industrial safety have been given. These steps clearly show how much emphasis has been placed on safety by the government and by other interested organizations in the past to protect the industrial worker.

Constant and continuous supervision of all shop activities is one of the most important duties of the shop teacher, especially from the standpoint of safety. If the occasion arises that the shop teacher has to leave the shop while a class is in session, to avoid any charge of negligence, he should have some means of cutting off the power to the machines.

Shop teachers should place the protection of the student first, but it is his legal duty to protect himself by taking the necessary precautions against his negligence. Most states do not have laws that protect the teacher against his own negligence; therefore, if an act of negligence can be proved, it is possible that it will cost the teacher a large amount of money for legal expenses and for judgment costs.

In order that a safety program might operate effectively in the school shop, the administrator must consider it as an important phase of education. He should give the program his full support. The teacher must take the lead in the program. The students can contribute much to the safety program through an effective personnel organization. The students must be given a voice and a part in operating the program if it is to gain their fullest support.

If written evidence of some type such as tests, and signatures of students showing they have received sufficient safety instructions, can be shown, they may be very important if a legal case does arise when a student is injured. Data on all accidents should be fully recorded and analyzed for the causes. Preventable causes should be corrected immediately. In case of a permanent injury, the detailed accident records should be preserved until after the student has become 21 years old.

A booklet, with rules that are to be followed by everyone in the shop, should be issued to each student taking courses in the shop. These rules should be studied by the students and used for class discussions. The students should be made familiar with every safety rule that applies to that particular shop.

Use should be made of any available aids that can be secured in making the shop a safe place to work. To give more meaning and to follow techniques used in industry, such material and equipment as posters, cartoons, audio-visual aids, photographs, and film strips should be used. It has been said that "a picture is worth a thousand words." This adage probably holds true in teaching safety.

Recommendations

The following recommendations are made with the belief that if they are put into practice, students and teachers will receive more protection than is now offered them in the school shops:

1. That adequate safety instructions be required in each shop course which requires the use of power machines and that no student be allowed to operate power machines in the shop until he has passed a test 100 per cent.

2. That all prospective shop teachers be required to complete a special course or unit in safety and first aid before they are certified to teach industrial education courses.

3. That legislation be proposed which would allow legitimate claims of accidentally injured students to be paid from educational funds.

4. That school authorities investigate the possibility of carrying liability insurance to cover all student injuries that may happen during school hours on the school premises.

5. That schools operating shops be required to keep records of tests taken by students together with complete records of all accidents.

6. That each school operating industrial education shops make available to each student a set of safety rules that apply to the particular class for which he is enrolled.

If the teachers of industrial arts and vocational trade and industrial classes will see that the rules and regulations of the safety program are strictly obeyed, and if the teacher obeys the rules himself, a much better program for accident prevention will result.

BIBLIOGRAPHY

BIBLIOGRAPHY

I. BOOKS

- Blake, Roland P. Industrial Safety. New York: Prentice-Hall, Inc., 1953.
- Ericson, E. E. Teaching Problems in Industrial Arts. Peoria, Illinois: The Manual Arts Press, 1930.
- Heinrich, H. W. Industrial Accident Prevention. New York: McGraw-Hill Book Company, Inc., 1950.
- Knowles, Asa S., and Thomson, Robert D. Industrial Management. New York: The Macmillan Company, 1947.
- Lange, Fred G. Handbook of Safety and Accident Prevention. Peoria, Illinois: The Manual Arts Press, 1926.
- Mays, Arthur B., and Casberg, Carl H. School Shop Administration. Milwaukee: Bruce Publishing Company, 1950.
- Selvidge, R. W., and Fryklund, Verne C. Principles of Trade Industrial Teaching. Peoria, Illinois: The Manual Arts Press, 1930.
- Stack, Herbert James. Safety Education in the Secondary Schools. Volume IV. New York: National Bureau of Casualty and Surety Underwriters, 1929.
- Struck, Theodore F. Creative Teaching. New York: John Wiley and Sons, Inc., 1945.
- Weaver, Gilbert G., and Bollinger, Elroy W. Visual Aids. New York: D. Van Nostrand Company, Inc., 1950.
- Wilber, Gordon O. Industrial Arts in General Education. Scranton, Pennsylvania: International Textbook Company, 1949.

II. BULLETINS

- Accident Facts. Chicago, Illinois: National Safety Council, 1953.
- Safety Training for Vocational Schools and School Shops. Chicago, Illinois: National Safety Council, 1938.

Safety-Vocational and Industrial Arts. School Publication No. 290. Los Angeles City School District, Division of Instruction and Curriculum.

U. S. Labor Department. Safety Subjects, Bulletin No. 67, Division of Labor Standards. Washington: Government Printing Office, 1946.

III. MAGAZINES

Barocci, Louis. "Safety in the Machine Shop," Industrial Arts and Vocational Education, 39 (May 1950).

Billings, Curtis. "Making the School Shop Safe," Industrial Arts and Vocational Education, 22 (December 1933).

Fales, Foy G. "The Pupil Managed Shop," Industrial Arts and Vocational Education, 35 (July 1933).

Gilliland, Lonnie. "Personnel Organization for the School Shop," Industrial Arts and Vocational Education, 35 (September 1946).

Groneman, Chris H. "Safety in the School Shop," Industrial Arts and Vocational Education, 40 (May 1951).

Rathbun, Jesse E. "Moral and Legal Aspects of Safety Education," Industrial Arts and Vocational Education, 35 (November 1946).

Tischendorf, E. W. "Shop Teacher Liability," School Shop, 12 (February 1953).

IV. THESIS

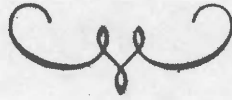
Dupin, Hubart W. "Safety in the School Shop." Unpublished Master's thesis, Western Kentucky State College, 1945.

Griffith, H. O. "Evaluation of a Course of Study in Safety for the School Print Shop." Unpublished Master's thesis, Stout Institute, 1944.

- Henig, Max S. "Safety Education in the Vocational School." Doctor's Dissertation, New York University. Publication of the National Bureau of Casualty and Surety Underwriters, Volume III, 1928.
- Humble, Milford Keith. "Practices and Provisions for Protecting Pupils in School Shops." Unpublished Ph. D. thesis, University of Missouri, 1937.
- Judy, Wayne M. "Accidents and Safety Education in the Industrial Arts Shops of Iowa." Unpublished Master's thesis, Iowa State College, 1932.
- Kranzrisch, Ray F. "The Development of an Instructional Test in Shop Safety." Unpublished Master's thesis, Iowa State College, 1941.
- Lusk, Mary Katherine Harris. "A Proposed Course in Industrial Hygiene and Safety in an All-Day Trade School Program." Unpublished Master's thesis, University of Tennessee, 1950.
- Miner, Frances H. "How to Teach Safety in the High School." Unpublished Master's thesis, University of Southern California, 1931.
- Peregrine, Donald. "The Legal Liability of Public School Officials in Civil Actions." Unpublished Master's thesis, Purdue University, 1936.

APPENDIX

WHAT THE SAFETY COMMITTEE SHOULD LOOK FOR ON THEIR INSPECTION TRIP



- Maintenance of safeguards.
- Tripping hazards in aisles.
- Unsafe ladders.
- Unsafe piling of material.
- Insufficient light for safe work.
- Look for burred chisels and hammers.
- Blocking of fire escapes.
- Are fire doors equipped with fusible links?
- Water or sand in the fire pails?
- Tag fire extinguisher with date last filled.
- Worn treads on stairs.
- Are stairs well lighted?
- Toe boards on working platforms.
- Keep milk bottles, etc., off of window sills.
- Are goggles worn while grinding or chipping?
- Necessary protective clothing worn .
- Is the splitter in place behind the rip saw?
- Is gasoline kept in 'Safety' cans always?
- If nitric acid or any other acid is used is it handled properly?
- Are minor scratches and cuts getting first aid treatment promptly?
- Are Safety Bulletins posted on all bulletin boards monthly?
- If a machine is not guarded ask your insurance company to suggest a practical guard.
- Is all electrical equipment grounded?
- Are drop cords on extension lights in good condition?
- Are all elevator gates working properly?
- Check use of freight elevators instead of stairs by employees.
- Uneven flange on emery wheels.
- Tool rests on emery wheels out of adjustment.
- Belt guards on emery and buffing wheels.
- Investigate serious accidents (where there is no safety inspector) and recommend methods to avoid repetition.
- Check oiler for unsafe methods.
- Check window cleaning methods.
- Check method of cleaning or replacing electric light globes.
- Is the use of solvents properly controlled?
- Are hazardous operations properly ventilated?

Suggestions by Liberty Mutual Insurance Company to assist your Safety Committee to eliminate accident hazards.

Safety Inspection Report

Name of Plant..... Names of Inspectors
 Location..... or
 Date of Inspection..... Committee Members
 Date of Last Inspection.....

1. MACHINE OPERATION: Check to see that guards are in place and in good condition. Look for points of operation where provision of guard could eliminate hazard. Is provision made against accidental starting of machine?

	A	B	C		A	B	C
.....						
.....						
.....						

2. TRANSMISSION AND MACHINE EQUIPMENT: Are belts, pulleys, shafting, revolving parts and set screws guarded? Are means for disconnecting power from machines easily accessible and in good working order?

	A	B	C		A	B	C
.....						
.....						
.....						

3. HAND TOOLS: Look for broken tools, noting condition of handles and heads. Check to see that non-sparking tools are used where provided. Check portable electric tools. They should be properly grounded.

	A	B	C		A	B	C
.....						
.....						
.....						

4. HOUSEKEEPING: Check condition of aisles, work benches, yards, stairs and windows. Are racks and bins provided for small parts and conveniently placed? Material in process neatly stored? Rubbish containers provided and used? Note condition of toilet facilities, ventilation apparatus, clothes lockers, etc.

	A	B	C		A	B	C
.....						
.....						
.....						

5. HANDLING MATERIALS: Check hand and power trucks. Is material piled safely? Are employees taught to lift properly? Is care taken loading and unloading trucks, elevators, cranes and conveyors? Are acids handled properly? Protective clothing provided? Note condition of material boxes, skids, tote boxes, etc.

	A	B	C		A	B	C
.....						
.....						
.....						

6. ELEVATORS AND OTHER MATERIAL HANDLING EQUIPMENT: Does every shaft opening have gate in good condition? Is elevator pit clean? Is elevator operated by authorized employee and not overloaded? Check light on car and landing, condition of signal system, safety devices car and shaftway protection, limit switches and control mechanism. Has inspection been made of cables and hoisting equipment by elevator inspector within six months? Look for hoistway shear hazards.

	A	B	C		A	B	C
.....						
.....						
.....						
.....						

7. FLOORS, FLOOR OPENINGS, WALL AND HOISTWAY OPENINGS: Are floors free of protruding nails, splinters, holes, slipperiness unevenness and loose boards? Are openings properly guarded?

	A	B	C		A	B	C

8. STAIRS AND LADDERS: Note condition of stair treads and supports. Are handrails and lighting adequate? Check condition of ladders. Are they properly stored or, if permanent, firmly fastened in place? Are safety feet used right ones for job?

	A	B	C		A	B	C

9. FIRST AID: Are first aid supplies adequate? Is attendant always available? Are all injuries reported and treated?

	A	B	C		A	B	C

10. ELECTRICAL EQUIPMENT: Note condition of switchboard, transformers, wiring and controlling and operating apparatus. Is it properly protected and isolated? Clear of tools or refuse? Report loose or disconnected wires. If wire is in rigid iron conduit or BX cable, report any point where conduit or BX is broken or separated. Is high voltage equipment locked up and posted with warning signs? Report location of any switch box or open switch where floor is frequently wet or where operator might contact plumbing fixtures. Are rubber gloves, rubber mats and fuse pullers provided?

	A	B	C		A	B	C

11. FIRE PREVENTION: Are exits adequate, well located, marked and clear? Do fire doors close freely? Are they equipped with fusible links? Is fire fighting equipment conveniently placed ready for immediate use? Check extinguishers and sand and water pails. Check to see that materials are not piled too close to sprinkler heads. Is plant kept free of flammable waste? Are flammable and explosive materials properly handled and stored? Is power exhaust provided for solvent vapors?

	A	B	C		A	B	C

12. ELEVATED RUNWAYS AND PLATFORMS: Are they in good condition? Clear of obstructions? Equipped with handrails and toeboards?

	A	B	C		A	B	C

13. BOILERS, PRESSURE APPARATUS: Note when last inspected. Are safety valves, water gauges and engine stops checked and tanks drained regularly? Are gas cylinders stored away from sun and fastened securely in place with separate storage places for different gases?

	A	B	C		A	B	C

14. SAFE PRACTICES: Are machines stopped before cleaning? Are goggles, respirators, safety shoes and other protective clothing worn when necessary? Check condition of protective equipment.

	A	B	C		A	B	C

15. SAFETY EDUCATION: Are bulletins posted? Number? Well located? Is safety literature distributed? How often?

	A	B	C		A	B	C

CHECK UP YOUR HOUSEKEEPING

	Good	Fair	Poor
1. AISLES AND PASSAGEWAYS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are aisles clearly marked?_____			
Are materials piled in aisles?_____			
Are trucks allowed to stand in aisles?_____			
2. FLOORS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are there any holes, worn planks or loose plates?_____			
Are floors clear of scrap materials?_____			
Are there any oil or grease patches on the floor due to spillage, splashing or dripping?_____			
3. STAIRS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are stairway lights in working order?_____			
Are stairways provided with railings?_____			
Are stairways clear of all scrap or stored materials?_____			
4. MATERIAL PILING	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are piles interlocked wherever possible?_____			
Do piles of material interfere with fire doors or sprinkler heads?_____			
Are bins and racks provided for items that cannot be piled?_____			
5. SCRAP DISPOSAL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are scrap boxes or containers provided?_____			
Are they placed convenient to points where the scrap is produced?_____			
Are scrap boxes emptied regularly so they do not become overloaded?_____			
6. TOOLS, DIES, JIGS AND FIXTURES	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are tools and dies kept off machines and material piles?_____			
Are work benches clear of tools and equipment?_____			
Are tools stored orderly in tool chests?_____			
7. TEMPORARY SET-UPS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is there any <i>temporary</i> storage of materials?_____			
Is there any <i>temporary</i> hoisting equipment?_____			
Is there any <i>temporary</i> electric wiring?_____			
8. OILY RAGS AND WASTE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are covered containers provided?_____			
Are containers used always?_____			
Are containers emptied daily?_____			
9. WINDOWS AND WALLS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are there any broken windows?_____			
Are windows clean?_____			
Are walls clean?_____			
10. GENERAL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is shop clear of bottles, rags, shoes, clothing, scrap and old machine parts?_____			
Are lockers cleaned out regularly?_____			
Are fire escapes and other exits from the plant clear of debris?_____			

Date

Department or Building

Signed

CHECK UP YOUR LIGHTING

GOOD LIGHTING INCREASES PRODUCTION. With good lighting men can see what they are doing quickly and accurately. Fewer mistakes are made and accidents are prevented.

This survey is designed to aid in getting the maximum efficiency from the present lighting system.

QUESTION	YES OR NO	REMARKS	LOCATION
1. Are reflectors cleaned regularly?			
2. Are there overhead lights without reflectors?			
3. Are there lights on machines or at benches which should be shielded?			
4. Are any lights placed so that the workman's own shadow is on his work?			
5. Are any men facing windows or other sources of bright light?			
6. Is there any bad glare condition from the surface of smooth or polished tables or machines?			
7. Are windows cleaned regularly?			
8. Are lights in storage areas and on stairways in working order?			
9. Are there sufficient extension cords of proper length in good condition?			

ADDITIONAL REMARKS: _____

Date

Department or Building

Signed