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CODE OF SAFE PRACTICE

FOR

FIELD SURVEY PARTIES

ENGINEERING DIVISION

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PLEASE DO NOT FOLD OR DEFACE IN ANY MANNER

C O D E O F S A F E P R A C T I C E

F O R

F I E L D S U R V E Y P A R T I E S

P H E L P S D O D G E C O R P O R A T I O N

M O R E N C I B R A N C H

E N G I N E E R I N G D E P A R T M E N T

Morenci, Arizona

January - 1952

I N D E X

CODE OF SAFE PRACTICE
FOR
FIELD SURVEY PARTIES
ENGINEERING DEPARTMENT

I. REFERENCES

A. General Safety Rules Book - Phelps Dodge Corporation, Morenci Branch.

B. Safety and Operating Rules - Drilling and Blasting Department, Open Pit Division.

C. Manuel of Rules and Procedure - Operating Department, Open Pit Division.

D. Code of Safe Practice for Transporting Men and Supplies, Open Pit Division.

E. Code of Safe Practice for Primary and Secondary Blasting, Open Pit Division.

F. Industrial Data Sheet No. D-Con. 1, National Safety Council.

G. Industrial Data Sheet No. D-Gen. 25, National Safety Council.

H. Safe Practices Pamphlet No. 41, National Safety Council.

II. OBJECTIVE

The objective of this code is to provide an outline of safe working rules and procedures for the Field Survey Parties. This code does not completely cover all phases of your work, but by following the rules given herein and remembering that safety is just common sense, you will become a safer worker.

III. JOB PRECAUTIONS

A. General Precautions

1. Before starting a job of any kind, note, and correct if possible, any hazards which exist. When more than one employee is engaged on the same job, all must understand the procedure to be followed.
2. Whenever possible, use only designated walkways and paths. Be watchful for stumbling hazards when walking over rocky or uneven terrain.

III. JOB PRECAUTIONS

A. General Precautions, - (Continued)

3. Do not use railroad tracks as a walkway.

4. Do not cross tracks immediately in front of moving trains.

5. Stand at a safe distance from the tracks when a train is passing.

6. Do not crawl under or between cars of a train.

7. Do not engage in scuffling or "horse-play" on the job.

8. When lifting an object, bend your knees and use the large muscles in your legs instead of the small back muscles thereby reducing the chances of a strain.

9. Always carry objects close to your body.

10. Get help to lift or carry heavy or awkward loads.

11. Carry instruments or rods securely and balanced to avoid falling. Be careful that it does not snag some obstruction and cause you to fall.

12. When carrying rod, avoid striking persons in front or behind you.

13. When not using rod, return it to rack on the ~~track~~ truck or lay it on the ground with numbers not touching ground. Do not lean against building or where it might fall.

14. Be sure that the instrument is firmly set in the ground before releasing it.

15. In chaining, a slow steady pull should be used in applying or releasing tension on the chain.

16. Safety belts are required when working on an unguarded platform or scaffold more than six feet above the floor or ground.

17. When climbing or descending a ladder, face the ladder.

18. Make sure that all ladders are secure before climbing them, and that the area below is guarded.

19. Use <u>both</u> hands when climbing or descending ladders. Use a hand line to raise or lower tools or material.

A. General Precautions, - (Continued)

20. Report any defective equipment or unsafe condition encountered so that it may be repaired or corrected.

21. Inspect tools, equipment and material (stakes, etc.) before using them, and discard or have repaired any which are found to be defective.

22. When it is necessary to enter a department or area where you are not familiar with the operations or procedure, report to the Foreman in charge so that he may familiarize you with the rules and hazards of the department or area.

23. Remember - Think before you act; don't take chances.

B. Special Precautions

1. Working Around Earthmoving Equipment

a. When working in the vicinity of operating trucks, tractors or trains, be alert to the danger of being struck or run over.

b. Persons who intend to pass between a train and a shovel must get permission from the shovel operator.

c. Never step on a power cable or allow it to brush against your body.

d. Stand in the clear of chains or cables under tension.

e. If it is necessary to work within the swinging radius of a power shovel, notify the operator so that the shovel can be stopped.

f. Stay from under suspended loads or booms.

g. Keep off of moving bulldozers - Do not attempt to get off of moving machines.

h. If a signalman is provided, obey his signals when working in the area of shovels or bulldozers.

i. Remember that it is always dangerous to work within the range of the swing of shovels or similar equipment.

j. Never work in the immediate area of shovels, bulldozers, or operating trucks without the knowledge and permission of the operator or the Foreman in charge.

k. Only authorized personnel are allowed on shovels or bulldozers.

l. Extreme care should be used when chaining near power lines or cables. Avoid letting the chain come in contact with such lines or cables.

2. Working Around Banks, Cuts, Steep Hillsides, Etc.

a. Stations should not be established too close to banks or cuts, and should be moved back when necessary.

b. When it is necessary to work near the crest or toe of a bank, stand in a position from which you can see the bank and be prepared to move quickly in case of a slide. Do not turn your back to the bank.

c. Examine crests for unsafe back break before approaching too close.

d. Loose rock should be scaled down if possible before working near the toe of banks or cuts.

e. Whenever possible, do not walk directly above or below another person when climbing or descending a steep hillside.

f. On steep hillsides, be sure that each foothold is secure before placing the weight of your body on it.

g. Never run on steep hillsides.

h. Safety belts and a sufficient length of rope should be obtained and used where necessary when working on steep hillsides or banks.

i. Be on the alert for slides at all times, and be prepared to move quickly should one start.

j. Do not throw material over a bank unless you have ascertained that no one is below.

k. Do not work directly above or below other men unless it is absolutely necessary.

l. If it should be necessary to work directly above other men, be careful not to allow any material to fall.

3. Working in Areas With Other Crews

a. When beginning work in any area or department, notify the Foreman in charge of any other crews working therein.

b. Keep interference with operations and other work to a minimum.

c. When working in an area near drilling and blasting operations, orders of guards must be obeyed.

d. All persons are required to retire immediately from a danger zone upon being notified by a guard that a blast is about to be fired.

e. See Section V., 5., for blasting signals.

f. When the whistle signal for a blast is sounded, all persons must make sure that they are a safe distance from any bank where a slide might occur, and that they are far enough from the blast to be safe from flying rock.

g. Always notify other crews in the area before starting any job which might interfere with their work.

h. Always obey signals from any signalman provided in areas where you are working.

C. Truck Driving

1. Do not allow unauthorized personnel to operate or ride in the vehicle. No persons other than company employees on duty shall be transported in company vehicles.
2. All State highway and local speed laws must be observed. Speed limits for vehicles are as follows:

   Public Highways - Pickups - 40 miles per hour.

   Plant Yards - Pickups - 20 miles per hour.
3. Drivers are responsible for checking the following at the beginning of each shift.

   a. Check tires for proper inflation and wear.

   b. Check oil, water and fuel supply.

   c. Check windshield for cleanliness. (Keep clean at all times)

   d. Check brakes for proper operation.
4. Report any needed repairs or adjustments. Do not operate trucks in an unsafe condition.
5. Vehicles should be taken to the garage for lubrication on designated days.
6. Drivers must not race with, nor crowd other vehicles. Stay at least fifty feet behind other vehicles on the level and one hundred and fifty feet on ramps or inclines. These distances should be increased under dangerous or unusual road conditions. Be sure that you can stop within the assured distance. A safe "rule of the thumb" when pavement is dry is to remain a distance of one vehicle length behind the vehicle ahead for every 10 miles of speed.
7. The general public always has the right of way over Company vehicles.
8. No more than the driver and two passengers are permitted to ride in the cab of any truck.

9. Do not permit anyone to stand on the running boards or hang on the sides of a truck while the vehicle is in motion.
10. Employees are forbidden to get on or off of moving vehicles.
11. When turning around near the crest of a hill, always head the truck toward the crest.
12. Select the proper gear and check your brakes before going up or down grades. Avoid changing gears while on a ramp or incline.
13. Do not allow the truck to coast or move when out of gear. Keep your foot off the clutch except when changing gears.
14. Vehicles must be brought to a complete stop before entering any building. Driver must sound horn before proceeding.
15. Backing into a building must be preceded by a careful look to see that there are no obstructions and that no one will be endangered by the move.
16. Do not drive over unprotected cables or hoses.
17. Always drive with your thumbs on the outside of the steering wheel to avoid injury should the wheel spin.
18. When parking, always set your emergency brake and leave the truck in low or reverse gear. Park on the level if possible.
19. Vehicles must not be parked within six feet of any railroad track.
20. Do not run over rocks or other obstructions in roadways which are too high for the truck to clear.
21. Always slow your vehicle before, not after, entering a curve or intersection. After entering the intersection or curve, speed may be increased as conditions warrant.
22. When traveling on the highway, stay as far to the right as possible.
23. Be alert for left hand driving zones in the Open Pit.

C. Truck Driving, - (Continued)

24. Never start the motor while men are getting on or off of a truck, since a jerk might cause someone to fall.

25. Stop at all railroad crossings, and ascertain that the track is clear before proceeding.

26. A red flag must be attached to the end of protruding loads.

27. Drivers should be particularly careful when hauling men to avoid all unnecessary jolts.

D. Use of Hand Tools

1. General

All tools, of course, should be inspected before use, and defective tools discarded or turned in for repair. Impact tools with mushroomed heads must never be used. Never carry tools which in any way might interfere with using both hands freely on a ladder or while climbing on a structure. Chisels, screw drivers and pointed tools should never be carried edge or point up in your pocket. Carry such tools in a carrying belt such as used by Electricians, in a pocket tool pouch, or in your hand with the point or cutting edge away from the body.

2. Shovels

a. Inspect the tool. See that it has a strong, smooth handle and grip, unsplit and free from splinters, and that the blade is smooth, sharp and free from twist.

b. When shoveling, be sure that there is plenty of clearance between yourself and others to avoid striking them with the shovel or material. When working in a confined space, be especially careful to keep sufficient clearance in front and behind yourself.

c. Use the ball of your foot - not your instep - to press the shovel into any stiff or hard material.

d. Avoid strains. Dig and lift loads by using your leg muscles as much as possible. Be sure of your footing and balance when shoveling material. The left hand gripped close to the load gives better leverage and lessens strain.

e. Judge the "bite" carefully. Four to six inches is customary in hard ground, with the edge of the hard ground used as a fulcrum.

f. Never throw or toss a shovel toward another person. Hand it - with the handle forward.

g. Never leave a shovel where others may stumble over it or strike against it. Stand it against a wall or in a rack.

3. Picks

a. Be sure that the tool is in good condition, and that the handle is free from cracks or splits.

b. To swing a pick safely, spread your feet, get a firm grip and have good footing. Make sure that no one is in the path of your swing.

c. Never swing the pick in line with your feet or legs.

d. Watch out for glancing blows in rocky ground or other hard material.

e. Do not use a pick as a hammer or maul.

f. Place your pick where no one will stumble over it, and where it cannot fall.

4. Hammers

a. Examine the hammer for cracked or loose handle, or mushroomed head. Do not use a defective tool.

b. Hammers should be kept clean and free from oil or grease, which might cause the handle to slip from your hand or the face to glance.

c. Selection of the proper hammer for the job is important. A hammer so light that it bounces off the work is hazardous; likewise one too heavy and hard to control may cause body strain.

d. When swinging a sledge hammer or maul, stand with your feet well apart; make certain that you have a firm footing and a good grip. Be sure that no one is in the path of your swing.

e. Never swing a hammer in line with your feet or legs, and watch out for glancing blows.

f. If you are driving some object which requires holding by another workman, use extreme care that you do not miss the object and strike the workman. The hammerman must not wear gloves in this case.

g. When driving any object with a hammer, stand at a point 90° from the man holding the object.

5. Axes

a. Safety in the use of axes lies in learning to swing correctly, and in placing the strokes accurately. The proper grip is for the left hand to be about three inches from the end of the handle and the right hand about three-quarters of the way up the handle. (Reverse for left-handed persons.)

b. A narrow axe with a thin blade is best for hard wood and a wide axe with a thicker blade for soft wood. A sharp, well honed axe makes for better chopping speed. Good honing saves labor and makes an axe safer to use. The axe should be honed after each sharpening and after each use.

III. JOB PRECAUTIONS
D. Use of Hand Tools, 5. Axes, - (Continued)

c. To file a single bit axe, drive a peg into the ground and press the blade of the axe against it. A double bit axe can be held by driving it firmly into a log.

d. The single-edged axe should be carried with the handle on the shoulder and the axe head back of and close to the shoulder with the blade turned out and the hand near the end of the handle. The double-edged axe should be carried in the extended hand at the side, grasping the handle just behind the axe blade.

e. Make sure that there is a clear circle to swing the axe before chopping. Remove all brush and shrubbery within range, and especially overhead brush or limbs which might catch or deflect the axe.

IV. JOB HAZARDS

A. Obvious

1. Rock falls and landslides.
2. Fall of person.
3. Use of faulty or improper tools.
4. Improper use of tools.
5. Failure to heed signals.
6. Unsafe driving practices.

B. Hidden

1. Unsafe condition of vehicles (make daily inspection).
2. Use of stations too close to banks.
3. Horseplay (kidding can be dangerous).
4. Faulty material (flaws in wooden stakes, etc.).

5. Snake bite.

6. Poisonous shrubs, and insects.

7. Faulty job procedure (follow rules and orders).

V. CREW, DUTIES AND RESPONSIBILITIES

A. Personnel

Crews shall consist of the number of employees deemed necessary by the supervisors to perform the assigned work safely and efficiently.

B. Training

Responsibility for initial training of new employees shall rest with the Chief of Party to whose crew the new employee is assigned. They shall be furnished a copy of this code as well as copies of other pertinent rules and regulations and shall be required to become familiar with the contents thereof. Additional training may be provided from time to time by supervisors, and at safety meetings.

C. Duties

The duties of personnel assigned to work covered by this code shall be as determined by their supervisors. All employees shall be charged with co-operating with fellow employees and their supervisors in performing work safely and efficiently

D. Signals and other information are given in the appendix of this code.

E. Apparel and Safety Equipment

1. Apparel

a. Employees shall be required to wear hi-top safety shoes.

b. Hats must be worn by all employees. Hard hats should be worn when there is danger of falling objects.

c. Safety goggles must be worn while:

(1) Using a pick in hard ground.

(2) Chipping rock with pick or hammer.

(3) Driving stakes.

(4) Chopping or cutting brush or timber.

(5) Whenever there is danger of an eye injury.

A pair of safety goggles must be carried at all times.

(Note: Spectacle type goggles are not always sufficient protection. Bulldog goggles must be worn when you are chipping or cutting material, or when using a hammer on metal of any kind).

d. Field parties should carry a snake bite kit and be thoroughly familiar with its use.

e. Each employee must have and wear when necessary a suitable pair of gloves.

f. Loose, baggy or torn clothing must not be worn.

g. Ties, finger rings, bracelets, and wrist watches with rigid metal bands must not be worn while working.

h. Respirators of an approved type must be worn when necessary.

2. Guards

a. Safety belts with tail ropes should be obtained and used when necessary.

b. When working overhead, the area below must be roped off.

c. Always obey signs or guards erected by other crews.

d. When using hand tools in a confined area, be sure that there is sufficient clearance between yourself and other employees.

e. Do not leave holes uncovered where other employees might stumble into them.

F. Services NOT to be Performed

1. Unauthorized personnel must not attempt to make mechanical or electrical repairs.
2. Personnel shall not be permitted to operate any piece of equipment until instructions in its correct operation have been received and authorization issued to do so.
3. Do not remove safety signs, tags or guards erected by another employee unless authorized to do so by the proper authority.
4. Do not begin any job until the proper safeguards have been erected, the necessary equipment is at hand, and you understand the job procedure to be followed.

VI. PROCEDURE IN CASE OF INJURIES

A. All accidents resulting in personal injury, regardless of seriousness, must be reported at once to the Foreman in charge of the work. The Foreman must see that injured employee receives medical treatment and must make out a written report on the accident as soon as possible.

B. In case of serious injury the Hospital must be notified at once so that a Doctor may be summoned to the Hospital or to the scene of the accident as dictated by the nature of the injury. If there is any doubt about the Doctor locating the place, arrange for a guide. Call Hospital on telephone, number 2211. Give the Hospital information regarding the nature of the injuries. Also telephone the information to the Safety Supervisor and to the Division Superintendent.

C. A "Blue Card", Form ED-10, must be issued by the Foreman to any man going to the Doctor for first treatment on account of an accident.

D. When doubt exists as to an injury occurring during employment and the

injured man is being sent to the Doctor with a "Blue Card", the card should be plainly marked "alleged" accident.

E. No employee who has been ill or injured will be permitted to return to work without written release issued by the attending physician.

F. A definite procedure prevails with respect to return to the Hospital for retreatment of employees who are injured on the job, as follows:

1. When an employee has been injured and returns to work afterward with written release by the Doctor, but is required to return to the Hospital for further treatment, he will be given a written statement to that effect by the Doctor each time that treatment is received for as long as treatment is necessary.
2. When it is no longer necessary for the man to return, the Doctor will issue a "discharge notice".
3. Foreman must insist upon getting these statements until discharge notice is received as this provides assurance that the man has been to the Hospital and also provides the Foreman with the knowledge as to when the injured employee is to return to the Hospital.
4. Employees who are working day shift will be provided with transportation at 7:50 o'clock A.M. to go to the Hospital.
5. Injured employees who are working on other shifts are required to go to the Hospital during the day time and they must present their medical redressing slip to the Foreman when reporting for work.
6. Foreman must receive slip before allowing the man to go to work.

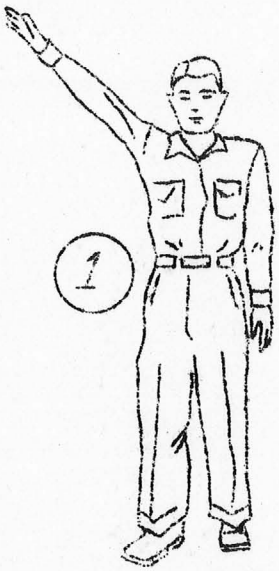
G. In case of probable fatal injury a Doctor and the Safety Supervisor must be called to the location of the accident.

H. First Aid

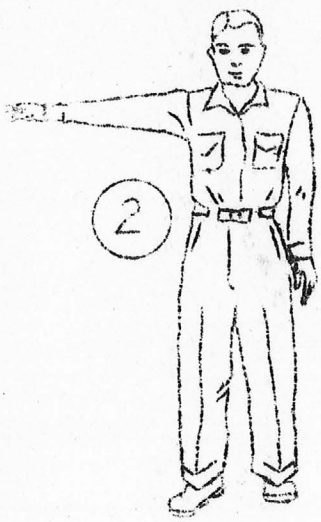
1. If necessary, remove injured man to a place where additional injury will not occur.
2. Apply first aid treatment to stop bleeding, if any, and treat for shock. There may be a spark of life.
3. If the Doctor pronounces accident fatal, follow instructions pertaining to fatal accidents.

* * * * * * * * * * *

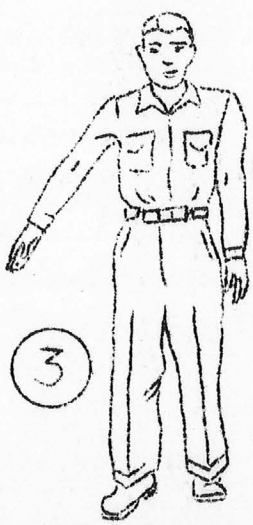
NUMERAL SIGNALS ARE AS FOLLOWS:



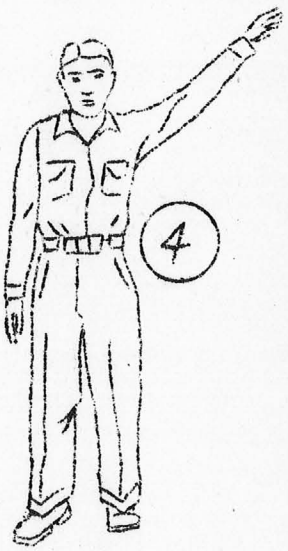
ONE - Right hand at arms length held above head 45° out from body.



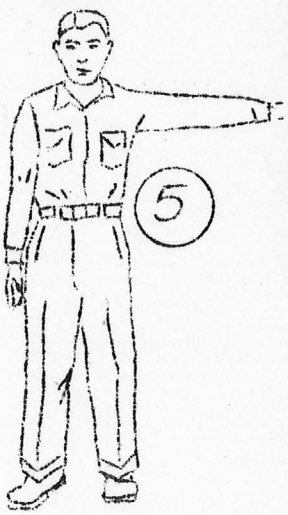
TWO - Right hand at arms length held straight out from body.



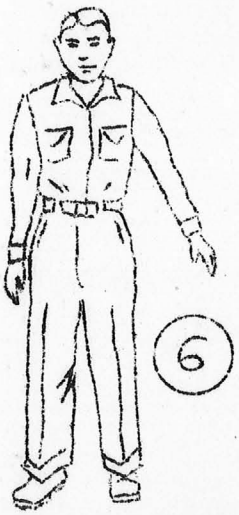
THREE - Right hand at arms length held down and out 45° from body.



FOUR - Left hand at arms length held above head 45° out from body.

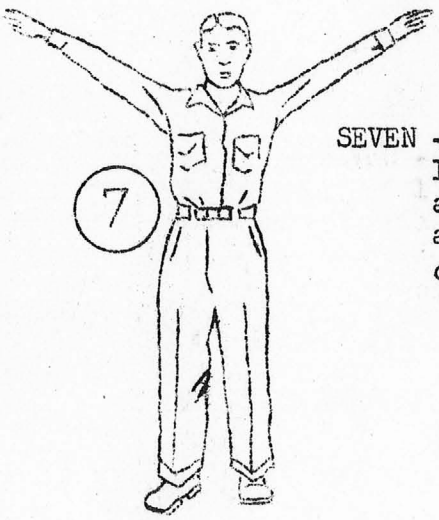


FIVE - Left hand at arms length held straight out from body.

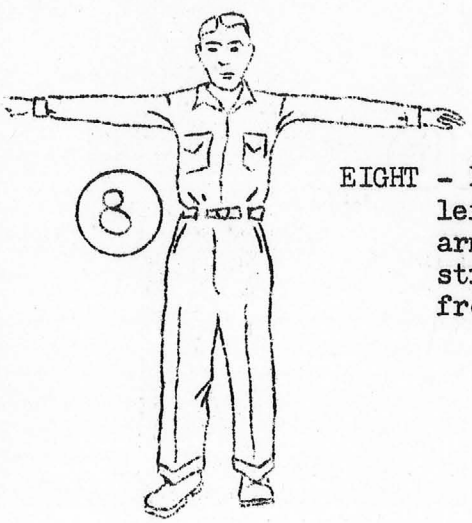


SIX - Left hand at arms length held down and out 45° from body.

NUMERAL SIGNALS (Cont'd.)

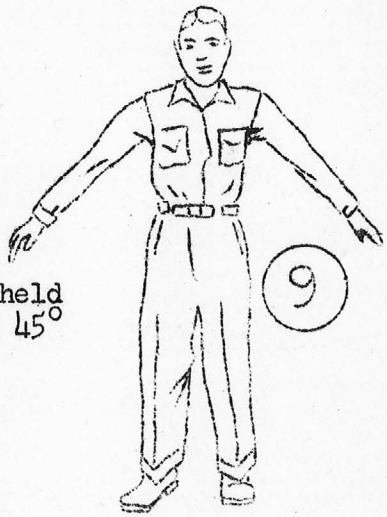


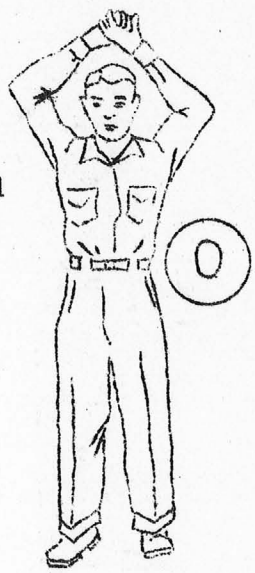
SEVEN - Both right and left hands at arms length held above head 45° out from body.



EIGHT - Both right and left hands at arms length held straight out from body.

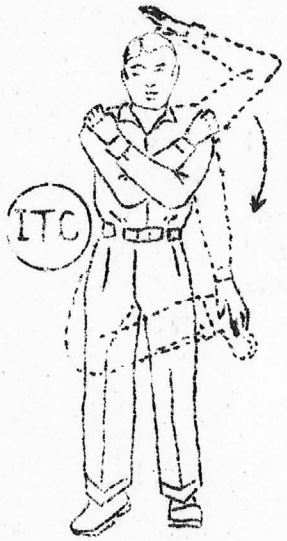
NINE - Both right and left hands at arms length held down and out 45° from body.





TEN - Hands locked and held above head forming an "0".

DECIMAL - Arms extended and crossed in front of body.

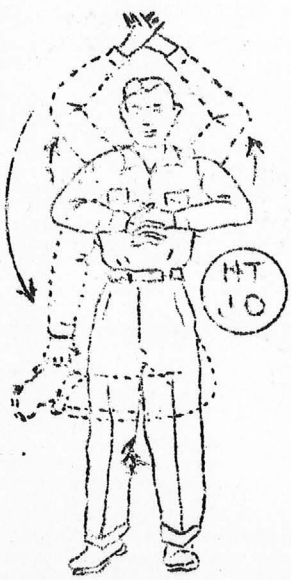


INTERSECTION TOE & CREST

Arms crossed in front. Both hands closed, then touch one foot and head alternately.

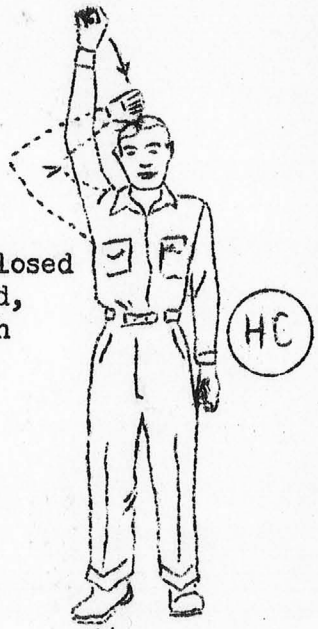
INTERSECTION BROKEN & HARD

Arms crossed in front of body. One hand closed, one hand open.

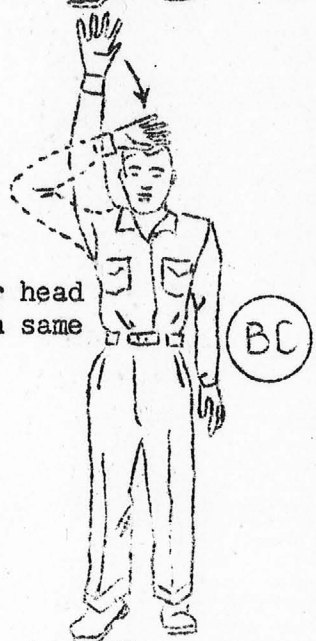


HARD TOE JOINS OLD

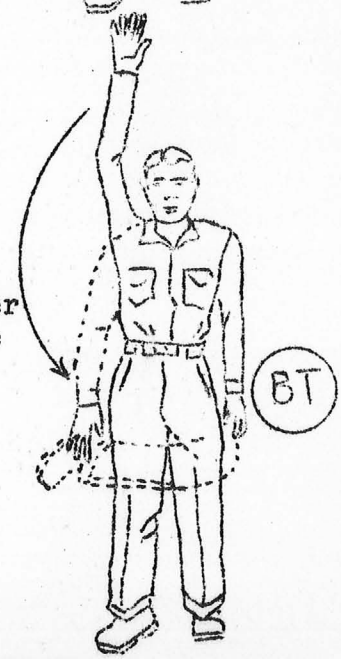
Lock fingers in front of body, elbows out from body, raise hands over head forming an O. Then touch toe with closed hand.



HARD CREST - Hand closed and raised over head, then touch head with same hand.



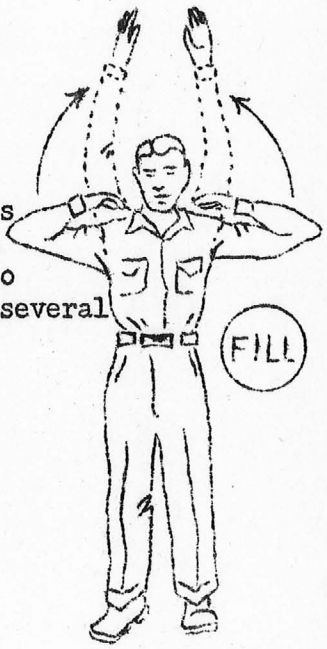
BROKEN CREST - Hand open and raised over head then touch head with same hand.



BROKEN TOE - Hand open and raised over head then touch toe with same.hand.

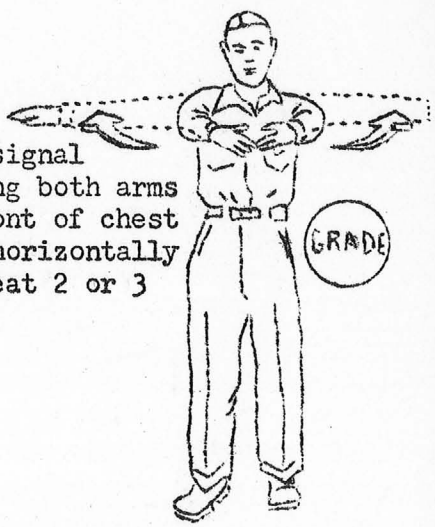
HAND SIGNALS (Cont'd.)

HARD TOE - 1 hand closed and raised over head then touch toe with same hand.

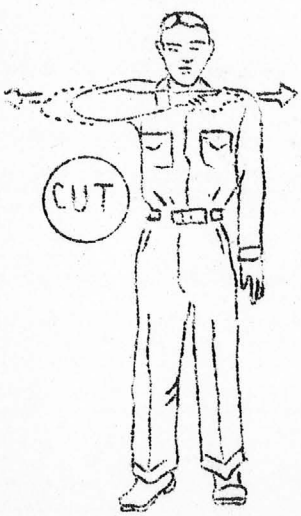


FILL - Fill signal is made by raising both arms from shoulder to arms length, repeat several times.

HARD CREST JOINS OLD - Lock fingers in front of body, elbows out from body, raise hands over head forming an O. Then touch head with closed hand.



GRADE - Grade signal is made by using both arms starting in front of chest and extending horizontally from body, repeat 2 or 3 times.



CUT - Cut signal is made with slicing motion with one hand at throat.

CODE OF SAFE PRACTICE

FOR

SAMPLING OPEN PIT BLAST HOLES AND ROTARY DRILL HOLES.

ENGINEERING DIVISION

CODE OF SAFE PRACTICE

FOR

SAMPLING OPEN PIT BLAST HOLES AND ROTARY DRILL HOLES

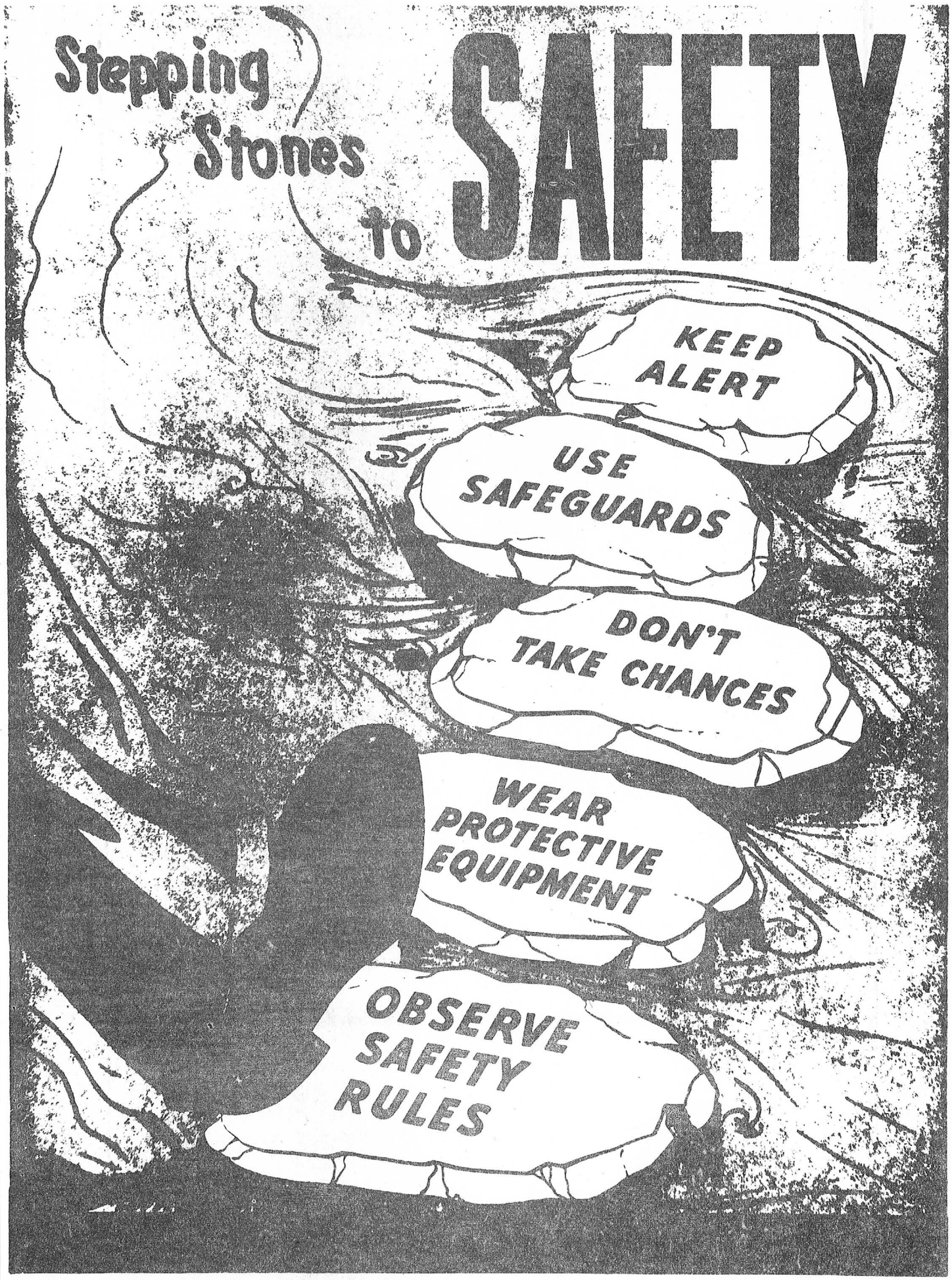
PHELPS DODGE CORPORATION

MORENCI BRANCH

ENGINEERING DIVISION

Morenci, Arizona

January, 1957


Stepping Stones to SAFETY
KEEP ALERT
USE SAFEGUARDS
DON'T TAKE CHANCES
WEAR PROTECTIVE EQUIPMENT
OBSERVE SAFETY RULES

INDEX

CODE OF SAFE PRACTICE
FOR
SAMPLING OPEN PIT BLAST HOLES AND ROTARY DRILL HOLES

I. REFERENCES

A. General Safety Rules, Morenci Branch.

B. Code of Safe Practice for Field Survey Parties, Engineering Division.

C. Code of Safe Practice for Churn Drilling, Open Pit Division.

E. Code of Safe Practice for Blasting, Open Pit Division.

F. Code of Safe Practice for Transporting Men and Supplies, Open Pit Division.

G. Code of Safe Practice for Prospect Drilling, Open Pit Division.

H. Master Code, Morenci Branch.

II. DESCRIPTION OF JOB

A. Statement of Objective

The objective of the Samplers is to obtain samples from drilling operations to determine the location and value of ore.

1. Services to be Performed

The Morenci Mine Sampling Department carries out the following functions:

a. Sampling

(1) Churn drill blast hole samples.

All blast hole churn drills are equipped with automatic sample boxes which cut out one-twelfth of the sludge. This sludge is delivered through a spout to sample collection cans. The sludge from the cans is split with a Jones Splitter to the required size so that a dry weight of 12 to 15 pounds may be obtained. The final sample is placed in a milk can and delivered to the bucking room for drying.

II. DESCRIPTION OF JOB
A. Statement of Objective, 1. Services to be Performed, - (Continued)

c. Laying out of the blast hole number system.

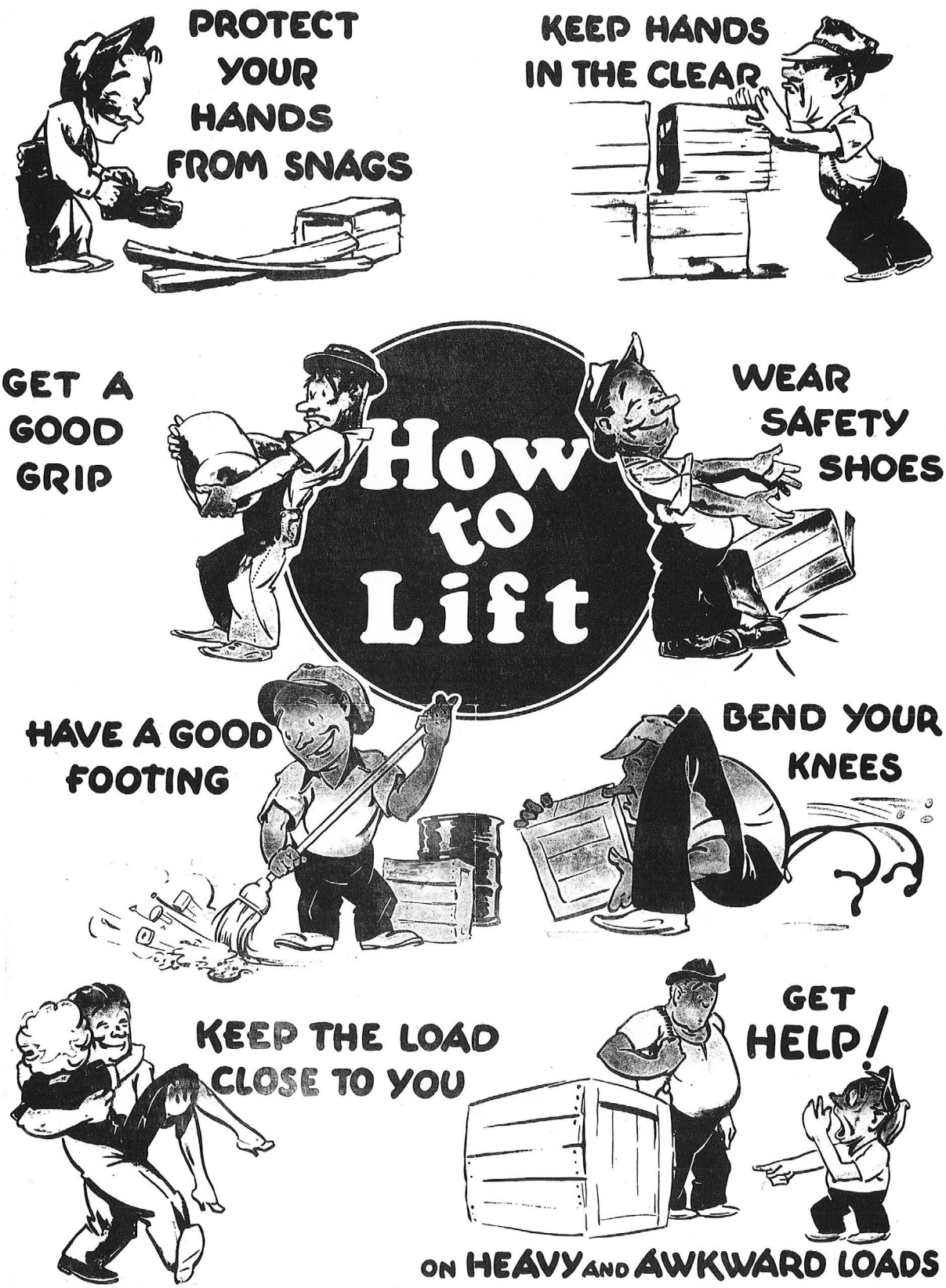
Blast holes are numbered by placing marked stakes on each drilled hole for identification purposes; for a rapid means of determining shovel positions, ore targets, waste targets, or leach targets; and for the location of missed holes. Each level in the mine has its own letter or letters. Smaller stakes are placed ahead of the drill holes by the Blasting Department to show the drillers where to drill. The Head Sampler, who is responsible for the number system, marks the smaller stakes for sampling and checks the drill holes periodically until they are blasted. The number system is preserved after blasts by placing off-set stakes along the back-break of the shot. This must be accurately done to preserve ore-waste or leach-waste contacts. After the shot, targets are placed on the cut-off points. Since the targets are sometimes knocked down or lost, they must be checked daily.

d. Field surveying.

All blast holes are located by means of stadia surveys prior to the blast. These holes are plotted on the Engineering Department's maps, and blasting tonnages are computed for a check against tonnages mined.

e. Shovel positions.

Shovel positions are determined at the end of the "C" shift by means of blast hole locations. These are located on pit planning and assay maps by flat-topped push pins so the foremen can ascertain the type of material which lies immediately ahead of each shovel.



Use Your Head — Save Your Back

II. DESCRIPTION OF JOB

A. Statement of Objective, 1. Services to be Performed, - (Continued)

j. Collections.

Special collections of minerals and rocks are made at the request of the management.

2. Services NOT to be Performed

a. Unauthorized personnel must not attempt to make mechanical or electrical repairs.

b. Personnel shall not be permitted to operate any piece of equipment until instructions in its correct operation have been received and authorization issued to do so.

c. Do not remove safety signs, tags, or guards erected by another employee unless authorized to do so by the proper authority.

d. Do not begin any job until the proper safeguards have been placed, the necessary equipment is at hand, and the job procedure is understood.

B. Statement of Hazards

1. Obvious hazards.

a. Improper lifting methods.

b. Running into or falling over obstructions at night.

c. Failure to use safety equipment.

d. Improper use of compressed air.

e. Working around moving machinery.

f. Working around suspended loads.

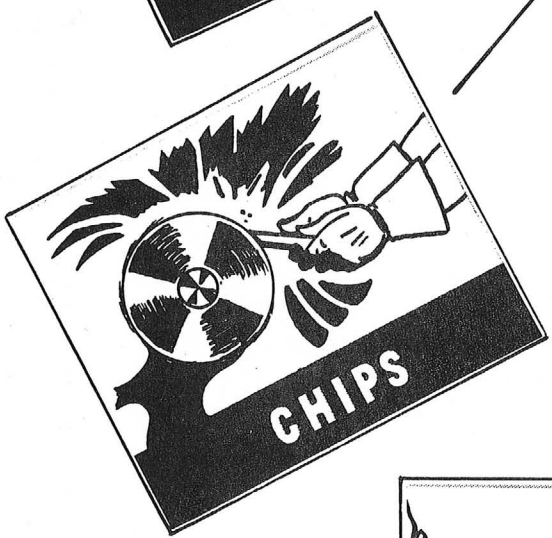
g. Improper use of tools; use of defective tools.

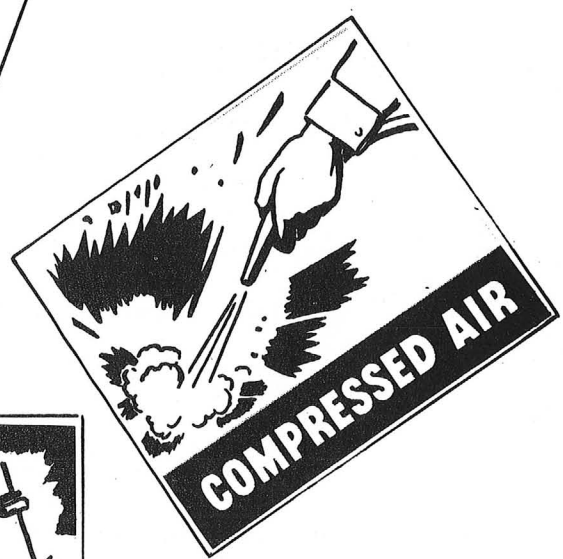
h. Unsafe driving practices.

i. Working near blasting operations.

j. Working with acids.

PROTECT YOUR EYES





III. CREW, DUTIES AND RESPONSIBILITIES
C. Training, - (Continued)

sampler. Every man shall have ample training for his job before he is required to assume full responsibility. They shall receive supplementary instructions from time to time at safety meetings and code reviews.

D. Duties

It is the duty of personnel covered by this code to perform the work to which they are assigned as efficiently as possible, following the precautions and safe practices outlined in this code. They must co-operate with their foreman and fellow workman in completing the job assignments as rapidly as is consistent with safety and efficiency.

E. Apparel

1. Employees shall be required to wear hi-top safety shoes.
2. Hats must be worn by all employees. Hard hats should be worn when there is danger of falling objects.
3. Safety goggles must be worn when there is danger of any objects getting into the eyes. (Note: Spectacle type goggles are not always sufficient protection. Bulldog goggles must be worn when chipping or cutting material, or when using a hammer on metal of any kind).
4. Each employee must have a pair of gloves. Gloves should be worn while handling material or where there is danger of pinch points, lacerations, etc.
5. Loose, baggy or torn clothing must not be worn.
6. Ties, finger rings, bracelets, and wrist watches with rigid metal bands must not be worn while working.

REACHING ON LADDER

LOOSE OBJECTS ON FLOOR

NOT WATCHING YOUR STEP

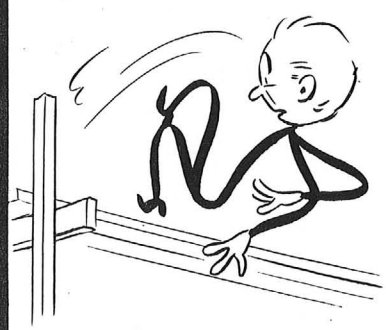
TRIPPING OVER OBJECTS

10 EASY WAYS TO FALL

BROKEN LADDER

SLIPPING ON OIL

NO GUARD RAIL



UNGUARDED MANHOLE

CLUTTERED STAIRWAY

BETWEEN PLANKS

VI. PROCEDURE AND PRECAUTIONS

A. General

1. Lifting heavy objects by hand.

   Hazards: Sprains; mashed fingers or injured feet.

   Precautions: Wear gloves and hard toed shoes; get a firm grip. Avoid awkward lifting methods. Face the load and take most of the weight on the heavy leg muscles rather than on the weak back or side muscles. When the load is to be carried, watch the footing as a slip will result in a loss of balance, thereby throwing the weight onto some of the weaker muscles. Carry the load close to the body. Put the load down the same way it was lifted, being careful not to twist the body and keeping hands and feet in the clear. When two or more persons are lifting insure teamwork by having one man give orders as when to lift or lower the load. For very heavy loads get plenty of help or use a bar, jack, chain block, crane or other mechanical means to handle the load.

2. Working at night.

   Hazards: Running into or falling over obstructions; falling into holes; walking into live power lines or cables.

   Precautions: Carry a hand lamp, not only to light the way, but also so others may see where you are.

3. Handling rough material by hand.

   Hazards: Mashed fingers; splinters, cuts.

   Precautions: Wear gloves and be careful to keep fingers clear of pinch points.

Have Your TOOLS Fixed

...Not Your HANDS!

VI. PROCEDURE AND PRECAUTIONS

A. General, 9. Working with suspended loads, - (Continued)

Precautions: Never work under a suspended load. Never put hands or feet under a load. Stand well in the clear in case anything should fall from the load or sling breaks.

10. Clearance on railroad tracks.

Hazards: Collisions.

Precautions: Never cross a railroad track without first making sure no train is approaching. Don't leave a machine or vehicle closer than six feet to the nearest end of the ties.

11. Getting off vehicles or equipment.

Hazards: Falls; sprains or bruises.

Precautions: Don't jump off vehicles or equipment; climb down carefully. Keep the area around the step clear of stumbling hazards.

12. Operating equipment without permission.

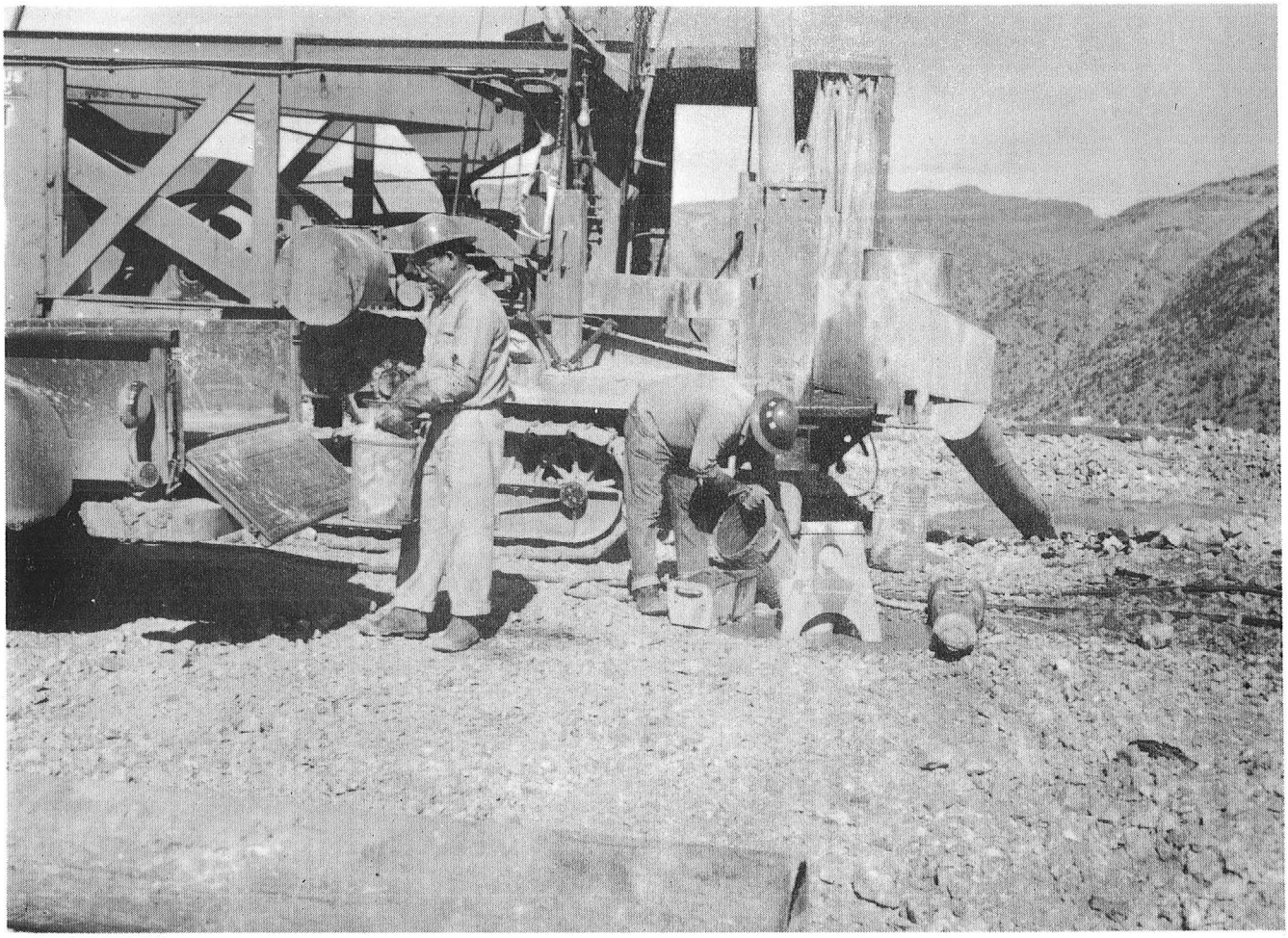
Hazards: Allowing equipment to get out of control.

Precautions: Never operate equipment without proper authority from the foreman.

B. Hand Tools

Hazards: Tools slipping in hands or using defective tools.

Precautions: Keep hands clean; keep tools free from grease or oil. Keep all tools in good working order. Never use a defective tool. Discard it or have it repaired. Always use the right tool and use it properly.



BLAST HOLE SAMPLING

1. WATCH FOOTING NEAR BANKS AND AROUND CHURN DRILLS.
2. PROTECT EYES WHILE TAKING SAMPLES.
3. LIFT PROPERLY AND AVOID STRAINS WHILE HANDLING SAMPLES.

VI. PROCEDURE AND PRECAUTIONS

D. Working Around Drills, Hazards:, - (Continued)

into holes, or over crest.

Precautions: When mounting or dismounting drills be sure of footing. Avoid any objects which may strike your body or head. Do not mount the churn drill decks unless the driller is notified and the drill is shut down. Before entering an area locate all hazards such as pipe lines, hoses, shovel and churn drill cables, and holes. Avoid these hazards so you won't fall over them. Safety goggles, hard hats, rubber gloves, and rubber boots are mandatory equipment. These are worn to prevent accidents from contact with sludge and water from the drills. Anyone working around churn drills should be familiar with the Code of Safe Practice for Churn Drilling, Open Pit Division, and the Code of Safe Practice for Prospect Drilling, Open Pit Division.

E. Working Around Blasts and Blast Holes

Hazards: Danger of premature explosion; danger of flying rocks; danger of falling into an unguarded hole.

Precautions: Anyone working near blasting operations should be familiar with the Code of Safe Practice for Primary and Secondary Blasting, Open Pit Division. When working in an area near blasting operations orders of guards must be obeyed. When the whistle signal for a blast is sounded, all persons must make sure that they are a safe distance from any bank where a

FIRST-AID
Minor Injuries
Prevent Infection—Get First-Aid First

1 Get expert first-aid attention at once for scratches, cuts, splinter punctures, or foreign bodies in the eye.

2 If you must treat an injury yourself:

a. Apply an antiseptic to open wounds.

b. Cover wounds and burns with a sterile dressing only, never adhesive tape directly on them.

c. See a doctor at once for puncture wounds, infections, and eye injuries.

3 Observe the company rules on the reporting and further care of injuries.

VII. CO-ORDINATION WITH OTHER JOBS - (Continued)

B. Employees working above other persons must safeguard them by posting necessary warnings and danger signs, and by enclosing the space below.

C. Observe the safety rules of the department in which you are working.

D. Notify all persons likely to be endangered by the work you are doing or who might endanger you.

E. If there is more than one employee engaged in the same job, all must understand the procedure to be followed.

VIII. PROCEDURE IN CASE OF EMERGENCIES

A. Electrical Storms

1. Stay in the truck if possible. If it is necessary to get out of the truck, jump clear. Do not touch the truck and the ground at the same time.

2. Stay away from pipe lines, power cables, shovels, railroad tracks, or any conductors of electricity.

3. Move from high places. Remember lightning will strike the highest point.

B. In any emergency help can be summoned by calling the Dispatcher, either from a field telephone or from a vehicle equipped with a 2-way radio.

IX. PROCEDURE IN CASE OF INJURIES

F. Procedure for returning to Hospital for retreatment-, - (Continued)

2. When it is no longer necessary for the man to return, the Doctor will issue a "discharge notice".

3. The foreman must insist upon getting these statement until the discharge notice is received as this provides assurance that the man has been to the Hospital and also provides the Foreman with the knowledge as to when the injured employee is to return to the Hospital.

4. Employees who are working on the day shift will be provided with transportation at 7:50 o'clock A. M. to go to the Hospital.

5. Injured employees who are working on other shifts are required to go to the Hospital during the day time and they must present their medical redressing slip to the Foreman when reporting for work.

6. The Foreman must receive the slip before allowing the man to go to work.

G. In case of a probable fatal injury a Doctor and the Safety Supervisor must be called to the location of the accident.

H. First Aid

1. If necessary, remove the injured man to a place where additional injury will not occur.

2. Apply first aid treatment to stop bleeding, if any, and treat for shock. There may be a spark of life.

3. If the Doctor pronounces the accident fatal, follow instructions pertaining to fatal accidents.

* * * * * * * * * * *

VII INTERNATIONAL
MINERAL PROCESSING CONGRESS

VISIT TO

PHELPS DODGE CORPORATION
MORENCI REDUCTION WORKS CONCENTRATOR
MORENCI, ARIZONA

OCTOBER 2, 1964

PHELPS DODGE CORPORATION

MORENCI BRANCH

MORENCI, ARIZONA

October 30, 1964

Mr. Frank P. Knight, Director
Department of Mineral Resources
Mineral Building, Fairgrounds
Phoenix 7, Arizona

Dear Mr. Knight:

In response to your letter of October 27 we are enclosing two copies of the brochure which was furnished to members of the Seventh International Mineral Processing Congress Tour to Morenci on October 2. These copies are Xerox copies of one of the original brochures and hence the pictures are not as good as the originals. There has, however, been no loss in transferring of the other data.

Yours very truly,

J. A. Lentz
Manager

JAL:h
Enclosures

VII INTERNATIONAL
MINERAL PROCESSING CONGRESS

VISIT TO

PHELPS DODGE CORPORATION
MORENCI REDUCTION WORKS CONCENTRATOR
MORENCI, ARIZONA

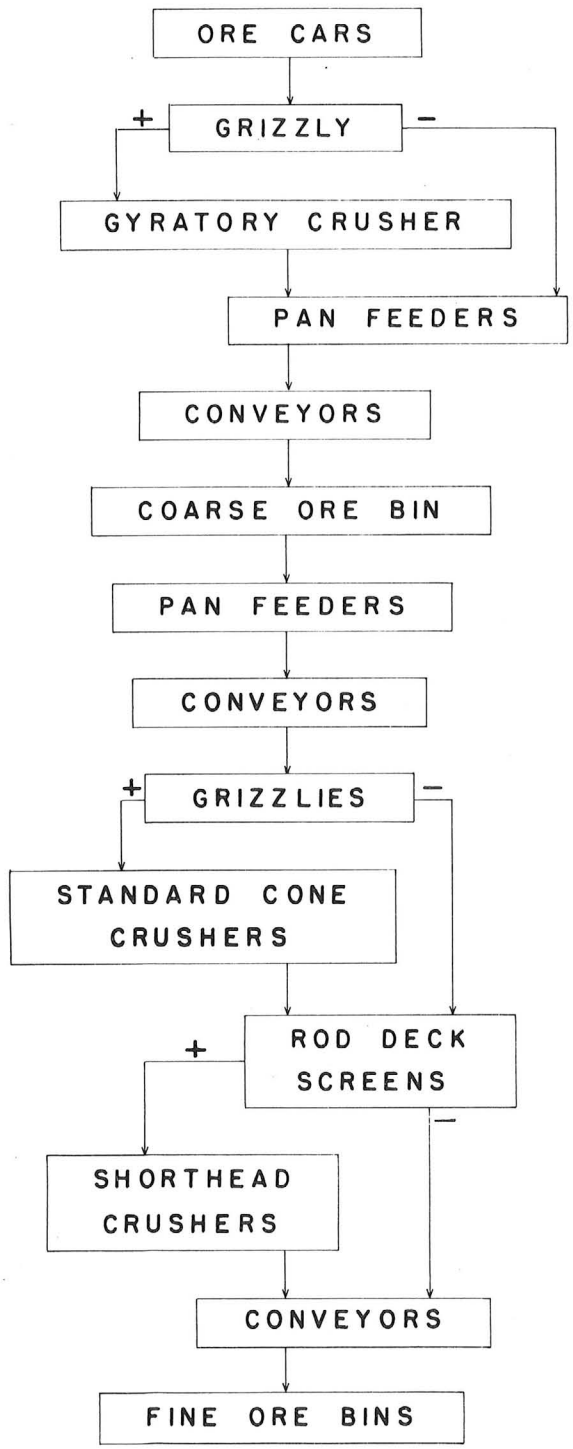
OCTOBER 2, 1964

PHELPS DODGE CORPORATION

MORENCI BRANCH

CONCENTRATOR FLOWSHEET

CRUSHING



40 & 43 CU. YDS.

6" OPENING
40° INCLINATION

60" OPENING
6" SETTING

2-72" X 38'

NO. 1-A, 1-B
54" WIDE BELT

12,000 TONS LIVE CAPACITY

16-48" X 13'

4-60" WIDE BELTS

4-6' X 11' 35° INCLINATION
1 1/4"-1 3/4" OPENINGS

4-7' CONE
1" SETTING

16-5' X 10' SCREENS
3/8" RODS
7/16" OPENING
25° INCLINATION

8-7' CONE
1/4" SETTING

7-54" BELTS

20,000 TONS LIVE CAPACITY

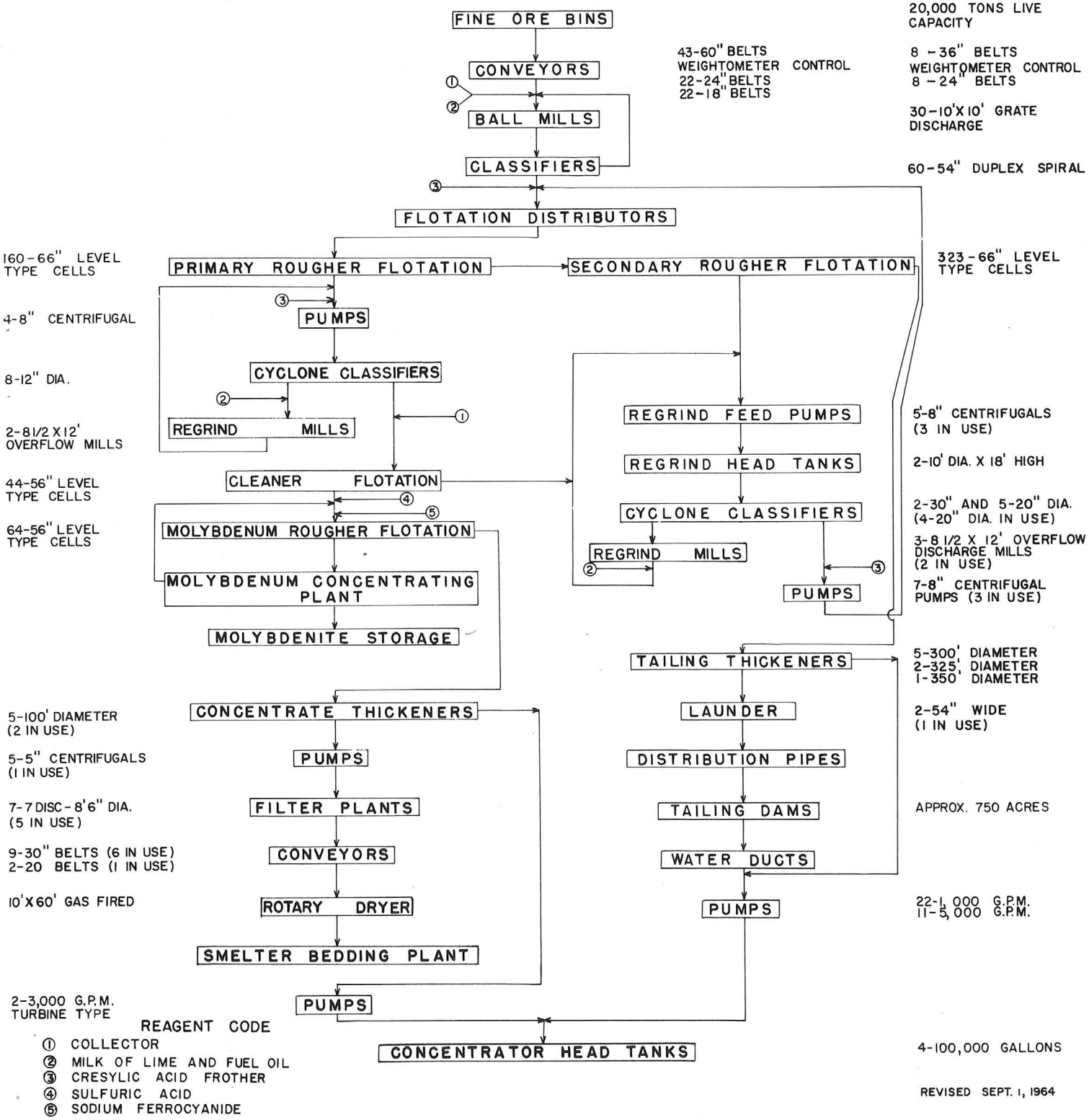
REVISED SEPT. 1, 1964

PHELPS DODGE CORPORATION

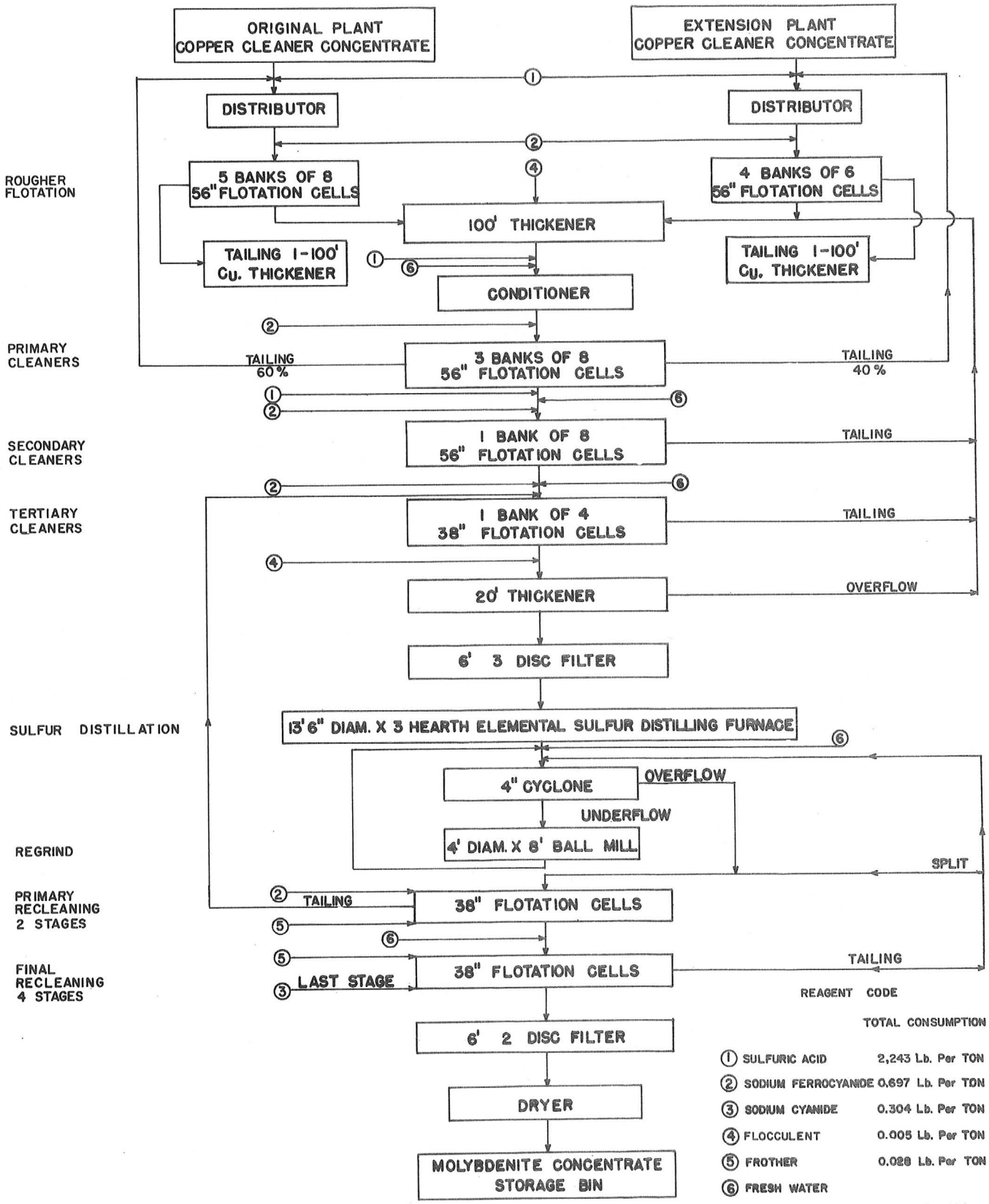
MORENCI BRANCH

CONCENTRATOR FLOWSHEET

GRINDING AND FLOTATION



PHELPS DODGE CORPORATION
MORENCI BRANCH
MOLYBDENITE FLOWSHEET



MORENCI CONCENTRATOR METALLURGY
JANUARY THROUGH AUGUST 1964

Dry Tons Ore Milled	12,229,599
Dry Tons Ore Milled per Operating Day	58,515
Dry Tons Ore Milled per Primary Ball Mill per 24 Hours	1,965
Ball Mill Operating Time, Percent of Scheduled	99.28

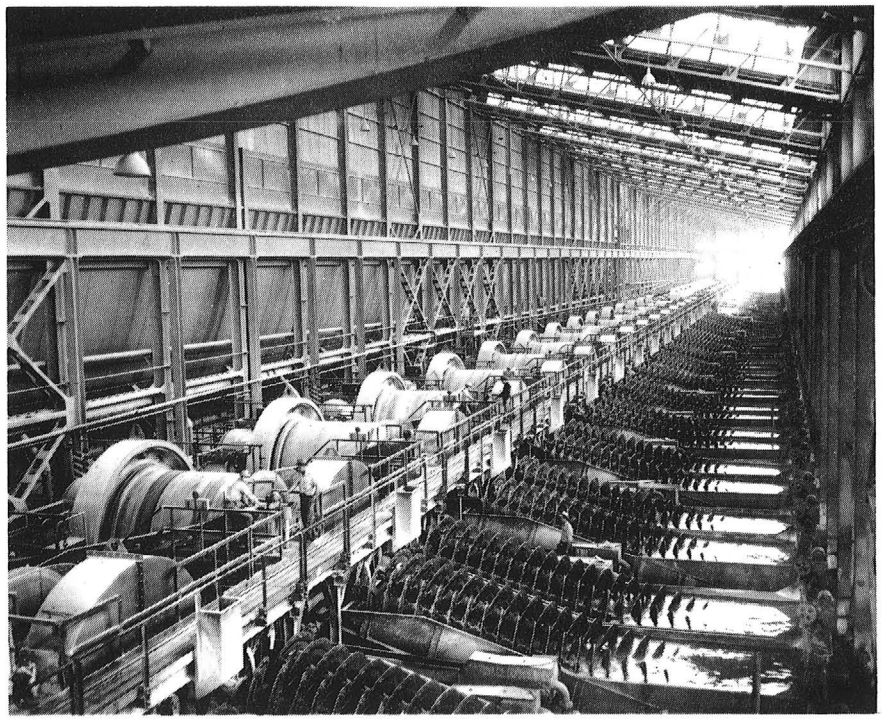
Assay of Feed

% Total Cu	0.91
% Oxide Cu	0.13
% Pyrite	4.96

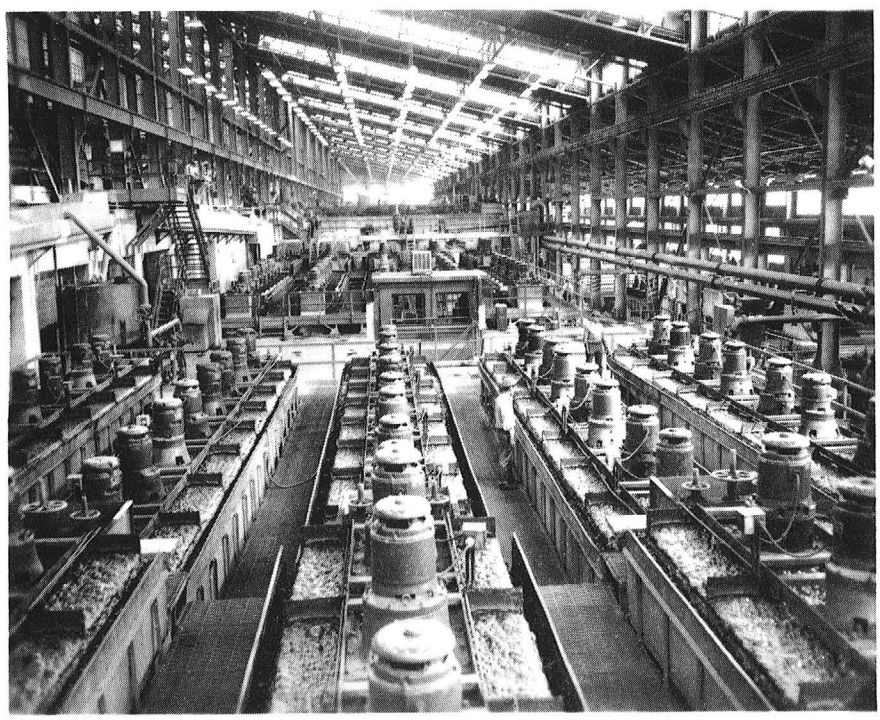
Flotation Reagent Consumption	Lb/Ton Ore Milled
Lime	5.15
Collector	0.018
Cresylic Acid-Fuel Oil	0.066

Screen Analyses, Cumulative Percent Retained

	Crusher Product	Flotation Tailing
+0.525"	6.0	
+0.371"	24.2	
+ 3 Mesh	40.6	
+ 4 Mesh	53.3	
+ 10 Mesh	72.2	
+ 28 Mesh	82.4	
+ 65 Mesh	88.8	10.9
+100 Mesh	90.6	23.1
+150 Mesh		34.0
+200 Mesh	92.6	43.5
-200 Mesh	7.4	56.5



PRIMARY GRINDING SECTION



ROUGHER FLOTATION SECTION

RECOVERY OF OXIDE COPPER FROM MORENCI MILL FEED

For the past ten years the sulphide ore milled in the Morenci Concentrator has contained an average of 0.12% Cu in an oxidized condition, with variations in annual averages from 0.09% in 1954 to a high of 0.14% in the year 1960. These assays represent from 10% to more than 15% of the total copper content of the ore treated, and as only a minor proportion of the oxide copper is floated with the chalcocite concentrate, this oxidation results in the loss of a substantial quantity of copper.

Portions of the ore body contain identifiable oxide copper minerals as chrysocolla, brochantite, azurite, malachite, cuprite, and native copper, but in most of the mill feed the major portion of the oxide copper appears to have been formed by fairly recent oxidation of chalcocite that does not result in the production of recognizable oxide minerals.

An intensive investigation was made of possible methods for profitably recovering some of this oxide copper from current mill feed and two different systems were developed.

Leaching, Sulphide-Precipitation, Flotation, System

A method was discovered for acid leaching crushed mill feed and simultaneously precipitating dissolved copper as a sulphide, the mixture then being made alkaline by the addition of lime, ground, and floated to recover copper sulphide minerals plus the precipitated copper sulphide. This method was developed in laboratory testing and investigated in detail in two years of operation on a scale of 2000 tons of ore per day with a 4-ton per day plant for producing the necessary calcium sulphide precipitant.

As a result of this testing the concentrator is now being equipped to apply acid leaching and sulphide precipitation to the crushed mill feed immediately before the grinding stage that prepares the ore for flotation recovery of copper sulphides. Plants are also being installed for production of the necessary sulphuric acid and additional lime; extra flotation equipment is being added to float pyrite from a portion of the copper plant tailing, and plant erection to produce calcium sulphide precipitant from lime, pyrite and coal is in progress. Leaching and sulphide precipitation is scheduled for application to the full tonnage of Morenci mill feed early in the year 1965.

In the concentrator the essential equipment for employment of the leaching-precipitation stage consists only

of a drum mixer installed between the fine ore bin and each of the 30 primary ball mills. Each cylindrical drum mixer is 6 feet inner diameter by 22 feet long and is rotated at 6 revolutions per minute. Crushed ore having a sizing of 6% remaining on a 1/2" screen with 47% passing 4 mesh is fed into the drum mixer together with fresh water to give a pulp containing 78% solids by weight. Into the feed end of the drum mixer sulphuric acid is added to maintain a pH of 1.5 in the mixer discharge pulp, and slurried calcium sulphide precipitant is added at the feed end to provide a slight excess of precipitant over the amount stoicheometrically required to precipitate copper that is dissolved by the sulphuric acid. Additions of acid and precipitant are automatically controlled to maintain the desired hydrogen ion concentration and oxidation reduction potential in pulp discharged from the drum mixer. At a feed rate of 2000 short tons of ore per drum mixer per 24 hours a contact time of 5 minutes is provided; the discharge pulp flows to the ball mill feed scoop box where lime slurry is added to raise the pH to 10.0 and the grinding and flotation circuits remain unchanged from those used before equipping for recovery of oxide copper.

Reagent consumption will be 5 pounds sulphuric acid, 3 pounds calcium sulphide precipitant and an additional 4 pounds lime per ton of ore milled, plus some increase in flotation

collector reagent, and this treatment recovers 50% of the oxide copper. An increase in recovery is dependent upon finer crushing to expose more of the oxide copper for acid leaching with subsequent precipitation as floatable copper sulphide.

An important section of this system is the manufacture of the precipitant, which is accomplished by dry grinding lime and pyrite in chemically equivalent proportions, the ground mixture then being moistened and pelletized. Dried pellets and fine coal are heated for 2 hours in a reducing atmosphere in a rotary kiln to a maximum temperature of 1700° to 1750° F followed by cooling in a non-oxidizing atmosphere. The product is magnetically separated to remove reduced pellets from non-magnetic material that is chiefly fine coal, which is then recirculated to the reduction kiln feed.

The precipitant manufactured consists largely of calcium sulphide with smaller amounts of metallic iron and ferrous sulphide. It is an active precipitant of copper when finely ground and applied to acid solutions. In the concentrator the wet ground precipitant will be circulated in slurry form for controlled addition to each of the drum mixers.

Essential features of the manufacture and application of this precipitant are covered in a United States Patent, issued to Phelps Dodge Corporation.

Pan Drainage Washing System

Another process developed for the recovery of oxidized copper from Morenci mill feed applies acid leaching to the crushed ore under conditions that result in agglomeration. The leached, agglomerated ore is water washed in counter-current stages by gravity drainage to give washed ore for grinding followed by flotation of copper sulphide minerals, the other product from washing is copper-bearing solution for sponge iron precipitation.

After laboratory development the details of this process were refined by two year's operation at a rate of 2000 short tons of ore per day, and continuing testing of a recently-modified pan drainage washer may be seen at number 30 ball mill in the Morenci Concentrator.

Sulphuric acid and water are added to the product from the secondary crushing plant before it is delivered to the fine ore bin. Crushed ore is acidified with sulphuric acid to give a pH of 1.5 in ore discharged from the fine ore bin and enough water is added to raise the total moisture content of the ore to about 9% to give the conditions needed for leaching oxide copper and agglomerating the crushed ore.

Adequate mixing and efficient agglomeration are obtained by spraying diluted sulphuric acid onto crushed ore at several

points on the conveyor system used in transporting crushed ore from the secondary crushing plant to the fine ore bins.

The residence time of moistened acidified ore in the fine ore bin varies up to a maximum of 11 hours and is ample for effective leaching of acid-soluble copper.

From the fine ore bin the agglomerated ore is delivered to the pan washer where it is bedded to a depth of 20 inches on a false bottom of 8 mesh stainless steel screen in each pan.

Stainless steel pans are each 6 feet long, 2 feet wide by 2 feet deep and are linked to form an endless chain which is continuously driven at a rate that provides 9 minutes for washing and draining from the time acidified agglomerated ore is delivered into a pan until it is discharged as washed ball mill feed.

The 30 degree inclination of the pan drainage washer permits six stages of washing by counter-current gravity flow of the washing solution. Washed ore is discharged to the feed scoop box of number 30 ball mill after which point the treatment is unchanged from that now used in the concentrator. An 85% washing efficiency is obtained with the production of one-fifth ton of copper bearing solution from the pan drainage washer per ton of ore treated, this solution is thickened to remove the small quantity of solids and the clarified solution is treated by

sponge iron precipitation to recover the copper.

Application of this agglomeration-leach-wash process is supplemented by a Phelps Dodge method for producing sponge iron from copper converter slag, a system that is currently producing 50 tons of sponge iron per day at the Phelps Dodge Corporation smelter in Douglas, Arizona.

A United States patent has been issued to Phelps Dodge Corporation that covers this method of producing sponge iron, and a patent application for the pan drainage system of washing agglomerated leached ore has been filed to cover the joint development of the process and equipment by the Eimco Corporation and Phelps Dodge Corporation.