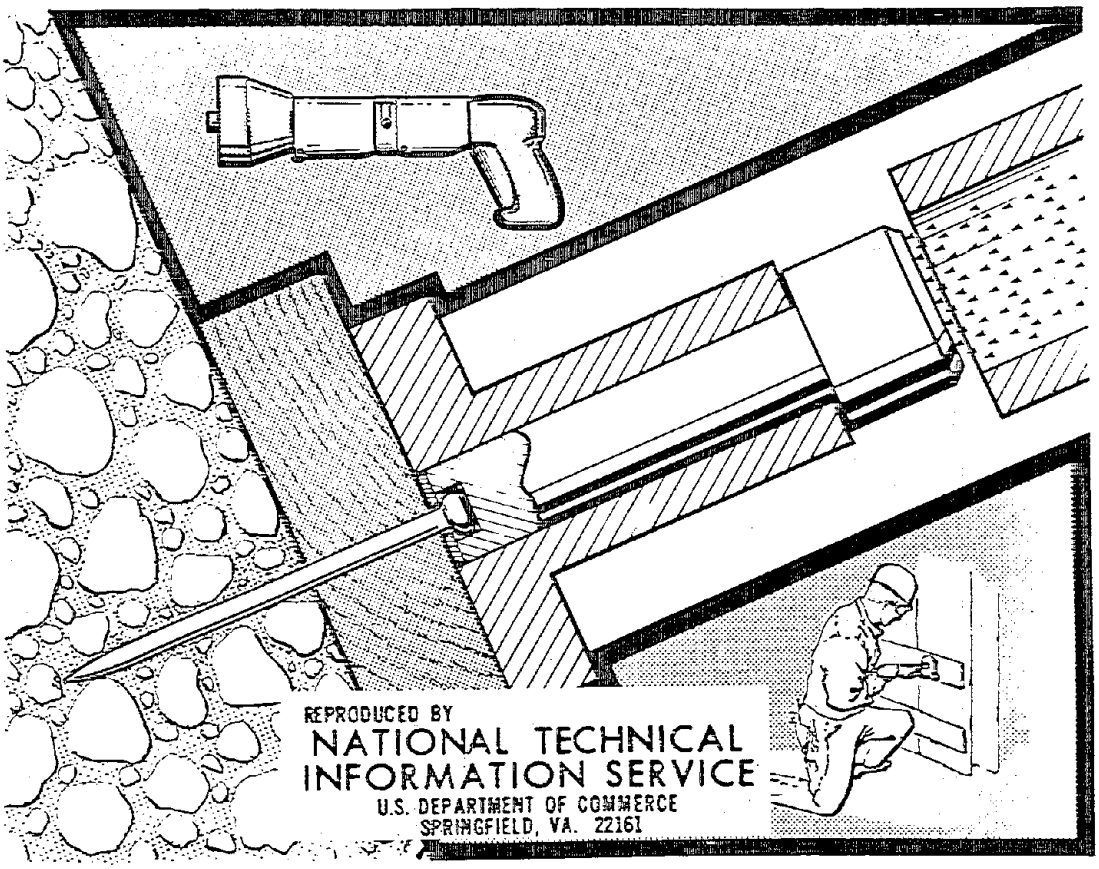
NIOSH

# Powder Actuated Fastening Tools

# EMPLOYER'S SAFETY TRAINING GUIDE

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The objective of this publication is to provide information and ideas that are useful to the employer in training employees for the safe use of powder actuated tools. In order to accomplish this objective it will be necessary to point out safety rules and regulations (see note below) and some responsibilities of the employer.

Because of the nature and content of prescribed training for operators of powder actuated tools, employer's responsibilities sometimes seem to be transferred to the employee. Such is not the case. The law states that it is the duty of each employer to "furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees." This duty is not transferrable.

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# POWDER ACTUATED FASTENING TOOLS

## Employer's Safety Training Guide

U.S. Department of Health, Education, and Welfare
Public Health Service/Center for Disease Control
National Institute for Occupational Safety and Health
Division of Technical Services
Cincinnati, Ohio
October 1977

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DHEW (NIOSH) PUBLICATION NO. 78-198 **B**

# PREFACE

Most employers are aware that they must comply with the standards promulgated by the Secretary of Labor under the Occupational Safety and Health Act of 1970. However, many employers may not be familiar with the standards that require them to provide training for their employees.

This booklet was prepared by the National Institute for Occupational Safety and Health (NIOSH) to provide information that may be useful to the employer as a guide for training employees in the safe use of powder actuated tools. A separate booklet, entitled "Powder Actuated Fastening Tools: Safe Practices for Employees" is available upon request from the National Institute for Occupational Safety and Health. Additional safe operating standards can be found in manufacturers' instructions and appropriate commercial industrial codes.

The purpose of this book is to:

1) describe the hazards that are associated with the operation of powder actuated tools,

2) provide material to the employer for use as a guide for training users in the proper working procedures, equipment operation, and use of protective equipment, and

3) point out the responsibilities of the employer and employee pertaining to training requirements.

Although neither the Occupational Safety and Health Administration (OSHA) nor NIOSH approve or certify training programs, OSHA compliance officers will look for evidence that an employer has provided the training required in the standards for his employees. The employer should be able to produce records indicating that employees have received training. The employer should be able to show the compliance officer that training has been given to the employee based on an

analysis of the tasks that employee performs. Such task analysis should identify the actual and potential hazards the employee would encounter on the job, and the equipment and practices to be used to minimize the risk of injury to the employee or to fellow workers. The training should give priority to the types of conditions and practices most likely to result in injury and illness. This booklet is designed to be of assistance in providing information for the establishment of such a training program.

# CONTENTS

# INTRODUCTION

Powder actuated fastening tools can be used in virtually every industry, either in completing the industry's principal tasks or in performing facility maintenance.

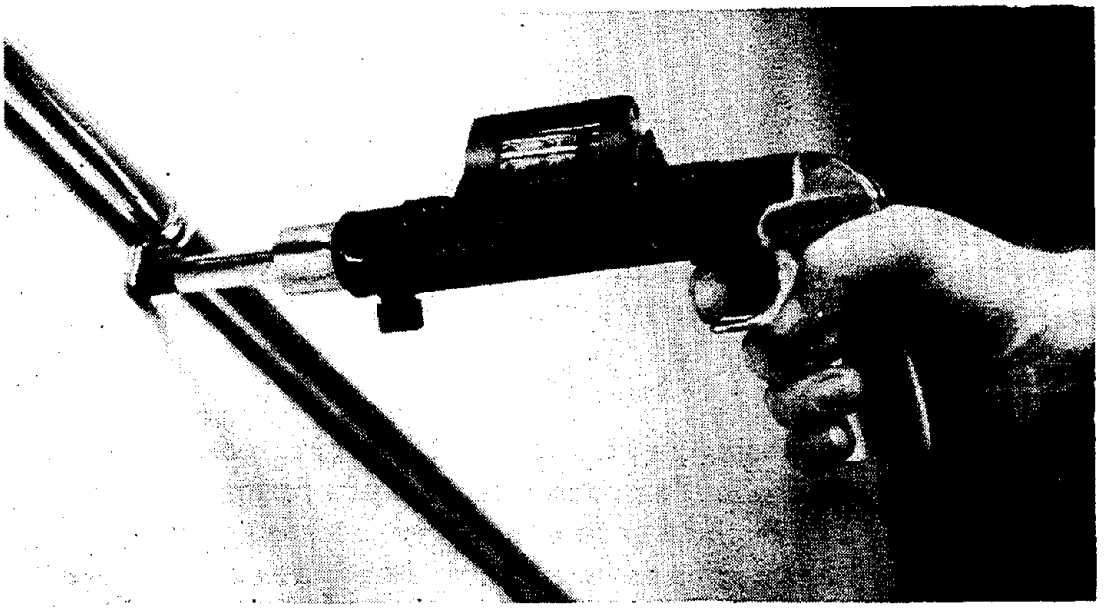
The principal industries using powder actuated fastening tools are construction of all types, shipbuilding, and steel manufacturing. They are also extensively used throughout general industry. Because of the speed provided in anchoring fastening devices into various materials (such as concrete and steel), the use of these tools has grown rapidly.

While there are hazards associated with the use of any tool, powder actuated tools represent a special problem. The tool manufacturers have, over the years, improved their tools to provide safety in use. Virtually every manufacturer of powder actuated tools provides operator training either directly or through their distributors, and certifies the successful completion of that training by issuing a qualified operator's card for the specific tools on which the operator has been trained.

IT'S A MATTER OF RESPONSIBILITY. The Occupational Safety and Health Act of 1970 (Public Law 91-596) made it mandatory that the employer provide work and workplaces that are both safe and healthful. The law requires the individual employee to "comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to the Act which are applicable to his own actions and conduct." The law, and the rules and regulations promulgated under the law, require that training be provided for workers in certain activities. Operating a powder actuated tool is one of these activities.

IT'S A MATTER OF ECONOMICS. To the employee, a safe and healthful workplace is important to his or her immediate livelihood and prospects for a long and productive life.

To the employer, an efficient, productive employee is an asset.



To both, it is a matter of economics. The employee must have a livelihood and the employer must provide a saleable product or service.

# OBJECTIVE

The objective of this publication is to provide information and ideas that are useful to the employer in training employees for the safe use of powder actuated tools. In order to accomplish this objective it will be necessary to point out safety rules and regulations (see note below) and some responsibilities of the employer.

Because of the nature and content of prescribed training for operators of powder actuated tools, employer's responsibilities sometimes seem to be transferred to the employee. Such is not the case. The law states that it is the duty of each employer to "furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees." This duty is not transferrable.

NOTE: The safety and health regulations promulgated under the law are published under Title 29, Code of Federal Regulations. Title 29, CFR is divided into parts. Safety and health regulations for general industry are found in Part 1910; those for the construction industry are found in Part 1926; those for ship repairing, ship building, ship breaking, and longshoring are found in Parts 1915, 1916, 1917, and 1918, respectively.

# INSTRUCTOR'S GUIDE

The following information may be used by the instructor as a guide for training personnel in the correct and safe operation of powder actuated fastening tools. This booklet is designed to provide basic training which is common to all systems. Additional training on manufacturers' individual systems can be obtained by contacting appropriate representatives of that particular company.

Education and training are effective means for prevention of unsafe acts by individuals. Through adequate instruction, employees gain useful knowledge and develop safe attitudes. Safety consciousness developed through education will be supplemented and broadened by training in specific practices and skills. Training gives each man a personal safety tool by developing in him habits of safe practice and operation.

### *Training Format*

Trainees only retain about 20 percent of what they hear, about 40 percent of what they see, and about 70 percent of what they both see and hear. Lecture material should be supplemented by visual aids such as films, viewgraphs, blackboards, flip charts, etc. Also, actual on-the-job training is very important. The instructor should demonstrate the correct operating procedure and inform the trainee of the hazards involved and the means of avoiding them. The trainee should then demonstrate the procedure under close supervision, until he is able to complete the task in a safe and efficient manner. The supervisor should check the trainee periodically to be certain that he understands and performs the job correctly. After the instructor has completed the training session, he should require that the trainee demonstrate his knowledge through practical use of the system in varied applications and by completing a written examination. Many manufacturers will provide the training and testing materials and will issue a qualified operator's card upon

successful completion of training for that particular make or model. Sections IV through VIII of this guide may be used to provide trainees with basic training on powder actuated tools. The Powder Actuated Tool Manufacturers' Institute (PATMI) Test may be given to trainees, and if they pass the examination satisfactorily, they will be entitled to receive a basic training certificate for powder actuated fastening systems. This certificate does *not* qualify the trainee to operate powder actuated fastening systems, but indicates that he has passed the basic training phase. Trainees will be required to be trained and certified on each particular model and make of powder actuated fasteners before a qualified operator's card is issued. Manufacturers' representatives should be contacted for this training and certification.

## INSTRUCTIONS TO APPLICANT

Fill in the answer for those questions with blanks and circle the correct answers on the multiple choice questions. Note that each multiple choice question has only one correct answer.

## PLEASE PRINT OR TYPE

_____
**Date of Examination**

_____
**Name of Applicant**

_____
**Home Address**

_____ _____
**Age** **Social Security Number**

_____ _____
**Trade** **Union & Local Number**

_____
**Examination Given At**

_____
**Examination Given By**

_____
**Instructor Affiliation and/or Title**

_____
**Number of Questions Answered Correctly**

Successful completion of the PATMI Basic Training Course and this examination entitles the trainee to a Basic Safety Training Certificate for Powder Actuated Fastening Systems. To receive this certificate, the successfully passed examination must be completed in all respects and mailed to:

Powder Actuated Tool Maufacturers' Institute
331 Madison Avenue
New York, New York 10017

Note: Any examination not completed and signed is invalid and will not be returned. Mail certificate to the following address:

_____
_____
_____
_____

## FOR PATMI OFFICE USE ONLY

_____ _____
Certificate Number Date of Issue

## EXAMINATION
## PATMI BASIC TRAINING MANUAL

1. Fasteners used in powder actuated tools are:
   (a) Common nails with washers
   (b) Manufactured from special steel and hardened
   (c) Very hard and brittle

2. A drive pin is a fastener used to:
   (a) Insert a wire for suspending a ceiling.
   (b) Permanently attach one material to another.
   (c) Attach one material to another with a nut.

3. Complete power load identification by filling in the blanks:

| | | |
|---|---|---|
| #_____ | — Nickel | — Green |
| #3 | — Brass | — _____ |
| #7 | — _____ | — Gray |
| #2 | — _____ | — Brown |
| #5 | — Brass | — _____ |

4. When selecting a power load, first choose:
   (a) The one you think is right.
   (b) The heaviest load recommended for the tool.
   (c) The lightest load recommended for the tool.

5. Standard shields and/or special fixtures are used to:
   (a) Confine flying particles.
   (b) Reduce recoil
   (c) Reduce operator fatigue

6. Which of the following materials is usually suitable for powder actuated fastenings:
   (a) Poured concrete.
   (b) Hollow tile.
   (c) Surface hardened steel.
   (d) Glazed brick.

7. To determine the suitability of a base material, use a fastener as a center punch as follows:
   If the fastener is blunted — don't fasten — material is
   too (a) soft (b) hard (c) brittle
   If the fastener penetrates easily — don't fasten — material is
   too (a) soft (b) hard (c) brittle
   If material cracks or shatters — don't fasten — material is
   too (a) soft (b) hard (c) brittle

8. When fastening into average masonry, the recommended fastener shank penetration for good holding power should be:
   (a) 5 to 6 times the shank diameter.
   (b) 7 to 8 times the shank diameter.
   (c) 9 to 10 times the shank diameter.

9. In masonry, a fastener should be driven no closer to an unsupported edge than:
   (a) 1/2''
   (b) 1-1/2''
   (c) 3''

10. When fastening into masonry the base material thickness should be greater than shank penetration by at least:
   (a) 1 time
   (b) 3 times
   (c) 2 times

11. Which of the following is not a cause of spall when fastening into masonry:
   (a) Fastener compression of the masonry.
   (b) Fastener striking surface aggregate.
   (c) Over-penetration due to excessive power.
   (d) Holding the tool perpendicular to the work surface.

12. Which of the following means used to eliminate or minimize fish-hooking is stated correctly:
   (a) Reduce shank penetration and increase shank diameter.
   (b) Reduce shank diameter and increase shank penetration.

13. When fastening into steel, the fastener point should fully protrude because:
   (a) Makes fastener removal easier when required.
   (b) Any imbedded part of the point tends to back the fastener out.
   (c) It prevents overtightening the nut.

14. The holding power of knurled shanks compared to smooth shanks when fastening into steel is:
   (a) Greater
   (b) The same
   (c) Reduced

15. Using a high velocity tool do not drive fastener into steel closer to an unsupported edge than 1/4''.
   (a) True (b) False

16. Do not drive fasteners into steel thinner than:
    (a) 2 times the shank diameter.
    (b) 1-1/2 times the shank diameter.
    (c) The shank diameter.

17. If a positive aligning guide or fixture is not used when fastening through an existing hole in steel:
    (a) Fastener could strike edge of hole and deflect.
    (b) Fastener may over penetrate.

18. When fastening soft materials to masonry or steel, a disc helps because:
    (a) It increases over-penetration.
    (b) It degrades the appearance.
    (c) It provides greater bearing surface.

19. A powder actuated tool should be carefully checked for proper working condition prior to each day's use.
    (a) True (b) False

20. If a tool is found to be defective in any way, you should first:
    (a) Call the foreman.
    (b) Try to fix it.
    (c) Stop using it immediately.

21. In operating a powder actuated fastening tool neither hand should ever be placed:
    (a) Around the tool body.
    (b) In front of the tool muzzle.
    (c) Over the assembly lock.

22. If a loaded tool fails to fire:
    (a) Keep trying until it does fire.
    (b) Immediately unload and reload it.
    (c) Hold it against the work for 30 seconds, then follow manufacturer's instructions.

23. Which one of the following safety precautions is stated incorrectly:
    (a) Hold tool perpendicular to work.
    (b) Avoid holes or spalled areas.
    (c) Make test fastening with heaviest power load.
    (d) Avoid welds and torch cut areas.
    (e) Avoid fastening into thin or soft base materials easily penetrated.

24. A *"Qualified Operator"* is one who is familiar with local Safety Regulations, has been trained and tested by a manufacturer's authorized instructor and possesses a "Qualified Operator" card.
    (a) True (b) False

25. Successful completion of this training course and examination qualifies you to use powder actuated fastening systems.
    (a) True (b) False

**ACKNOWLEDGEMENT**

I have completed the PATMI Basic Training Course and this examination. I have reviewed all wrong answers with my instructor and now understand the correct answers. I also understand that the completion of this course does not qualify me for, or entitle me to, a Qualified Operator's Card.

_____

Signature of Trainee

_____

Attested: Instructor's Signature

## INSTRUCTIONS TO EXAMINERS:

Contained on the other side of this sheet are the correct answers for the Basic Safety Training Examination. In grading the examination the following considerations apply:

1. The question must be answered correctly. If any part of the answer is unanswered or answered incorrectly, the whole answer is incorrect. A passing grade requires at least 18 questions with correct answers.

2. It is essential that the instructor review each missed question with each trainee to assure his understanding the correct answer.

3. In the event of trainee's failure to pass the examination a review of the training course will normally equip him to pass a reexamination.

4. Additional examination forms are available from the PATMI office. Requests should be mailed to:
   Powder Actuated Tool Manufacturers' Institute
   331 Madison Avenue
   New York, New York 10017

5. Please do not mail *failed* examinations to the PATMI office.

6. Please be sure that all forms are completely and correctly filled in according to instructions contained in the examination form.

## ANSWER SHEET
## PATMI BASIC TRAINING MANUAL

1. b
2. b
3. 9
   Green
   Nickel
   Brass
   Red
4. c
5. a
6. a
7. b
   a
   c
8. b
9. c
10. b
11. d
12. a
13. b
14. a
15. b
16. c
17. a
18. c
19. a
20. c
21. b
22. c
23. c
24. a
25. b

*NOTE:* All completed examinations are to be graded by the Examiner before they are returned to the PATMI office with the total number of correct answers entered where indicated on the first page of the examination form.

# EMPLOYEE TRAINING

In Federal safety regulations, tool design specifications are detailed, operator training is required, and a host of other safety practices are spelled out. These include such things as general requirements; inspection, maintenance, and tool handling; requirements for loads and fasteners; and operating requirements (including the need for personal protective equipment).

Providing specific training to operators of powder actuated tools is required. In some instances, the training is clearly spelled out (e.g., construction, ship repairing, ship building), and in other instances training is clearly required by the General Duty Clause of the OSH Act.

The operator must receive training in the specific model or models he or she is to use. This is so because the operator must be able to determine when the tool is not functioning properly.

In training, the operator is taught to carry out the instructions of his supervisor (employer), and not to make determinations for himself. If an operator is trained in the use and operation of powder actuated tools, that does not mean that he is qualified to recognize all materials or conditions he may encounter, or to make subjective decisions which he is not equipped to make. Some of these conditions are discussed below to alert the employer to a few of the ways in which he might have an *un*safe workplace.

In selecting the proper propellant charge to be used, the operator is taught to start with the lowest (least powerful) load level recommended for the tool being used and progress through the successive higher (more powerful) power load until the desired penetration is obtained. This makes the employee an experimenter. The supervisor (employer) should determine the power load and fastener to be used in a given application and instruct the operator.

The suitability of the material to be driven into should be determined by the supervisor (employer) before deciding to assign work using a powder actuated tool.

A prospective tool operator is taught that there are certain materials which should not be driven into by powder actuated tools (e.g., very hard or brittle materials including, but not limited to, cast iron, glazed tile, surface hardened steel, glass block, live rock, face brick, and hollow tile). The operator may not always be able to recognize these materials as such, either because he is unfamiliar with the materials or because they are covered in some manner (paint or other coating) rendering them unrecognizable.

The supervisor (employer) should be particularly careful that the material to be driven into has been properly identified and that it is safe to proceed. Before attempting to drive powder actuated fasteners into any unfamiliar or unusual materials, consult the tool manufacturer to determine if the material is suitable. This is the approach that all employers should take in special cases.

Operators are taught not to drive fasteners into easily penetrated materials such as wood fiberboard, particle board, plasterboard, or other soft material. Failure to follow this precaution (either through carelessness or lack of knowledge) has caused serious accidents and fatalities. Fasteners have penetrated walls (room partitions), striking and killing persons on the opposite side of the wall. Never drive a fastener into any material when the type or thickness is unknown. Also, most accidents of this type happen during alterations or additions to older buildings where the base material is concealed.

Training of operators is not always consistent. The procedure to follow in case of misfire is an example. The following is suggested as the safest procedure:

In case of misfire, the operator should hold the tool in operating position for at least 30 seconds. He should then try to operate the tool a second time, continuing to hold it in a firing position. If the tool misfires the second time, he should wait another 30 seconds with the tool in firing position. If the charge has failed to fire, the operator should carefully remove the misfired power load and place it in a container of water. The faulty power load, in the container of water, should be turned over to the supervisor for disposal.

Operators are taught not to operate a powder actuated tool in an explosive or flammable atmosphere (leaking gases, flammable fuel vapors, etc.). The operator should be particularly mindful of this precaution when working in confined spaces, and areas such as basements. Individual workers do not always have the means — either in detection equipment or knowledge — to make such safety decisions for themselves; the decisions should be made by the employer.

From the foregoing it should be obvious that there is ample opportunity for unsafe conditions to occur when responsibility is surrendered.

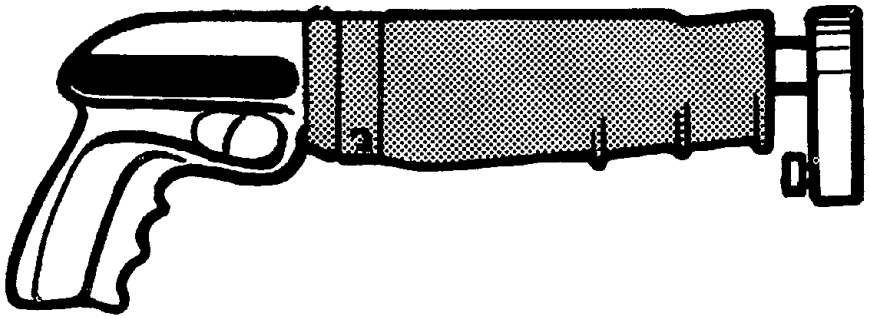
All operators of powder actuated tools (sometimes known as explosive actuated tools) must receive training in the proper handling and operation of these tools. This includes the use of required personal protective equipment. Employees must receive the training before they are permitted to use the tools. Names and other pertinent information about all certified operators must be kept on record. Each operator must be provided with a card to show what tools he or she is qualified to operate. Toolroom supervisors will issue equipment only to persons identified as qualified operators.

The Powder Actuated Tool Manufacturers Institute (PATMI) sponsors a *basic* training program for powder actuated fastening systems. This basic and fundamental instruction must be supplemented with specialized advanced training by individual tool manufacturers or their distributors for specific tool systems. Satisfactory completion of this specialized training will qualify the trainee for certification as a Qualified Operator for specific makes and models of powder actuated tools.

# SELECTION OF TOOLS/FASTENERS/POWER LOADS

Use of a powder actuated fastening system is an acceptable method of making instantaneous forced entry fastenings into various construction materials. This system consists of:

TOOL



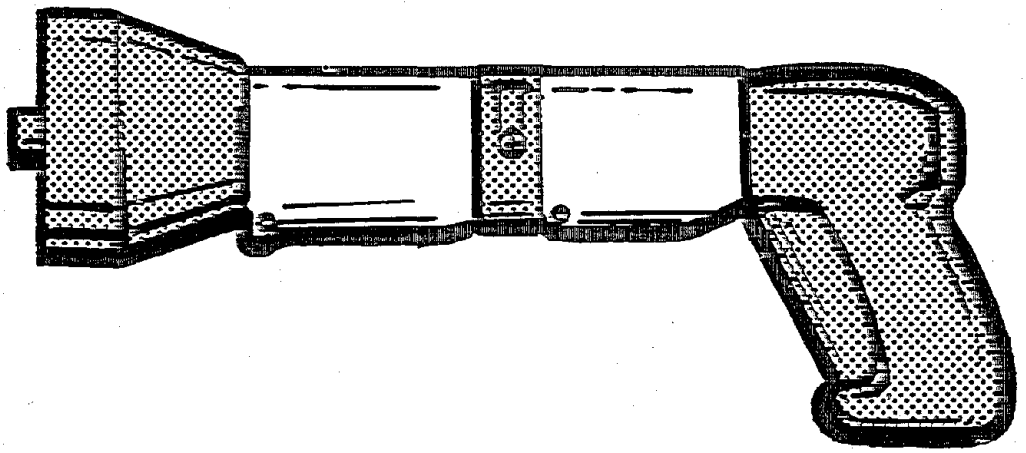
FASTENER

POWER LOAD

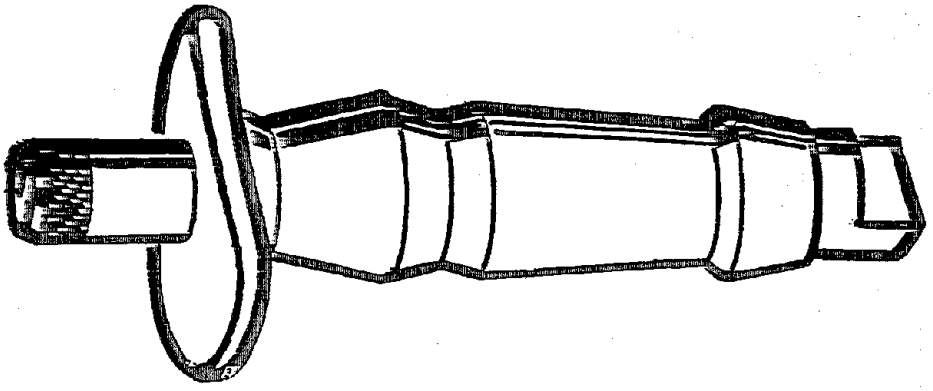
OSHA standards specify that powder actuated tools shall meet the design requirements in the American National Standards Institute (ANSI) Standard A10.3 of 1970. That standard recognizes two classes of tools — low velocity and high velocity. Since 1970, the standard has been revised by ANSI to recognize a third class (medium velocity). As far as the Federal rules and regulations are concerned, the two categories recognized in the 1970 standard prevail.

A low velocity tool is one which is designed to propel a fastener at a velocity of 300 feet per second or less, with the measurement made at 6.5 feet from the muzzle. Tools causing greater fastener velocity are classified as high velocity tools.

There are numerous tool designs on the market. They are either direct or indirect acting and may be either trigger/sear or hammer operated.

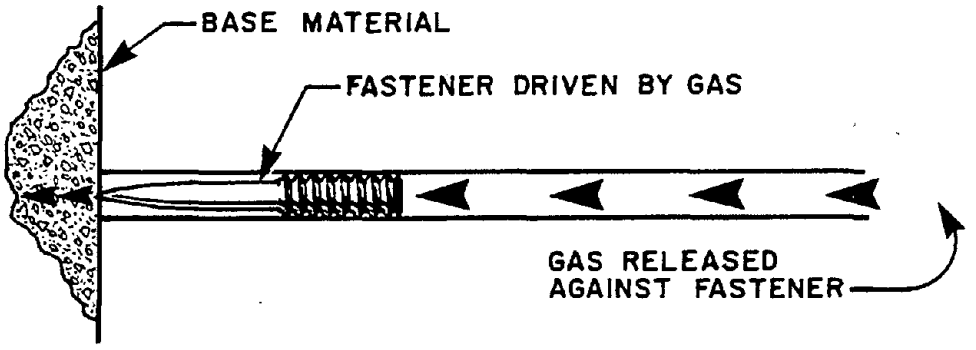


TRIGGER/SEAR



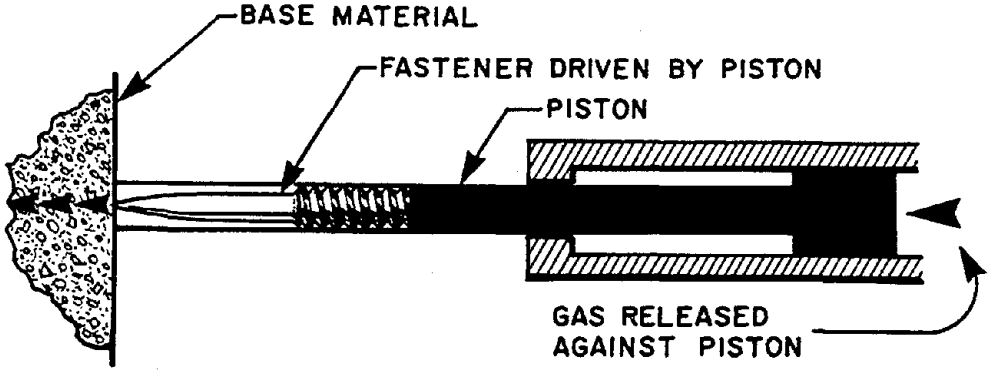
HAMMER

A direct acting tool uses the force of expanding gases of a power load (propellant), acting directly upon the fastener to be driven.



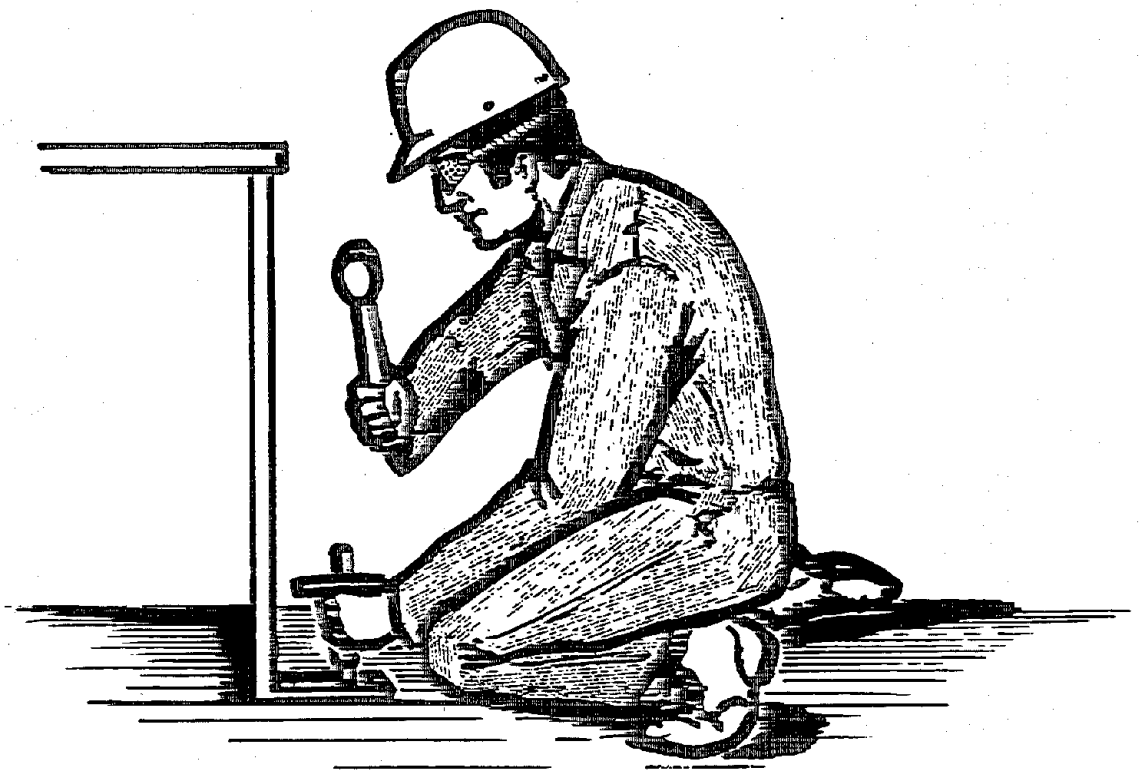

DIRECT-ACTING TYPE TOOL

An indirect acting (piston) tool uses the force of expanding gases of a power load (propellant), acting upon a captive piston, which in turn drives the fastener.




INDIRECT-ACTING TYPE TOOL

A hammer operated tool is struck by the operator with a heavy hammer (about three foot-pound force) held in one hand, while the other hand is holding and positioning the tool. If the tool is not hammer operated, it is fired by a trigger mechanism.



HAMMER OPERATED TOOL

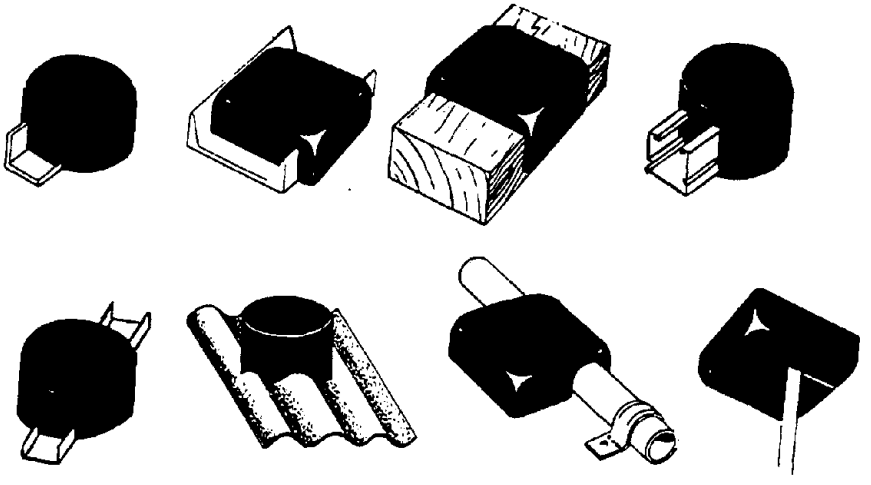
From the preceding material, it is obvious that the tool used for one job may not be the proper tool to use for another job. Tool selection, fastener selection, and power load selection is the responsibility of the supervisor (employer).

It should be noted that for each specific application, either the low velocity or high velocity tool type will provide optimum fastening performance. The employer should select the type of powder actuated tool which is best for his application, as determined by his own engineering expertise or the expert advice of the tool manufacturer. All the approved tools can be used safely if used properly.

Low velocity tools come supplied with a shield designed to confine flying particles which may be generated when fastening directly into steel or concrete. Low velocity tools can be operated without the shield in place. High velocity tools cannot be operated without the shield in place. The operator is taught to use the shield (on low velocity tools) when the materials being fastened do not confine flying particles.

This requires the operator to make a subjective judgment, for his own safety, concerning the need for the shield. Because the operator may not be qualified to make such a judgment, the need for the shield should be determined by the supervisor (employer) and the employee instructed accordingly.

SHIELDS AND SPECIAL FIXTURES



# FASTENERS

The fasteners used in powder actuated tools are not common nails. They are manufactured from special steel and heat-treated to produce a very hard yet ductile fastener. These properties are necessary to permit the fastener to penetrate concrete or steel without breaking.

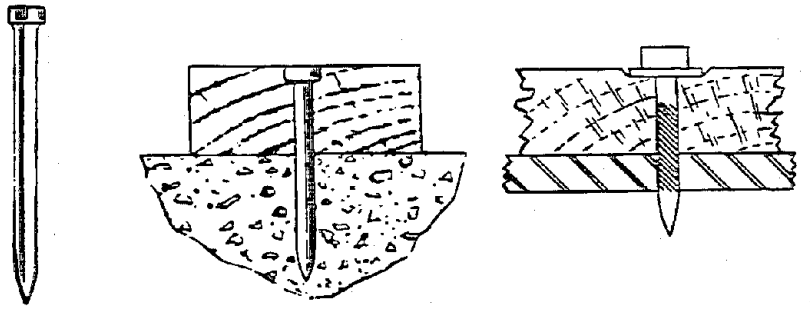
The fastener is equipped with some type of tip, washer, eyelet, or other guide member. This guide aligns the fastener in the tool as it is being driven and is usually used to retain the fastener in the tool.

WASHER EYELET PLASTIC

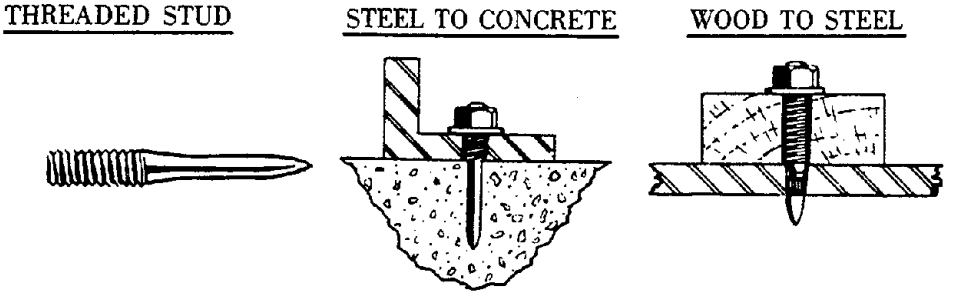
ALIGNMENT GUIDES

The two basic types of fasteners used are *drive pins* and *threaded studs.* A *drive pin* is a special nail-like fastener designed to permanently attach one material to another such as wood to concrete or steel. Head diameters are generally 1/4", 5/16", or 3/8". However, for additional head bearing in conjunction with soft materials, washers of various diameters are either fastened through or made a part of the drive pin assembly.

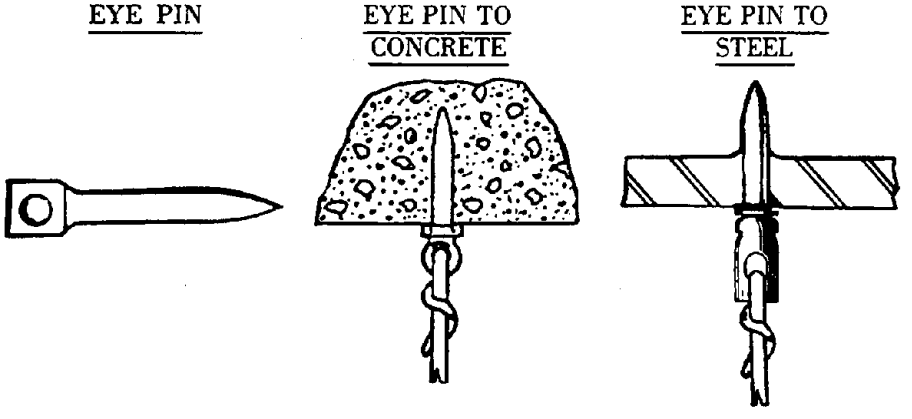
DRIVE PIN WOOD TO CONCRETE WOOD TO STEEL



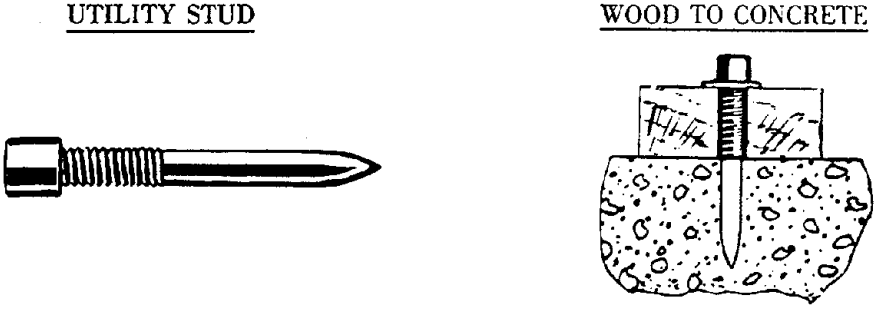
A *threaded stud* is a fastener comprised of a shank portion which is driven into the base material and a threaded portion to which an object can be attached with a nut. Usual thread sizes are 8-32, 10-24, 1/4-20, and 3/8-16.




There are also other types of special fasteners designed for specific applications. An *eye pin* is a fastener with a hole through which wires, chains, etc. can be passed for hanging ceilings, light fixtures, etc.

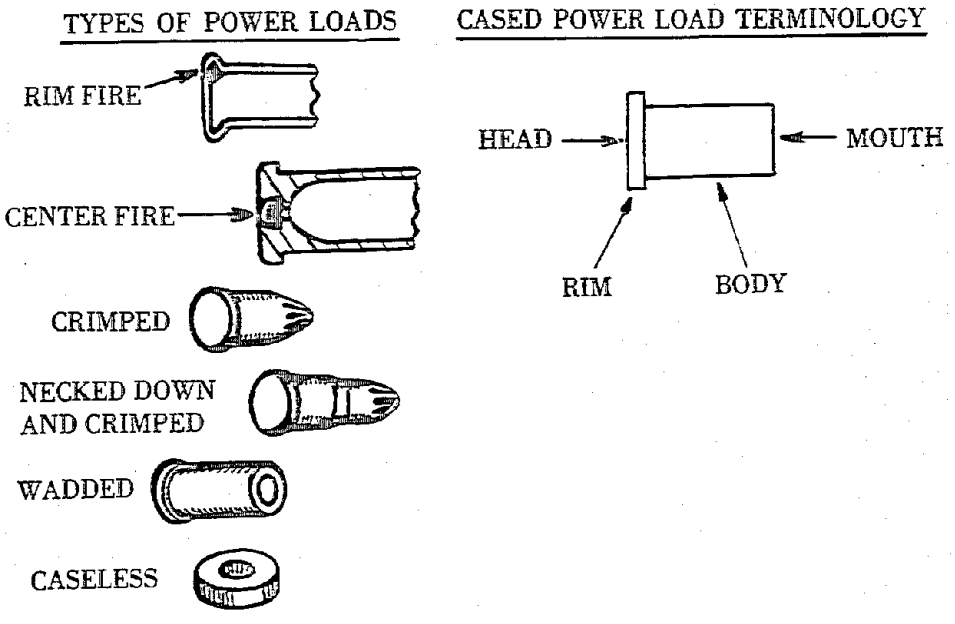



A *utility stud* is a threaded stud with a threaded collar which can be tightened or removed after the fastener has been driven into the work surface.



# POWER LOADS

The power load is a unique, portable, self-contained energy source used in powder actuated tools. These power loads are available in two forms: cased or caseless. The propellent in a cased power load is contained in a metallic case.




The power loads (propellant charges) for these tools come in various sizes and shapes ranging from .22 through .38 caliber. In order to operate safely, the operator must be able to recognize the various power loads for his tool. The variation for a given tool is in strength only, not size. The power loads are coded, both numerically and by color. The following chart shows the standard identification code:

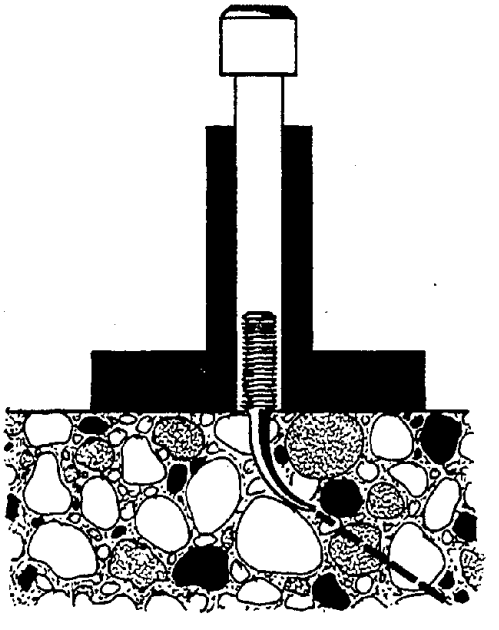
COLOR IDENTIFICATION

| *POWER LEVEL* | *CASE COLOR* | *LOAD COLOR* |
|---|---|---|
| 1 | BRASS | GRAY |
| 2 | BRASS | BROWN |
| 3 | BRASS | GREEN |
| 4 | BRASS | YELLOW |
| 5 | BRASS | RED |
| 6 | BRASS | PURPLE |
| 7 | NICKEL | GRAY |
| 8 | NICKEL | BROWN |
| 9 | NICKEL | GREEN |
| 10 | NICKEL | YELLOW |
| 11 | NICKEL | RED |
| 12 | NICKEL | PURPLE |

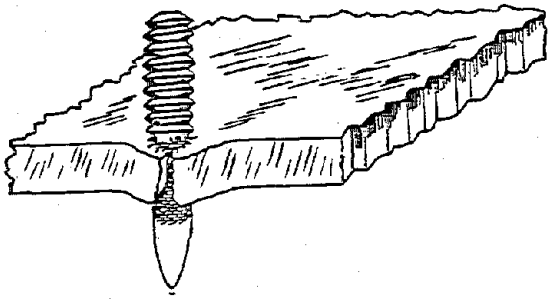
Cased power loads used in all types and classes of tools cover a range of 12 power load levels, with the lightest being #1 load and the heaviest being #12 load. A basic six color code of gray, brown, green, yellow, red, and purple is used twice because there are not 12 different readily distinguishable colors. It is the combination of the case color and load color that defines the load level or strength. Caseless loads are manufactured only in the #1 through #6 load levels.

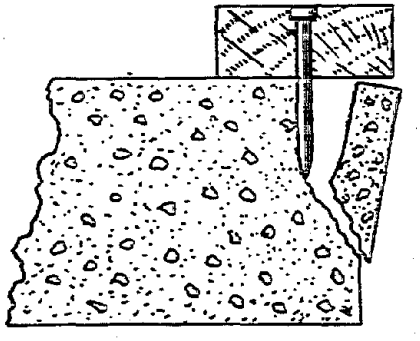
Fastening into concrete with a high content of hard aggregate or striking a reinforcing rod with the fastener can cause the fastener to "fishhook" and rebound toward the operator or others in the work area.

FISHHOOKING



Fastening too close to the edge of masonry or steel can cause particles to fly off at high speed (and force) or fracture in such a way that the fastener does not hold. In such cases, the fastener becomes a missile. Operators should never use the tool without wearing approved safety glasses or goggles and other face protection. Never drive fasteners closer than 1/2 inch from the edge of steel, or closer than 3 inches to the unsupported edge of concrete or other masonry materials, except for special applications recommended by the tool manufacturer.





When fastening one material to another (e.g., a furring strip to a concrete wall, thin metal to concrete or structural steel, sheet siding or roofing to steel frame) it is best to set the fastener through prelocated holes in the material being fastened. A headed drive pin is normally used to do this. When the material is to be fastened so that it can later be removed, threaded studs must be used.

While all operators of powder actuated tools must receive training in their use, there are still many variables and unknowns experienced on the job that make the use of these tools potentially dangerous. This is particularly true if carelessness becomes part of work habits.

# SAFE OPERATING PRACTICES

The following is an outline of requirements and good work practices that the operator should follow. Every possible circumstance cannot be covered. When a condition arises which creates any doubt about the safe procedure to follow, the operator should bring the matter to the attention of his supervisor. If the supervisor is unable to solve the problem, he should contact the manufacturer's representative.

## The Operator

- Operators of powder actuated fastening tools and other workers in the vicinity must wear approved safety glasses or goggles. Face shields and hard hats must be worn if conditions require it.

- The use of ear protection (ear plugs or ear muffs) is recommended, particularly when making fastenings in confined areas such as small rooms, tanks, vaults, or ship compartments.

*Operators should:*

- Never allow bystanders to gather around where the tool is in use. Flying material may be discharged by the fastener or the fastener may be deflected and ricochet.

- Never load a powder actuated tool until ready to make the fastening.

- Always keep the tool pointed in a safe direction — loaded or not.

- Never carry loaded tools to and from the job.

- Never carry fasteners or other metal objects in the same container with propellant charges.

- Consider possible dangers to nearby workmen before using a powder actuated tool. Powder actuated tools must not be left unattended at any time. When tools are not in use they must not be loaded. Never carry power loads in pants pockets. Never carry mixed power loads in a single apron compartment.

## Tools

- Clean and maintain tools in accordance with instructions supplied by the manufacturer.

- Check all tools prior to each day's work for proper working condition. Reject any tool with the slightest malfunction. Tag and remove defective tools from service until they have been repaired.

- Do not alter any powder actuated tool or attempt repairs with any but the manufacturer's replacement parts. Use only the manufacturer's brand of pins and power loads.

- Store tools — unloaded — in a locked container. Store power loads in a separate locked container. Do not allow unauthorized personnel to handle either the tools or power loads.

- Always use the proper shield (muzzle) or fixture for the job. Use special shields or fixtures where the standard shield does not provide suitable protection. All manufacturers can supply special fixtures for their tools.

- These tools are designed to work at right angles to the work surface. If the angle varies more than eight degrees, the high velocity tools will not function.

- No part of the hand or any part of the body shall be placed in front of the muzzle of the tool.

## Power Loads

- Always check the color of each power load before inserting it into the tool chamber.

- The supervisor shall determine which power load to use for the job at hand.

- Never force a power load into the tool's chamber. If force is required, something is wrong.

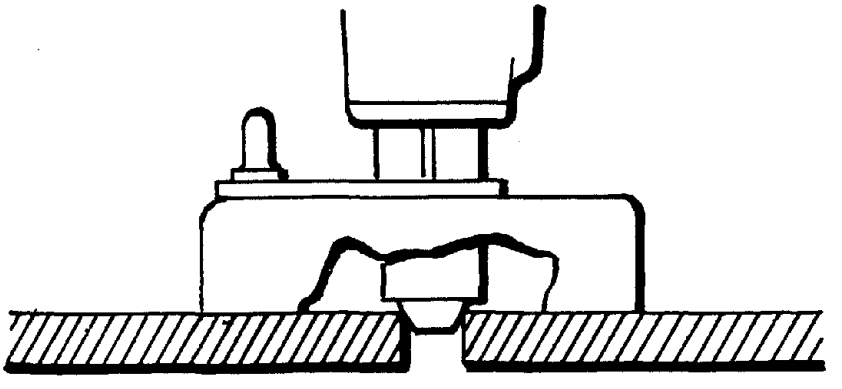
## Materials

- Positively identify all materials (base materials and materials to be fastened) before actuating the tool each time. Some materials cannot be fired into.

- Follow the instructions for edge distances — 3 inches for concrete and masonry, 1/2 inch for structural steel.

- Do not attempt to install a fastener through existing holes unless a positive guide is used to assure accurate location of the fastener as it is expelled. To do otherwise may cause the fastener to fish-hook or ricochet. Guides may be attached to the tool much the same as muzzle shields. Various guides are supplied by the tool manufacturer.

GUIDE



- Never attempt to fasten into spalled or cracked areas or along seam lines in masonry, or into a location where a previous fastener has failed. The fastener is likely to fish-hook or ricochet.

- The supervisor should identify the materials, determine the propellant charge, and instruct the tool operator accordingly.

# EMPLOYEE/OPERATOR SAFETY ESSENTIALS

Safe operation of powder actuated tools requires operator alertness and knowledge, and the operator's constant obedience to the safe operating practices in this document.

This document when combined with specific tool training and operator certification will provide the necessary knowledge for the safe operation of powder actuated fastening systems.

**CONTINUOUS ADHERENCE TO SAFE**

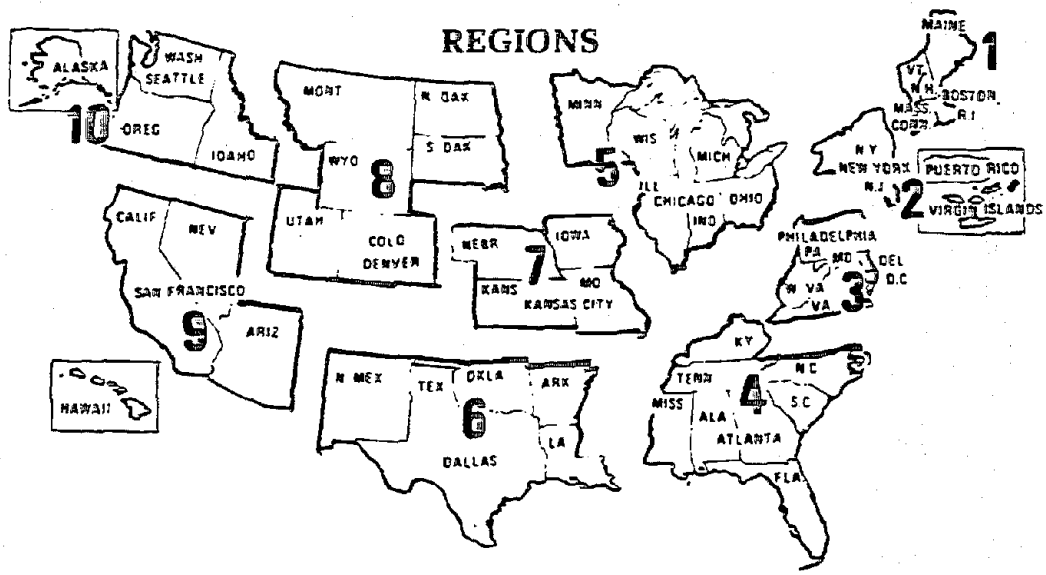
**OPERATING PRACTICES IS THE**

**OPERATOR'S RESPONSIBILITY**

REMEMBER: Failure to follow safe operating practices contributes to almost all accidents with powder actuated tools.

# NIOSH AND OSHA REGIONAL OFFICES

The following pages list NIOSH and OSHA regional offices. Either of these facilities serving the state can provide information on the Occupational Safety and Health Act including questions on standards interpretations, voluntary compliance information, copies of the OSHA Standards, OSH Act, Employee Rights Posting Notice, and other OSHA publications.




NIOSH REGIONAL OFFICES

DHEW, Region I
JFK Federal Bldg.
Room 1401
Boston, Massachusetts 02203
617/223-6668

DHEW, Region II
26 Federal Plaza, Room 3300
New York, New York 10007
212/264-2485

DHEW, Region III
P. O. Box 13716
Philadelphia, PA 19101
215/596-6716

DHEW, Region IV
101 Marietta Tower
Atlanta, GA 30323
404/221-2396

DHEW, Region V
300 South Wacker Dr.
33rd Floor
Chicago, IL 60606
312/886-3651

DHEW, Region VI
1200 Main Tower Bldg.
Dallas, Texas 75202
214/655-3081

DHEW, Region VII
601 E. 12th St.
5th Floor West
Kansas City, Missouri 64106
816/374-5332

DHEW, Region VIII
11037 Federal Bldg.
Denver, Colorado 80294
303/837-3979

DHEW, Region IX
50 United Nation Plaza, Rm. 231
San Francisco, CA 94102
415/556-3781

DHEW, Region X
1321 Second Ave., Mail Stop 502
Seattle, Washington 98101
206/442-0530

# OSHA REGIONAL OFFICES

**Region I**
U.S. Department of Labor
Occupational Safety and Health Administration
JFK Building, Room 1804
Boston, Massachusetts 02203 ..... Telephone: 617/223-6712/3

**Region II**
U.S. Department of Labor
Occupational Safety and Health Administration
1515 Broadway (1 Astor Plaza), Room 3445
New York, New York 10036 ..... Telephone: 212/971-5941/2

**Region III**
U.S. Department of Labor
Occupational Safety and Health Administration
15220 Gateway Center, 3535 Market Street
Philadelphia, Pennsylvania 19104 ..... Telephone: 215/596-1201

**Region IV**
U.S. Department of Labor
Occupational Safety and Health Administration
1375 Peachtree Street, N.E., Suite 587
Atlanta, Georgia 30309 ..... Telephone: 404/526-3573/4 or 2281/2

**Region V**
U.S. Department of Labor
Occupational Safety and Health Administration
230 S. Dearborn, 32nd Floor
Chicago, Illinois 60604 ..... Telephone: 312/353-4716/7

**Region VI**
U.S. Department of Labor
Occupational Safety and Health Administration
555 Griffin Square Building, Room 602
Dallas, Texas 75202 ..... Telephone: 214/749-2477/8/9 or 2567

**Region VII**
U.S. Department of Labor
Occupational Safety and Health Administration
Federal Building, Room 3000, 911 Walnut Street
Kansas City, Missouri 64106 ..... Telephone: 816/374-5861

**Region VIII**
U.S. Department of Labor
Occupational Safety and Health Administration
Federal Building, Room 15010, 1961 Stout Street
Denver, Colorado 80202 ..... Telephone: 303/837-3883

**Region IX**
U.S. Department of Labor
Occupational Safety and Health Administration
9470 Federal Building, 450 Golden Gate Avenue
Post Office Box 36017
San Francisco, California 94102 ..... Telephone: 415/556-0584

**Region X**
U.S. Department of Labor
Occupational Safety and Health Administration
6048 Federal Office Building, 909 First Avenue
Seattle, Washington 98174 ..... Telephone: 206/442-5930



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